Bridging the divide between resource management and everyday life

Smart metering, comfort and cleanliness

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Declaration by the Candidate

I, Yolande Strengers, declare that:

a) except where due acknowledgement has been made, this work is that of myself alone;

b) this work has not been submitted previously, in whole or part, to qualify for any other academic award;

c) the content of the thesis is the result of work that has been carried out since the official commencement date of the approved research program;

d) any editorial work, paid or unpaid, carried out by a third party is acknowledged.

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Glossary of terms

Bluetooth: An open wireless protocol for exchanging data over short distances from fixed and mobile devices, which can be used to communicate between a smart meter and a Home Area Network (HAN), including an in-home display (IHD).

Council of Australian Governments (COAG): The peak intergovernmental forum in Australia, comprising the Prime Minister, State Premiers, Territory Chief Ministers and the President of the Australian Local Government Association (ALGA) (COAG 2009, p. 117).

Demand management: A resource management strategy designed to control, curb or shift consumer demand for resource services through the use of financial incentives, market mechanisms, education, efficiency measures, or other programs and instruments. Normally employed when there is a shortage of supply, or where the provision of supply is environmentally or economically damaging. Also known as demand-side management.

Direct load control (DLC): The remote control of large appliances by electricity utilities during periods of peak demand, which can be enabled both with and without a smart meter (through radio frequency and powerline communication systems).

Dynamic peak pricing (DPP): A consumer tariff structure employed in the electricity sector which charges significantly more (10-40 times the off-peak rate) for electricity during short and variable periods of high demand known as DPP 'events'. Customers are typically notified within 24 hours of an event occurring via multiple communication methods, such as SMS, email, phone, or through an IHD. Events generally last four to six hours and are typically called up to 12 times per year. Also known as critical peak pricing (CPP).

Dynamic peak rebate (DPR): A new dynamic tariff proposed by EnergyAustralia that is delivered directly to customers through a distributor (rather than retailer). DPR is similar to DPP, except that instead of charging more for electricity during DPP events, customers receive a rebate for electricity savings achieved during this period (Collins 2009).

ecoMeter: An IHD manufactured by Landis & Gyr.

Home area network (HAN): A residential local area computer network which is used to connect multiple devices within the home. In conjunction with smart metering, a HAN refers to a network of smart appliances, TSCs, DLC, home automation and/or the provision of an

IHD. The minimum functionality for the national roll-out of smart metering in Australia includes an interface to a Home Area Network which enables IHDs and DLC programs.

Home automation: The increased automation of household appliances, devices and building features, particularly through electronic means. Generally refers to automatic or semi-automatic lighting; heating, ventilation and air-conditioning (HVAC) services; entertainment systems, climate-controlled windows and doors; and security or surveillance systems.

In-home display (IHD): A device located inside the home which displays recent or real-time consumption feedback (electricity, water and/or gas) specific to the household (or building). IHDs gain access to this information through a smart meter (although some IHDs do not require a smart meter to function) and can facilitate communication between households and utilities. Displays generally consist of a screen and a series of buttons which move between different information formats (pricing, greenhouse gas emissions, water consumption, gas consumption, electricity consumption, messages from a utility, etc.).

Kilowatt hour (kWh): A unit of energy which is the product of power in kilowatts and time in hours. For example, a heater rated at 1000 watts (1 kilowatt) operating for one hour uses one kilowatt hour (equivalent to 3600 kilojoules) of energy. The unit of kilowatt hours is commonly used by electricity providers for the purposes of billing.

Light-emitting diode (LED): A low-energy electric light source.

Load shifting: A demand management strategy employed by electricity utilities to smooth out peaks and troughs in demand by encouraging consumers to shift their consumption from peak to off-peak periods through strategies such as DPP, TSCs or TOU tariffs, or by directly controlling consumer demand through ripple control or DLC.

Ministerial Council of Energy (MCE): An organisation governing and setting policies for marketing electricity, gas and other energy supplies in Australia. Founded in 2001 by COAG, the MCE applies COAG's national energy policy framework, monitoring the use of energy reserves and supply prices to advantage Australians.

Peak demand: A term used predominately in the electricity sector to refer to periods of time when consumer demand is at its highest. Fluctuations in peak demand may occur on daily, weekly, monthly, seasonal and yearly cycles. For an electricity utility, the actual point of peak demand is a single half hour or hourly period which represents the highest point of customer

demand for electricity. Peak demand often occurs on very cold or very hot days and is directly related to residential heating and cooling services.

Ripple control: A form of electricity load control that communicates over the powerline to control demand for specific appliances inside a building. Ripple control is used extensively by electricity distributors to manage electric hot water heaters by switching them from peak (daytime) to off-peak (night-time usage).

Smart metering: A new form of electronic metering which replaces the traditional manually read electricity, water or gas meter to measure the amount of energy supplied to or produced by a residence, business or machine. Definitions of smart metering vary in both the energy and water sectors, partly because this device's functionality is still being defined. However, generally speaking, a smart meter is characterised by at least half-hour data logging capability and two-way communication functionality (between the metered property and the utility).

Time of use pricing (TOU): A form of variable pricing predominately implemented in the electricity sector. TOU is typically characterised by an off-peak, shoulder and peak rate which are set at fixed periods of time and remain the same throughout the year. TOU tariffs are being implemented in some states where customers have received a smart meter.

Time switch control (TSC): A device which can be attached to appliances such as air-conditioners and pool pumps to remotely turn them on and off at specified times. Unlike DLC, TSCs allow householders to maintain complete control over their own energy consumption, over-riding the time switches if they think it's necessary. TSCs do not require a smart meter to operate. However, they have been provided to customers as part of some smart metering trials in Queensland and internationally.

ZigBee: A specification for a suite of high-level, low-cost, low-power, wireless communication protocols often deployed in conjunction with smart metering to enable a HAN, which can then facilitate an IHD and home automation.

Abbreviations

ACF:	**Australian Conservation Foundation**
ACID:	**Australasian Co-operative Research Centre for Interaction Design**
AGL:	**Australian Gas and Light Company**
AHURI:	**Australian Housing and Urban Research Institute**
ALGA:	**Australian Local Government Association**
AMI:	**Advance Metering Infrastructure**
ASHRAE:	**American Society of Heating, Refrigeration and Air-conditioning Engineers**
AWA:	**Australian Water Association**
CALC:	**Consumer Action Law Centre**
CHI:	**Computer-human interaction**
COAG:	**Council of Australian Governments**
CPP:	**Critical peak pricing**
DLC:	**Direct load control**
DPP:	**Dynamic peak pricing**
DPR:	**Dynamic peak rebate**
DSE:	**Department of Sustainability and Environment (Victorian Government)**
HAN:	**Home area network**
HIA:	**Housing Industry Association**
HVAC:	**Heating, ventilation and air-conditioning**
ICTs:	**Information and communication technologies**
kWh:	**Kilowatt hour**
LED:	**Light-emitting diode**
MCE:	**Ministerial Council of Energy**
NEMMCO:	**National Electricity Market Management Company**
NSW:	**New South Wales**
NT:	**Northern Territory**
PV:	**Photovoltaic**
QLD:	**Queensland**
RG1:	**Research Group 1: Frankston and Dromana Australian Conservation Foundation (ACF) GreenHome program**

RG2:	**Research Group 2: South East Water (SEW) EcoPioneer pilot program**
RG3:	**Research Group 3: Currumbin EcoVillage housing development**
RG4:	**Research Group 4: EnergyAustralia dynamic peak pricing (DPP) trial**
RGs:	**Research groups**
SA:	**South Australia**
SEW:	**South East Water**
SMS:	**Short message service**
TAS:	**Tasmania**
TDP:	**Technical development pathway**
UK:	**United Kingdom**
USA:	**United States of America**
VIC:	**Victoria**
WA:	**Western Australia**

List of Tables and Figures

List of Appendices

Table of contents

Abstract

Smart metering residential demand management programs, such as consumption feedback, variable pricing regimes and the remote control of appliances, are being used to respond to the resource management problems of peak electricity demand, climate change and water shortages. Like other demand management programs, these strategies fail to account for (and respond to) the reasons why people consume resources in their homes, namely to carry out everyday practices such as bathing, laundering, heating and cooling. In particular, comfort and cleanliness practices together constitute most of Australia's potable water consumption in urban centres, and represent most of household energy consumption. In addition, new household cooling practices involving air-conditioning appliances are the major contributor to the nation's rising peak electricity demand, which overloads the electricity system on hot days, costing consumers millions of dollars each year. The oversight of comfort and cleanliness practices in smart metering demand management programs is concerning because these practices are continuing to shift and change, often in more resource-consuming directions, potentially negating the resource savings achieved through demand management programs.

This thesis aims to bridge the problematic divide between the policies and strategies of demand managers, and the day-to-day practices which constitute everyday life. Using the empirical 'hook' of smart metering demand management programs and the everyday practices of comfort and cleanliness, this thesis develops a practice-based conceptual framework to study, understand and analyse these practices and the ways in which smart metering demand management programs reconfigure or further entrench them.

A series of qualitative methods were employed in studying 65 households across four research groups, focusing specifically on the household practices of heating, cooling, bathing, laundering, toilet flushing and house cleaning. In addition, 27 interviews were conducted with smart metering industry stakeholders involved or implicated in delivering demand management strategies. Together, these lines of inquiry are used to analyse householders' existing and changing comfort and cleanliness practices, the role of several smart metering demand management strategies in reconfiguring these practices, and potential avenues and opportunities for further practice change in less resource-intensive directions. In particular, this thesis highlights the inherent contradictions and problems in accounting for everyday practices within the dominant demand management paradigm, and offers an alternative paradigm termed the *co-management of everyday practices.* The thesis concludes by briefly identifying the ways in which smart metering could potentially constrain or catalyse a transition towards this new paradigm.

Chapter 1: Introduction and overview

Australia's limited energy and water resources have been facing growing pressure as a result of rising and more erratic household demand. Changes and increases in this demand have contributed to a number of economic and environmental problems such as peak electricity demand, climate change, and widespread urban water shortages. Faced with these challenges, utilities and governments have begun to depart from the 'build and supply' paradigm (Guy & Marvin 2001) traditionally dominating the energy and water sectors, whereby resource engineers build more dams, pipes, power stations and power lines to meet escalating demand. In addition to building and supplying more power and water, resource providers are 'managing' demand through consumer education, consumption feedback, new energy and water pricing schemes, and new technologies and devices designed to make resource usage more efficient. Such strategies assume that individuals weigh up the costs and benefits of consuming resources in accordance with their desires, opinions, values, attitudes and beliefs. Furthermore, they ignore the ways in which systems of energy and water provision — including technologies and infrastructures inside the home, and dams, pipes and wires outside it — shape this consumption (Van Vliet *et al.* 2005).

Thus, demand management strategies have been characterised by a conceptual and practical split between the sphere of resource *production* — where resources are produced, captured, managed, and delivered to people's homes — and the seemingly separate sphere of *consumption* (Guy & Marvin 2001). In focusing on either empowering consumers to reduce their demand or designing more efficient supply systems and household technologies, demand managers reinforce this production–consumption divide and overlook the reasons *why* people use resources, *how* these 'needs' and 'wants' are constituted, and *how* they are changing within the broader context of everyday life, where day-to-day practices, such as bathing, cooking, laundering and house cleaning, take place (Wilhite *et al.* 2000). This is problematic because everyday practices are continuing to shift and change, often in more resource-intensive, expensive and environmentally damaging directions, thereby subsuming the efficiency gains achieved through demand management strategies.

Examples of the problems arising from ignoring the changing dynamics of everyday practices are numerous and widespread. Energy consumption is continually rising as new or more energy-intensive appliances, such as plasma TVs, home entertainment systems, personal computers, dishwashers, clothes dryers, air-conditioners and central heating and cooling systems, are incorporated into day-to-day living (Akmal & Riwoe 2005; DEWHA 2008; Harrington *et al.* 2006). While urban water consumption is in a temporary growth hiatus, it is

expected to rise again as water restrictions and targets are lifted when new energy-intensive supply systems, such as desalination, interconnected pipelines and wastewater recycling, are brought online (Besser 2007; England 2009; Ker 2009; VLP 2007). With climate change scientists warning of the severe dangers facing the planet if emissions are not drastically and urgently curbed (IPCC 2007), there is a critical need to break down the production–consumption divide and refocus attention on the constitution and transformation of everyday practices at all levels of policy and practice.

One of the ways in which utilities and governments are responding to the challenges of peak electricity demand, climate change and water shortages is through the introduction of smart meters, which can facilitate the large-scale implementation of demand management programs. Smart meters are a new 'intelligent' version of the traditional manually read energy and water meter, and are characterised by two-way communication (between a utility and a household or business) and remote reading capability (NERA 2008b). Smart meters can improve utilities' communication with households through the use of an in-home display (IHD), and can communicate directly with 'smart' appliances in the home to switch them on or off. Householders can also communicate with their utilities through a smart meter — sending information about their own energy or water production (through on-site generation) and consumption, or responding to messages sent by the utility. To date, smart meters have focused on technological efficiencies, such as the remote control of large appliances (i.e. the air-conditioner), or education and pricing programs designed to encourage householders to 'save' or 'shift' their consumption. Such strategies are characteristic of the demand management assumptions identified above, in that they fail to account for, or address, the changing composition of everyday life and the ways in which householders' everyday practices constitute residential demand.

These oversights are particularly problematic for smart metering residential demand management programs, given that the problems they seek to address, namely peak electricity demand, climate change and urban water shortages, are problems that are exacerbated primarily by comfort and cleanliness practices. For example, new mechanical forms of residential heating and cooling are the primary cause of Australia's rising peak demand (EES 2006; NEMMCO 2007; Wilkenfeld 2004), whereas indoor cleanliness practices — bathing (20%), laundering (15%) and toilet flushing (15%) in particular — account for the majority of potable (drinking) water in the home (Harper 2006) and the largest percentage of Australia's urban potable water supplies (AWA 2001). Comfort and cleanliness practices together dominate household energy use (and greenhouse gas emissions) through space heating and cooling (41%) and hot water production (24%) (ABS 2008a). In addition to the economically inefficient investment in new electricity infrastructure required to meet peak

electricity demand (DPI 2009; ETSA 2007a) — a cost which is currently passed on to all electricity consumers — water is predicted to become less affordable with the introduction of energy-intensive supply systems required to meet demand (Ker 2009). The impact of comfort and cleanliness practices is therefore interconnected and widespread, contributing to a range of resource management, economic and environmental problems which smart metering seeks to alleviate.

This is a significant issue, because comfort and cleanliness practices are continuing to change in ways that do not support demand managers' assumptions of how people choose to consume resources and how they change this consumption (Wilhite *et al.* 2000). Bathing practices, for example, have changed dramatically as a result of the introduction of modern systems of energy and water provision, infrastructures such as the bath and the shower, and the commercial promotion and social diffusion of common understandings regarding body odour, presentability and hygiene (Ashenburg 2007; Hand *et al.* 2003; Vinikas 1992). Such transformations have little to do with individuals weighing up the costs and benefits of their energy and water consumption.

Nonetheless, smart metering provides a unique opportunity to both reconfigure the production–consumption divide characterising current demand management strategies and further entrench it. This new quasi-technology infrastructure is located, both geographically and metaphorically, at the nexus between the messy and mundane realm of everyday life and the provision of energy and water resources. While 'dumb' traditional energy and water meters remind consumers that responsibility for energy and water management rests *outside* the household in the separate sphere of production (Sofoulis 2005), smart meters have the capability of extending *inside* the home, as well as back out again. This technology may therefore offer opportunities to blur the boundaries between the separate realms of production and consumption, thereby better accounting for and potentially reconfiguring the interconnected dynamics of everyday practices, which span across both these spheres. This potential is significant given the large-scale government mandates for smart metering in Australia and internationally. Consequently, the types of programs and technologies trialled and implemented now are likely to constitute a form of path dependence (Arthur 1989)[1] that will both enable and limit opportunities for reconfiguring the current divide between resource management and everyday life.

[1] Path dependence refers to the 'locking in' of a particular technological and/or social trajectory which comes about as a result of economic, technical and social investment into a particular innovation (Arthur 1989). Once this trajectory is established, change is likely to become dependent on the path already taken.

In response to these concerns and potential opportunities, this thesis develops a distinctly different approach to 'human dimensions' research typically characterising demand management policy and practice, whereby social researchers have traditionally attempted to understand and overcome the 'barriers' householders face in acting as individual and autonomous resource managers (see Guy & Shove 2000 for a critique of this approach). In contrast, this thesis aims to identify and analyse strategies that bridge the segregation between energy and water production and consumption or, more particularly, between resource management and everyday life, using smart metering residential demand management programs and comfort and cleanliness practices as an empirical 'hook'.

Research question

This thesis addresses the following research question:

> ***How can smart metering demand management programs bridge the problematic divide between the policies and strategies of demand managers, and householders' day-to-day comfort and cleanliness practices?***

Given the lack of attention previously paid to understanding comfort and cleanliness practices in Australia, or how smart metering demand management programs might reconfigure or further entrench these, a series of interrelated questions need to be answered to inform the primary research question. These questions are addressed methodically in the thesis as follows.

- What are the problems and limitations associated with the production–consumption divide (and the divide between resource management and everyday life) characterising demand management programs, and how do these problems manifest themselves in smart metering demand management programs (chapter 2)?
- How do we understand, conceptualise and analyse everyday life, and the practices which constitute it (chapter 3)?
- How do we study everyday practices and what methods can be usefully employed in this process (chapter 4)?
- How are comfort and cleanliness practices currently constituted and changing in Australian households (chapters 5 and 6)?
- How do smart metering demand management programs reconfigure these practices, if at all, and what are the problems with overlooking practices in these programs (chapter 7)?

- How does the relationship between providers and consumers of power and water shape everyday practices and enable or limit opportunities to bridge the current divide between resource management and everyday life (chapter 8)?
- What are the strategies, approaches and paradigms likely to bridge the divide and what role can smart metering play in a transition towards these alternatives (chapter 9)?

Together, these lines of inquiry are used to identify and address the types of questions left unanswered by the dominant demand management paradigm. In using smart metering as an empirical hook to encapsulate the assumptions and problems associated with the production–consumption divide and the demand management strategies that emerge from it, this research offers practical insights regarding reorienting these programs towards the day-to-day activities for which people consume resources. This research therefore contributes not only to our understanding of how everyday practices are composed and changing, but also to how demand managers, policy makers and behaviour change practitioners can attempt to reconfigure them in less resource-intensive directions. This empirical study also offers methodological insights for other researchers wishing to understand and analyse everyday practices, particularly those wanting to transpose these understandings into current demand management policy and practice.

Smart metering, comfort and cleanliness

Why smart metering?

Smart metering, also referred to as 'advancing metering infrastructure' (AMI) or interval metering, is best described as a 'platform' or 'data logger' which enables a range of services, demand management programs and relationship configurations between providers and consumers of power and water (Cornelius 2007; NERA 2008b). Definitions vary in both the energy and water sectors, partly because the smart meter's functionality is still being defined (MCE 2008b; NERA 2008b). However, generally speaking, a smart meter is characterised by at least half-hour data logging capability and two-way communication functionality (NERA 2008b). Smart metering is most developed in Australia's electricity sector, where several state governments and the federal government have mandated its roll-out[2]. The aim of these mandates has been to facilitate a range of demand management programs aimed at curbing peak demand and greenhouse gas emissions, as well as improving the operating efficiency

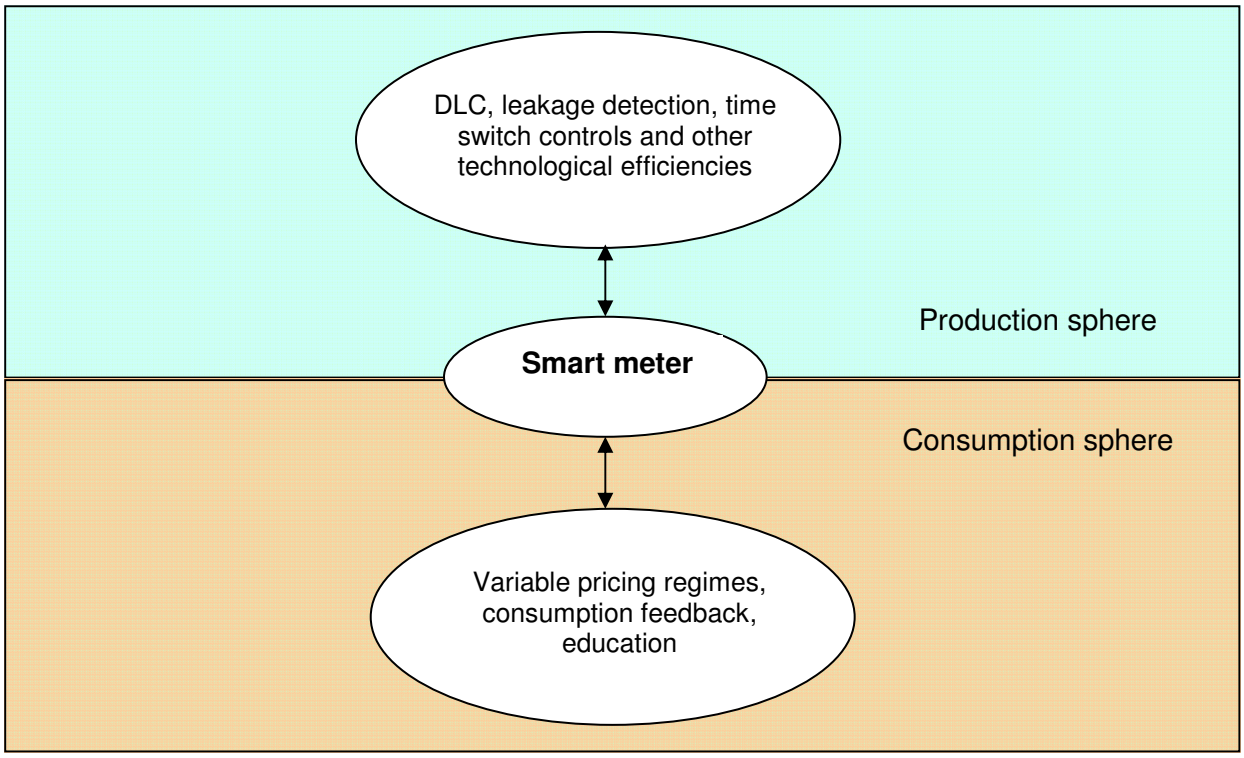
[2] In 2007, the Council of Australian Governments (COAG) endorsed a staged approach for the national mandated roll-out of smart electricity meters 'to areas where benefits for consumers outweigh the costs' (NERA 2007b, p. ii). Victoria, New South Wales (NSW), Western Australia (WA), and Queensland all have their own smart electricity metering policies which involve 'new and replacement' smart meters, or in the case of Victoria, a state-wide rollout beginning in 2009 (MCE 2008b).

of the electricity network (NERA 2008b). To date, there have been no such mandates in the water sector, although trials of smart water metering are taking place in several states with the aim of reducing potable water consumption (Landmatters 2008; Wetherall 2008).

The residential demand management techniques enabled by smart metering include the provision of energy and water consumption feedback through an in-home display (IHD), variable pricing regimes for electricity, and direct load control (DLC) involving the remote control of large appliances such as the air-conditioner. Smart meters also enable more complex home automation functions, new pricing regimes for on-site electricity generation, and leakage detection in the water sector (NERA 2008b).

As noted above, smart metering currently reinforces the production–consumption divide dominating the energy and water sectors (Guy & Marvin 2001). Within the sphere of production, smart metering seeks to improve the operating efficiency of the electricity network through 'technological fixes' such as DLC and leakage detection. In the seemingly separate sphere of consumption, smart metering programs aim to engage consumers with their demand for energy and water resources through education, consumption feedback and price signals (see Figure 1.1). However, smart metering, while characteristic and symptomatic of the dominant demand management paradigm and the divide between production and consumption may also have the potential to bridge it. Armed with two-way communication capability, the smart meter provides a unique opportunity to both enter and exit the home, potentially changing the ways in which resources are provided to householders and householders interact with their provision (Marvin *et al.* 1999). This device and the demand management programs it enables therefore represent a previously unexplored empirical opportunity for understanding the limitations of the production–consumption divide and potential ways to bridge it.

Figure 1.1: Smart metering: split between spheres of production and consumption



Why comfort and cleanliness?

The most significant practices contributing to the problems smart metering seeks to address (i.e. peak demand, water shortages and climate change) are those concerning indoor comfort and cleanliness. Smart metering demand management programs largely ignore the composition and dynamics of these practices, focusing instead on making 'demand' for energy and water more *efficient*. This focus is potentially dangerous, as the history of comfort and cleanliness practices depicts significant variation in the energy and water they require. Shove (2003a) argues that these practices have been subject to distinctive forms of standardisation (in terms of what counts as 'normal') and escalation (i.e. the ratcheting up of demand) in recent centuries. From the 'dry' bodily cleaning practices of 17th century France (Vigarello 1988) to the weekly bath of the 19th and early 20th centuries (Davidson 2008) and, more recently, the common daily shower (Hand *et al.* 2003), bathing practices have steadily increased in their resource consumption.

Similarly, heating and cooling practices have moved along an upwards energy-consuming trajectory as new mechanised forms of comfort have been introduced into buildings (Shove 2003a). In Australia, residential air-conditioning penetration has risen to 67 per cent from just over ten per cent 40 years ago (ABS 2008b)[3]. Most of this growth has occurred in the last ten years, where there has been a doubling of penetration (DEWHA 2008). Cooling services in

[3] This figure varies significantly between states. State penetration estimations for 2009 (based on 2005 data) are NSW (57.8%), Victoria (63.1%), QLD (62.7%), SA (87.7%), WA (73.7%), Tasmania (23.9%), NT (93%), and ACT (52.6%) (EES 2006).

the residential sector are projected to increase by a factor of five from 1990 to 2020 under current trends (DEWHA 2008). A similar resource-intensive escalation can be found when considering laundering (Davidson 2008; Shove 2003a; Slob & Verbeek 2006), house cleaning (Martens 2007; Schwartz Cowan 1989) and toilet flushing (Davidson 2008) practices in the western world (OECD 2002).

Importantly, the transformation of comfort and cleanliness practices is neither a solely historical phenomenon nor a natural evolution. While we often think of commercial interests as being instrumental in establishing the comfort (Ackermann 2002; ASHRAE 2004; Cooper 1998) and cleanliness (Lupton & Miller 1992; Vinikas 1992) practices, expectations and standards we take for granted today, we rarely question the *current* marketing of products designed around *new* or *modified* practices. For example, the development and promotion of new heating and cooling appliances and housing infrastructures designed around these technologies has reconfigured, and is still reconfiguring, domestic comfort practices (Wilkenfeld 2004). Similarly, cleaning products such as bug sprays, surface cleaners, deodorants, toilet cleaners, laundry powders and shampoos are continually entrenching and establishing new benchmarks for smell, hygiene and presentability (see, for example, Datamonitor 2008a; Datamonitor 2008b). At the same time, demand managers are introducing new technologies, infrastructures and programs that predominantly *uphold* practices of the day — whatever they may be — rather than challenging 'normal' taken for granted understandings.

Figure 1.2 illustrates the distinction between the interests of marketers and demand managers, focusing particularly on comfort and cleanliness. On one side of the diagram, demand managers promote and develop efficient technologies, infrastructures and strategies that 'save' energy and water associated with existing practices, while, on the other, commercial interests advertise and market new products and practices, such as domestic air-conditioners, central heating and cooling, spa baths, or multiple showerheads (see Figure 1.3), which may become appropriated as the new norm.

For example, encouraging householders to install a water-efficient showerhead or shower in four minutes does not question the historically recent practice of showering. By focusing on 'saving' consumption, modifying existing routines, or changing the ways in which such practices are upheld and maintained, the resource intensity associated with existing practices may continue to rise. Householders may start to shower more frequently, wash their clothes more often, or heat and cool larger spaces for longer periods of time, as historical trends indicate they have done in the past (Davidson 2008; Shove 2003a), and current trends suggest they will in the future (DEWHA 2008). Furthermore, Shove (2003a, p.

3) warns that ignoring the 'inconspicuous consumption' associated with these practices may result in trajectories, habits and expectations that 'are obdurately resistant to change'. These are compelling reasons to account for, and address, the changing composition of comfort and indoor cleanliness practices in smart metering demand management strategies.

Figure 1.2: Technologies and strategies that uphold and promote new household comfort and cleanliness practices

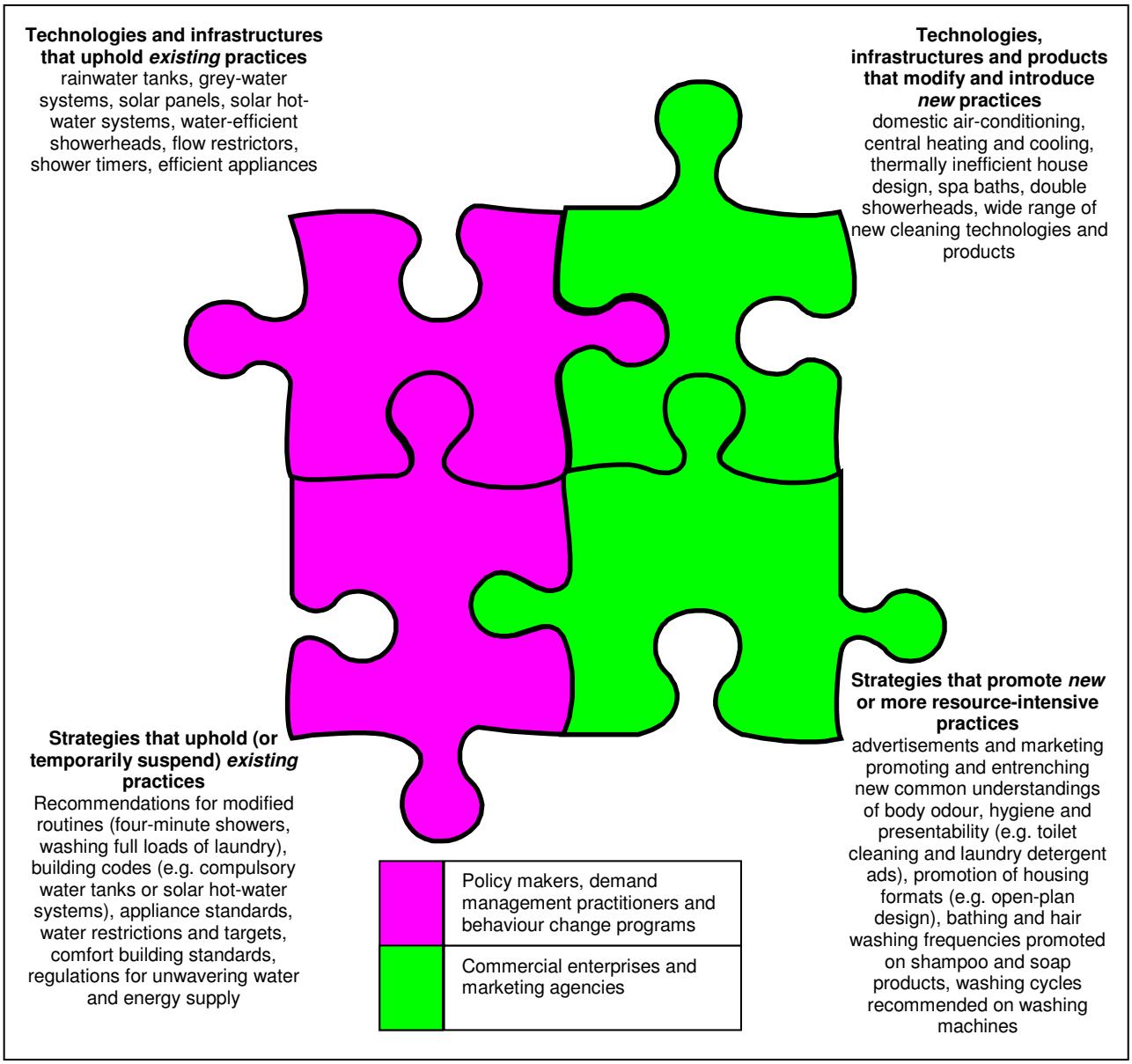


Figure 1.3: A non-efficient quadruple showerhead array with four heat lamps (flowing over a spa bath)

Source: RG4, 58, 11 May 2008[4]

The significance of household comfort and cleanliness

As noted earlier, the changing composition of *residential* comfort practices is widely acknowledged as the primary cause of Australia's accelerating peak electricity demand (EES 2006; NERA 2008b; Wilkenfeld 2004). Similarly, household water consumption, while only accounting for around ten per cent of the nation's water use (Harper 2006), constitutes over half of Australia's potable water consumption (AWA 2001)[5], the supply of which faces severe shortages. Indoor water usage, in particular for cleanliness practices, accounts for the majority of this consumption (ABS 2006b; AWA 2001). In addition, heating and cooling and hot water production together account for the majority of greenhouse gas emissions in households (ABS 2008b).

[4] All photos were taken by the researcher unless otherwise indicated. References to photos taken in households as part of the primary data collection refer to the research group (RG 1–4) the household belongs to, the household number (1–65), and the date on which the photo was taken. All other photos taken by the researcher are identified by their location and date. See Chapter 4 for further clarification.

[5] This figure varies in different urban centres. For example, Sydney households account for 70 per cent of total drinking water consumption (SydneyWater 2004), whereas Melbourne households account for 60 per cent (VictGov 2007). Accurate and up-to-date figures for all states are difficult to source.

Compounding these issues is the growing size and number of Australian households, and their collective consumption of energy and water resources. Like many developed nations, Australia's population is growing slowly, while the average number of people per household is diminishing (Linacre 2007a). Between 1990 and 2020, the number of occupied residential households has been forecast to increase by 61 per cent, in combination with a 145 per cent increase in total residential floor area — representing more 'space' to be heated and cooled (DEWHA 2008). During this period, a 56 per cent increase in residential sector energy consumption is projected, with a higher proportion met by greenhouse-intensive electricity. Building shell performance standards, now implemented across Australia, only affect two per cent of total stock per annum, and have so far only managed to slow (rather than reverse or stabilise) the escalating resource consumption associated with heating and cooling practices (DEWHA 2008). Similarly, the increasing number of 'wet' rooms, such as the second bathroom, the separate laundry, the second, third or fourth toilet, and the spa bath (ABS 2002), point towards a renewed desire to continue the historical trajectory of consuming more water, more often, once current restrictions are lifted, thus paving the way for Australia's dependence on more energy-intensive water supply systems such as desalination. These are compelling reasons to focus an empirical study of smart metering at the residential level.

Research methods and design

Smart metering is a quantitative tool capable of measuring discrete patterns of consumption data. As a result of multiple demand management trials that have taken, or are taking, place around Australia and internationally, there is a surge of data being produced and analysed on changing consumption patterns resulting from this new device (see Chapter 2). While some qualitative research has been conducted, this has predominately focused on the types of energy and water-saving behaviours householders have engaged in (Oliphant 1999; Wetherall 2008), and their attitudes and opinions towards demand management programs (Jelly 2008). Overlooked is an understanding of *if*, *how* and/or *why* everyday practices are transforming in response to these programs.

In responding to this empirical gap, one body of literature, loosely termed 'social practice theory' (Bourdieu 1977; Giddens 1984; Reckwitz 2002b; Schatzki 2002; Warde 2005), provides useful insights into how to study, understand and analyse everyday practices. Developing a conceptual framework based on common theoretical features associated with this theory, I view householders participating in this research as 'carriers' of everyday practices. In particular, I conceptualise everyday practices as loosely bounded entities constituted and reproduced through a series of 'components', those being: configurations of material infrastructures, such as technologies, resources and systems of provision; rules and

recommendations, such as regulations, restrictions and advertisements; practical knowledge regarding what makes sense for someone to do; and common understandings about what is acceptable or appropriate for someone to do.

I employed a range of qualitative research methods centred on a group household interview to understand the way householders' comfort and cleanliness practices are constituted, and the ways in which they are performed and transformed in everyday life. These methods are detailed in Chapter 4 and related appendices. In particular, I identified four research groups (RG) with which I conducted qualitative research activities with households. They are: the Dromana and Frankston Australian Conservation Foundation (ACF) GreenHome programs in Victoria (RG1); the South East Water EcoPioneer trial in Victoria (RG2); the Currumbin EcoVillage in south-east Queensland (RG3); and EnergyAustralia's DPP trial in New South Wales (NSW) (RG4). I used the RG approach to gain access and insights into different configurations of smart metering demand management trials taking place around Australia[6]. In total, 65 households involving 122 participants took part in this research.

In addition to the research activities conducted with RGs, I interviewed 32 industry stakeholders from a range of government departments, water and energy retailers and distributors, consultancies, housing organisations and companies involved in the delivery of smart metering demand management programs, or implicated in the changing dynamics of comfort and cleanliness practices. In these interviews I investigated how stakeholders understood these practices, smart metering demand programs, their 'consumers', and household energy and water consumption. Here, I was interested in how the dominant provider–consumer relationship shapes everyday practices, and how the assumptions demand managers make about consumption influence, or fail to influence, the way householders use resources. In sum, my research methods aimed to understand existing and changing comfort and cleanliness practices in Australian households, how these were changing (if at all) in response to smart metering demand management programs, and how industry stakeholders involved in these programs shape and limit opportunities for reconfiguring everyday practices.

Thesis outline

Given the saliency and political relevance of this empirical inquiry, particularly for policy-makers and utility-providers, this thesis takes an unusually practical approach, presenting the issues and analysis in a language and format that is likely to interest those who may gain

[6] RG1 was originally intended as a pilot group to test the research methods and therefore did not involve a smart metering demand management program. However, due to valuable insights regarding the dynamics and reproduction of comfort and cleanliness practices, I draw on material from these households to understand the composition and changing nature of these practices. Refer to Chapter 4 for further clarification.

most from the findings. Summary boxes throughout the thesis, particularly in the concluding chapter, are intended to provide palatable and quickly available information for audiences unlikely to have the time or inclination to review the entire thesis.

Chapter 2 begins this empirical inquiry by identifying the problematic assumptions underpinning dominant demand management programs, and elaborating on how those assumptions manifest themselves in smart metering demand management approaches. Here I ask, **what are the problems and limitations associated with the production–consumption divide characterising demand management programs? How do dominant demand management assumptions manifest themselves in smart metering programs and what questions does this leave unanswered?** And, **how do these assumptions sustain and replicate themselves?** As such, that chapter highlights the self-reinforcing nature of the concepts, methodologies and relationships underpinning the dominant demand management paradigm, which together perpetuate the divide between resource management and everyday life. Noticeably lacking is an understanding of household practices and how they are changing.

Chapter 3 offers an alternative conceptual framework for understanding and analysing demand from the perspective of everyday life and, in particular, the practices that constitute it. In that chapter I ask, **how can we understand everyday life and everyday practices? Why might this alternative conceptualisation be useful for analysing comfort and cleanliness practices?** And**, what do we already know, and not know, about comfort and cleanliness practices in an Australian context?** Drawing on concepts from social practice theory, I outline a series of 'components' that can be usefully employed to understand the composition and reproduction of practices. I conclude the chapter by reviewing what we currently know about comfort and cleanliness practices in an Australian context, focusing on the limitations in our knowledge where empirical research is required. In **Chapter 4**, I outline my methodological approach for addressing the knowledge gaps identified in chapters 2 and 3. I ask, **how do we study everyday practices**? And, **how do we study the role of demand management programs in reconfiguring them?** I outline how and why I identified and selected the RGs, households and industry stakeholders involved in this research, and the types of methods I employed with them. I conclude the chapter by summarising my argument and analysis for the remainder of the thesis.

In chapters 5 and 6, I address limitations in our knowledge of current and changing comfort and cleanliness practices in Australian households. Drawing on empirical data with households from all RGs, **Chapter 5** begins this analysis by asking, **how are comfort and cleanliness practices currently composed in RG households?** Drawing on the

conceptual framework introduced in Chapter 3, I highlight the diversity and commonality within and between households undertaking comfort and cleanliness practices. In order to understand this dynamic composition, I focus on common understandings of presentability, body odour, hygiene, cosiness and the environment, as well as the 'scripts' contained in material infrastructures implicated in these practices. In **Chapter 6,** I ask, **how do comfort and cleanliness practices emerge, persist and change in RG households?** In particular, I discuss three avenues of reproduction and change found in households: *faithful reproductions* involving childhood, life and infrastructural experiences; *active reconfigurations*, involving debate and manipulation from fellow householders, friends and influential peers, and; *deliberate reconfigurations* prompted by government and commercial 'rules' and recommendations.

Having analysed how practices are composed and changing in RG households, **Chapter 7** asks, **how do smart metering strategies reinforce and/or reconfigure comfort and cleanliness practices in households?** Drawing on findings for RGs 2–4, I find that DPP reconfigured comfort practices during specific temporal periods by engaging householders as co-managers of their everyday practices. However, I argue that IHDs may be inadvertently justifying and legitimising existing practices by ignoring them. I warn that both strategies attempt to frame householders as micro-resource managers and place too much responsibility at the individual level rather than understanding and attempting to reconfigure the ways in which energy and water resources are implicated in everyday practices.

Having established that existing smart metering demand management strategies are inadequate or need improvement in bridging the divide, the remainder of the thesis is concerned with how we can achieve necessary change. **Chapter 8** begins this task by returning to the obduracy and self-reinforcing nature of the dominant demand management paradigm outlined in Chapter 2. As such, Chapter 8 shifts focus to the realm of resource management, where smart metering demand management programs are developed and deployed. Here I ask, **how does the relationship between providers and consumers of power and water shape everyday practices? How do smart metering stakeholders understand changing comfort and cleanliness practices?** And, **whose responsibility do they believe it is to manage them?** I argue that the provider–consumer relationship is being further entrenched through neo-liberal policies, potentially leading to more resource-intensive comfort and cleanliness practices in, and disaggregating blame and responsibility for these practices across the resource sectors, government, building industry and households. Furthermore, I argue that the provider–consumer relationship is prioritising and reinforcing a narrow range of contradictory consumer conceptualisations that fail to account for the changing composition of everyday practices. I conclude by suggesting that a new

relationship is required to break down the self-reinforcing production–consumption divide and better account for the changing dynamics of everyday life.

Chapter 9 introduces that new relationship and applies it to the context of everyday life to develop a new resource management paradigm termed the *co-management of everyday practices.* That chapter addresses two questions: **how can we bridge the divide between resource management and everyday life?** And, **how might smart metering be used to facilitate this transition?** Based on the analysis presented in chapters 5–8, that chapter outlines the co-management of everyday practices paradigm by discussing the concepts, methodologies, responsibilities and roles underpinning it; how it builds on alternative co-management approaches; and what types of strategies might emerge from it. In considering what role smart metering could play in facilitating a transition to this new paradigm, I argue that this influential device has the potential to be both a catalyst and constraint for change. I conclude by suggesting that further transition analyses are required to identify alternative pathways towards new approaches.

Chapter 10 takes stock of the contribution this thesis has made to our understanding of existing and changing comfort and cleanliness practices, the role of smart metering demand management programs in reconfiguring these, the ways in which the relationship between providers and consumers both enables practice change and entrenches existing practices, and the ways in which the divide between resource management and everyday life can be reconfigured to better account for the changing dynamics of practices. Most significantly, this thesis offers a new paradigm for co-managing everyday practices. I conclude by critically reflecting on the limitations of this research, the questions it raises, and the areas where further empirical studies are required.

In sum, this research breaks down the traditional production–consumption divide characterising the energy and water sectors by reconceptualising demand through the lens of everyday practices and, more specifically, by investigating the problems, questions and opportunities arising from overlooking comfort and cleanliness practices in smart metering policy and practice. From this empirical analysis, I identify an alternative resource management paradigm that takes account of the unpredictable and taken for granted realm of everyday life, thereby offering valuable insights for energy and water demand management practitioners and policy-makers that extend beyond the roll-out of smart metering.

Chapter 2: Demand management strategies: assumptions, limitations and persistence

This chapter elaborates on the production–consumption divide characterising demand management programs, homing in on smart metering demand management strategies to discuss the assumptions, limitations and persistence of this dominant paradigm. The chapter is divided into three distinct sections that serve to illustrate the problems and pervasiveness associated with the production–consumption divide and its role in developing smart metering demand management programs. The first section expands on the concept of demand management in the context of the resource sector, where it is being used to address supply constraints or impacts resulting from the growing demand for energy and water. This section discusses the assumptions embedded into this approach and which emerge out of the practical and conceptual divide between the seemingly separate spheres of production and consumption, such as the ways in which 'consumers' are framed as 'rational' actors, and the taken for granted nature of demand. I argue that these assumptions inform a number of common demand management approaches.

In the second section, I show how smart metering programs fit within this dominant paradigm, and the types of strategies it enables. I divide smart metering demand management techniques into three broad categories — consumption feedback and information, variable pricing regimes, and efficient and controlled appliances — to discuss the assumptions they replicate, the changes in demand they have achieved to date, and the limitations they give rise to. Thirdly, I discuss why this dominant approach to demand management continues to persist, despite clear problems and limitations. In particular, I show how the demand management paradigm constitutes a self-reproducing rationale of concepts, methodologies and responsibilities, which limits opportunities for change. I conclude this chapter by suggesting that an alternative understanding of human action and its relationship with the provision of resources is required to bridge the divide between production and consumption or, more specifically, between resource management and everyday life — one which brings to the fore the often hidden and silent realm of day-to-day practices.

The dominant demand management paradigm

What is demand management?

Demand management (or demand-side management) is the use of financial incentives, market mechanisms, education, efficiency measures, or other programs to modify the demand for natural resources. Demand management emerged as a dominant strategy in the energy and water sectors in the last half of the 20th and early 21st centuries as the flipside to the 'build and supply' rationale that dominated the expansion of electricity and water services during the late 19th century and first three-quarters of the 20th century (Guy & Marvin 1996; Kaika 2005). Demand management has become a common policy and utility alternative (or complementary approach) to this 'predict and provide' logic (Guy & Marvin 1996). The popularity of demand management in the resource sector has risen in western societies since the early 1970s for various reasons, including pressures on public funding for new urban infrastructure, emerging environmental regulation, climate change, supply constraints, and growing demand (and temporal peaks in the demand) for resources (Graham & Marvin 2001; Guy & Marvin 2001; Kaika 2005). The focus is on the efficiencies gained through techno-economic and information-based strategies — an approach that offers little insight into the changing nature of demand itself.

Why manage demand?

As introduced in Chapter 1, demand management in Australia's energy sector has predominantly risen in response to rising resource consumption (Akmal & Riwoe 2005), climate change concerns and the declining cost effectiveness of investing in new infrastructure (NERA 2008b; Wilkenfeld 2004). In the electricity sector in particular, demand management strategies attempt to reduce 'peaks' or 'hot spots' in demand (Guy & Marvin 1996; Moss 2004; NEMMCO 2007). Peak electricity demand generally occurs on hot summer afternoons and evenings when people return home to switch on air-conditioners and appliances (Burrow 2006). Between 40 and 50 per cent of residential sector demand is now due to air-conditioning on system peak summer days (Wilkenfeld 2004). The recent surge of air-conditioner penetration in households (DEWHA 2008) has led to major infrastructural and generation challenges for utilities, who are forced to 'upsize' their capacity to cope with these short bursts of demand (NERA 2008b)[7]. Similarly, peak transmission and distribution capacity is only required for one or two per cent of the year (ETSA 2007a). Therefore, utilities cite demand management as a method of avoiding one-off investments in the order of $A300

[7] In NSW, for example, ten per cent of the state's generating capacity is needed for just one per cent of the time (less than 100 hours a year) and this is expected to rise to 20 per cent by 2014 (Frew 2006a).

million, which could lead to a five per cent rise in the wholesale price of electricity[8]. Nationally, the costs associated with peak demand are estimated to be as high as $1.5 billion annually (consultant, 25[9]).

With approximately 77 per cent of all households using a heater and 67 per cent using a cooling appliance (ABS 2008a), there is significant room for more penetration, and therefore more peak demand. Furthermore, saturation (the average number of appliances per household) can continue to increase once penetration has peaked, as households acquire more than one air-conditioner or heater (EES 2006). Trends towards larger houses, central heating and cooling, and open-plan living also increase the amount of energy required for space heating and cooling (Wilkenfeld 2004, 2007). In addition, electricity generators required during peak times draw disproportionately on urban centres' dwindling water supplies for self-cooling. In south-east Queensland, power stations used up to one-fifth of the region's water consumption in 2006 (Spearritt 2008), although this is rarely given as a justification for demand management strategies that attempt to curb peak demand — mainly because the issues of water and energy management are clearly segregated in both policy and practice[10].

Unlike the energy sector, where demand management has been introduced to reduce the impacts of consumption (i.e. greenhouse gas emissions) and avoid large capital investments, Australia's water sector has been forced to restrict demand due to the lack of supply (SydneyWater 2004; VictGov 2007). However, strategies such as household restrictions and targets are considered temporary measures until large-scale 'drought-proof' water supply systems come online, such as desalination plants and 'pipelines' from less drought-stricken water catchments (England 2009; VLP 2007).

The management of demand is therefore a crisis-driven approach, where the environmental and/or economic impacts of demand are too great to ignore (i.e. climate change and peak demand), or there are significant supply constraints (i.e. water shortages) that cannot be overlooked (Chappells & Shove 2004). Importantly, demand management is not a fundamental rejection or opposition to demand itself, but rather a response to the suite of problems and challenges it poses to the *maintenance* of existing or escalating demand. As such, 'the overriding ethos is one of meeting what are taken to be non-negotiable consumer

[8] Figure quoted refers specifically to South Australia (ETSA 2007a).
[9] Reference refers to an industry stakeholder interviewed for this research. See Chapter 4 for further detail regarding stakeholder interview coding.
[10] For example, none of the following policy or utility reports discussing peak demand management programs mention interconnected water impacts (ETSA 2007a; NEMMCO 2006, 2007; NERA 2008b; Wilkenfeld 2004).

"needs"' (Chappells & Shove 2004, p. 138). Demand management therefore seeks to largely preserve and maintain existing systems of energy and water provision and levels of supply — and, through these systems, current ways of life.

How effective are demand management strategies?

Demand management strategies have experienced mixed successes in the energy and water sectors. Between 1987–88 and 2006–07, residential energy consumption grew by 49 per cent or an average of 2.6 per cent per year (ABS 2008a). Energy use per dwelling is predicted to continue to increase by 1.7 per cent per year (Akmal & Riwoe 2005), despite the federal and several state governments' implementing demand management strategies to improve the thermal efficiency of houses, behaviours of occupants, and energy efficiency of appliances (Wilkenfeld 2007). This is mainly due to the falling number of people living in households, larger dwellings, more households overall, and increasing energy use for lighting and appliances (ABS 2008a; Linacre 2007a, 2007b). In other words, this increase is due to the changing nature of demand itself. This trend is similar to other OECD (2002) nations, where energy needs are growing along with demand for larger houses, greater floor space, a narrowing range of accepted internal room temperatures, and higher hygiene standards.

In contrast, residential water use in Australia has fallen considerably since the onset of demand management strategies, such as water restrictions, targets, and efficiency measures (Harper 2006). However, most of this reduction has been achieved by curbing outside water use and by making indoor practices more efficient, rather than questioning what these practices are and why people do them. Current water consumption is still considerably higher than it was in the mid 19th century in most towns and cities, when it was around 100 litres per person per day (Davidson 2008). Household water consumption was approximately 300 litres per person in Melbourne and Sydney in 2006-07 — a 60 year low since its peak at 400 litres following the Second World War (Anon. 2007; Davidson 2008). Consumption has been consistently dropping during the 21st century, with some supply-restricted areas, such south-east Queensland, using as little as 140 litres per person per day since the introduction of household targets (Spearritt 2008) — one of the lowest consumption levels in the developed world.

In short, energy demand is still rising despite efficiency improvements, whereas in the water sector it is declining or stabilising, although this is considered temporary (England 2009; Ker 2009). Consequently, demand for energy and water resources is continuing to change, and will most likely escalate, despite the introduction of demand management techniques. Given that demand management mainly focuses on making existing 'needs' more efficient, rather

than questioning their changing existence, the effectiveness of these strategies is almost entirely dependent on the ways in which demand changes in the future and new expectations that emerge.

How does demand management understand consumption?

As outlined in Chapter 1, demand management strategies are characterised by the dominant resource management division between the spheres of consumption and production (Guy & Marvin 2001). On the one hand, demand management techniques focus on the development and implementation of new technologies and infrastructures that are designed to reduce resource use, abate pollution and minimise the impact of continued economic development on the environment. Examples of these 'technical-fix' demand management strategies include leakage detection in the water sector (Green 2003), the installation of water or energy-efficient fittings (Spiller 2009), and direct load control (DLC) or ripple control (the remote-control of large appliances) in the electricity sector (Wilkenfeld 2004). In these examples, technology is framed as 'an impartial, instrumental tool in a 'win-win' scenario that couples economic growth with environmental improvement' (Hobson 2006, p. 319).

In contrast, the consumption of resources is treated as a separate sphere, where the focus is typically on community mobilisation (MEFL 2004), the removal of non-technical 'barriers' to sustainable development (Huback *et al.* 2004; McKenzie-Mohr 1999; Roaf 2006), the construction of 'efficient' pricing structures that reflect the social and environmental costs of energy or water consumption (Borenstein *et al.* 2002; Green 2003; Young 2005), attempts to change the attitudes, opinions and values of consumers (Ajzen 1991; Young 2002), and/or educational programs designed to assist people in making more resource-efficient decisions (Day & Monroe 2000). The management of demand is therefore split, with technologies and infrastructures on the one hand, and people and their consumption on the other. This division not only contextualises demand management strategies, but a raft of other policy responses focused on environmental improvement and sustainable development (Hobson 2006). The dominance of this view has produced a relatively monotone vision of people's consumption and a narrow range of common policy and utility responses targeted at 'consumers'.

The role of the 'consumer' in demand management

The split between production and consumption sets the framework for assumptions and understandings of choice and change — that is, the way people *choose* to use resources, and the ways in which they *change* their usage. Householders, who are located within the sphere of consumption, are viewed as 'customers' or 'consumers' of aggregate resources who make autonomous and rational decisions about their consumption as a result of their

personal preferences. Changes in demand are viewed as the product of micro cost-benefit analyses conducted by individuals as they go about their daily lives.

The framing of humans as rational actors originates from the field of economics, where people are thought to act freely and in a self-interested manner based on the information available to them in order to maximise their own wealth (utility) and avoid unnecessary labour (Jackson 2005). Rational choice theory assumes that individuals buy, consume or use resources in a manner that provides them with the most personal gain at the least personal cost. These consumer preferences are taken for granted without further consideration of their origins or antecedents (Jackson 2005). Calculations of utility, price and time are seen to dominate the consumption decisions of individuals (Southerton *et al.* 2004b). In short, a central assumption is that people make decisions resulting from the quantification of both the costs of delivering a new technology, infrastructure or program and the monetary benefits or savings achieved. The idea that choices may in some way be embedded into or emerge out of the sphere of production is overlooked. Instead, this theory of 'consumer sovereignty' views producers as competitors whose primary aim is to meet the preferences of their customers (Summerton 2004).

In Australia, as in many other industrialised nations, these assumptions have dominated the political sphere over the past 15 years (Hobson 2006). Even in supposed alternatives to the dominant paradigm, such as lifestyle models that reject consumerism and promote self-sufficiency and simplicity (De Graaf *et al.* 2001; Hamilton & Denniss 2005; Hayden 1999), the split is maintained, and the problem is presented as one of individual choice — in this case the choice between one lifestyle and another. The underlying assumption is that people could and would change if they were informed about the damage they were doing to the environment and the benefits of an alternative approach (Shove 2003a). As such, a raft of other programs have emerged that attempt to change or influence the mindset of *homo economicus* by placing a strong emphasis on 'the motives, values and beliefs of an individual human being' (Spaargaren *et al.* 2006, p. 107).

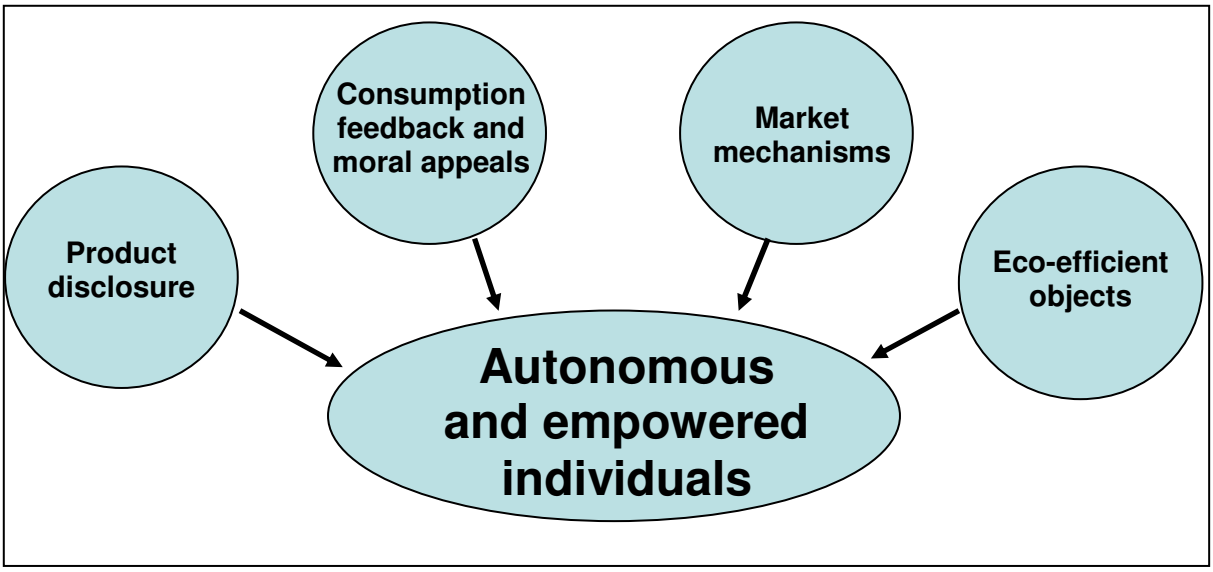
Dominant policy responses based on assumptions of the 'consumer'

The production–consumption split, with its assumption of rational and autonomous consumption, produces a number of policy and utility responses that broadly encompass resource-based demand management approaches. These responses assume that householders are damaging the environment because they are misinformed, ill-informed, receiving the wrong market signal, or not receiving significant personal benefit to change their consumption patterns. Based on this divide, two clear options emerge. The first is to

bypass self-interested consumers altogether and implement efficiency and technological improvements in the sphere of production, which are viewed as independent of any relationship with people. The second is to overcome the market and informational 'barriers' to sustainable consumption by educating, informing and empowering the population (Southerton *et al.* 2004a). This approach relies on providing the correct 'signals' to 'consumers' and making the desired action as easy and self-rewarding as possible. The objective is therefore to find out what sort of 'instruments' might lead householders to choose more sustainable practices and purchasing habits, and to implement these accordingly (Southerton *et al.* 2004b).

Southerton *et al.* (2004b), in their critical evaluation of the dominant rational-action model, discuss how framing consumption and demand in this way generally results in one of four major policy responses (see Figure 2.1). The first is the provision of relevant product or consumption information with the view that informed consumers will change their consumption patterns in accordance with the information provided. The second attempts to persuade people to consider ecological concerns by appealing to their ethics and morals. The third relies on the regulation of markets through mechanisms such as new electricity tariffs, tax incentives or disincentives, and penalties or fines for non-desirable behaviour — i.e. their self-interest. The fourth involves technological fixes, eco-innovation and eco-efficiency, such as on-site generation, and efficient lighting or showerheads, which intend to bypass consumers' practices. These eco-efficient technologies are promoted as an incentive to produce fewer resource-intensive goods, services and systems, whilst achieving the same or similar practices and services, such as lighting or showering.

Figure 2.1: Dominant demand management strategies



Source: Adapted from Southerton *et al.* 2004b

Summary of dominant demand management assumptions

This section has situated demand management strategies within a paradigm that conceptually and practically splits the consumption and production of resources. This division creates a seemingly totalising package of beliefs and ideas about the ways in which infrastructures and technologies function in society, and the ways in which people choose to consume resources. Technologies and infrastructures are viewed as self-fulfilling, linear and impartial 'objects', whilst individuals are positioned as autonomous and rational consumers who are confronted with a number of 'obstacles' or 'barriers' which limit their ability to change. The role of social researchers has traditionally been to address these barriers and provide or improve incentives and instruments, through demand management strategies, to assist in reducing demand. Underlying this paradigm is the assumption that demand is non-negotiable. Demand itself is taken for granted as a largely unchangeable phenomenon, leaving policy makers and utilities focused on managing the effects and impacts of current demand by seeking to make existing consumption patterns more efficient. How then, is smart metering situated within this paradigm? What types of assumptions does it replicate? How effective has it been in changing demand, and what limitations emerge through the assumptions it reproduces?

Smart metering demand management programs

Situating smart metering within the dominant demand management paradigm

As outlined in Chapter 1, smart metering reinforces the juxtaposition between production and consumption and consequently reproduces dominant assumptions of consumer choice and change. On the one hand, this quasi-technology infrastructure supports a new form of metering provision that enables efficiencies in its own right through, for example, improved operation and control of the electricity network (NERA 2007b). On the other hand, smart metering facilitates a raft of demand management programs that target the sphere of consumption by attempting to engage householders (and businesses) in their demand for resources. The meter itself, 'that quietly clicking sentinel in the front yard' (Sofoulis 2005, p. 435), is the centrepiece of this division — both metaphorically and physically separating the realm of resource management from that of domestic life.

The mandate for smart metering in Australia, which requires the roll-out of *technology,* rather than the programs and strategies it facilitates (NERA 2007b), is based on the assumption that technology transfer as a linear process which can be accelerated by the diffusion of knowledge and correct market signals. Similarly mandates have been proposed or are being

implemented internationally in developed countries such as New Zealand (PCE 2009), the United Kingdom (UK) (DECCb 2009), and parts of the United States of America (USA) (CEC 2007; RMI 2006a), Canada (OEB 2007) and Europe (Devine-Wright & Devine-Wright 2006). Smart metering is therefore embedded within a worldwide trend towards techno-economic optimism, where neo-liberal free markets are thought to bear witness to new forms of sustainable service relationships and innovative demand management solutions (Bakker 2005; Davison 2001).

The national mandate for smart metering has been promoted and justified through a series of cost-benefit analyses, which serve to reinforce the production–consumption distinction further through separate analyses of 'consumer impacts' (EMCa 2009; NERA 2007a, 2008a), 'network impacts' (CRA 2008a), 'economic impacts' (CRA 2008b) and 'retailer impacts' (KPMG 2007). Through these discrete analyses, certain 'benefits' and 'costs' are prioritised or ignored, such as those that are easier or more difficult to quantify. Emerging out of these cost-benefit analyses are three dominant demand management strategies which are intended to 'shed' or 'shift' demand at the household level (NERA 2008b). They are: market mechanisms in the form of variable pricing regimes; eco-efficiency involving DLC and leakage detection; and consumption feedback or product disclosure about the energy or water consumed by particular appliances and infrastructures. These strategies potentially contribute to all of the policy responses proposed by Southerton *et al.* (2004b) in their critique of the rational framing of the consumer (see Figure 2.1). Like dominant demand management approaches, such strategies do not question the nature of demand, but rather to 'manage' its impacts by moving it to other times of the day (variable pricing), directly intervening to make it more efficient (DLC), or encouraging people to 'save' energy and water (consumption feedback). The remainder of this section elaborates on the strategies that smart metering facilitates, and discusses recent reviews and evaluations of them in order to identify the limitations of framing demand within this paradigm.

Dominant smart metering demand management strategies

This section discusses the main three demand management approaches facilitated by smart metering. Appendices 1–3 provide summaries of the estimated and actual savings achieved from a wide range of international and Australian trials discussed below.

1. Consumption feedback and information

Smart meters enable the provision of consumption feedback and improved resource information, delivered to householders through the meter itself, a website, or an IHD. This strategy is based on the premise that householders are currently lacking accurate information about their energy and/or water consumption and its impacts, and that this

'barrier' can be overcome through more relevant and personalised consumption information. Feedback generally takes two forms. Firstly, householders can be provided with information about their own consumption, including resource units (kilowatt hours (kWh) or litres), greenhouse gas emissions and the cost of resources. Secondly, smart meters can enable the provision of information to householders generating or capturing their own power or water through on-site micro-generators such as solar photovoltaic (PV) panels, or on-site water supply infrastructures such as rainwater tanks and grey-water systems.

There has been a wide range of literature concerning the impact of consumption feedback and improved billing information on patterns of resource consumption, most of which has focused on the energy sector. Reviews and trials of feedback measures suggest that this approach can reduce energy consumption by 5–15 per cent (Darby 2006; Formby 2005; Oliphant 1999; Socolow 1978; Van Houwelingen & Van Raaij 1989) or, in one review, up to 20 per cent (Shipworth 2000). More informative bills, also known as indirect feedback, were found to reduce consumption by around ten per cent (Darby 2006; Owen & Ward 2006; Wilhite & Ling 1995). Feedback can achieve reductions in consumption as high as 30 per cent when combined with other incentives (Rosa *et al.* 1988; Shipworth 2000). Trials and reviews of smart metering specifically focused on the delivery of energy consumption feedback through an IHD estimate that the conservation effect varies widely between 0–20 per cent (see appendices 1–3).

Studies on water feedback are less common, although there is some literature available (Arbues *et al.* 2003; Arroyo *et al.* 2005; Renwick & Green 2000; Wetherall 2008), as well as a wide range of Australian educational programs and campaigns that seek to change water consumption patterns through information and awareness (see, for example, ACF 2006; NSW 2009; Savewater 2009; VictGov 2009b). The Australian Water Association (AWA 2001) notes that the introduction of *traditional* water meters and public awareness schemes to reduce demand has lowered consumption by as much as 30 per cent in some areas. A small trial of IHDs displaying water, gas and electricity consumption in Victoria found that water consumption feedback achieved an additional five per cent reduction in consumption above the 17 per cent reduction already being achieved by Melbourne households under Stage 3a water restrictions (Wetherall 2008). This group of households also achieved an 18 per cent reduction in gas consumption — higher than the 15 per cent threshold estimated by most reviews. However, several studies warn that these reductions are not always sustained (Challis 2004; Reidy *et al.* 2005).

While the provision of information and feedback can achieve resource savings in homes, there is a wide degree of variability (0–20 per cent) in its effectiveness that has not been

adequately explained through dominant demand management assumptions. For example, in one study measuring consumption in identical homes and low-energy dwellings, consumption differed by a factor of three due to variations in householders' practices (Hackett & Lutzenhiser 1991). There is also evidence to suggest that people behave 'irrationally' when provided with information and feedback by not taking proven cost-cutting steps to change their practices or make them more efficient (Shipworth 2000; Wilk & Wilhite 1985). It is currently unclear how to achieve greater resource reductions using an information and feedback strategy, aside from improving the quality and format of the information provided. I return to these limitations at the conclusion of this section.

2. Variable pricing regimes

Smart meters can send market signals to consumers in the form of variable prices for energy and water resources. These signals are designed to encourage householders to weigh up the costs and benefits of consuming a resource at particular times of the day. Demand managers assume that householders will be less likely to consume resources during peak times because the higher cost will not match the benefit and visa versa if the cost is lower. Smart metering supports two main types of variable pricing regimes: time of use (TOU) tariffs and critical or dynamic peak pricing (DPP). TOU tariffs and DPP are used by the electricity industry to charge more for power during peak demand, and less during off-peak periods. A TOU tariff typically sets out several peak, shoulder and off-peak tariffs which are charged consistently across every day in a tiered structure, the peak period being the most expensive. DPP tariffs are characterised by variable critical peak pricing periods, which are 10–40 times higher than the off-peak rate and are generally called up to 12 times per year. These DPP 'events' are communicated to customers through an IHD, SMS, email, phone call and/or customer website. Rates are lower at other times of the day to compensate for the high price charged during DPP periods (NERA 2008b). Similar pricing structures for periods of water scarcity and abundance have been proposed by the water sector (AAP 2008) but have not been trialled in Australia.

New pricing tariffs for electricity have been, or are being, trialled and implemented in nearly every state and territory around Australia (NERA 2008a). TOU tariffs are becoming the default residential tariff structure for some electricity retailers. However, although DPP has been trialled by the main three government-owned retailer and distributor businesses in NSW, there has been no commitment to offer this rate structure to residential customers permanently (NERA 2008b). Reviews of variable pricing trials in Australia and overseas show that TOU tariffs generally achieve a lower demand reduction during peak times than

DPP tariffs and have a negligible conservation effect[11] unless combined with other measures, such as feedback through an IHD (NERA 2008a, see appendices 1–3). It is assumed that this is because DPP events incur a disproportionately higher charge than the peak period TOU tariff.

Internationally, DPP in the electricity sector has resulted primarily in load shifting (transfer of electricity-consuming practices to other times of the day) rather than conservation while, in Australia, conservation has dominated existing trials (NERA 2008b, see appendices 1–2). DPP has been shown to achieve average peak demand reductions of up to 25 per cent in Australian trials when used in conjunction with an IHD (NERA 2008a) and, in the best-case international example, an average reduction of 26 per cent was achieved on weekdays in summer months when combined with an IHD and time switch controls (TSCs) (Braithwait 2000).

The results of the national and international trials point to the weather dependency and seasonal variation in demand responses. Nearly all pricing trials found a correlation between high temperatures and higher responses and, to a lesser degree, low temperatures and higher responses, suggesting that consumption is more elastic with extreme weather conditions, or in the height of summer and winter. In the California Statewide Pricing Pilot, the largest and most reputable pricing study in the world, there was an over ten per cent increase in load response from customers on extremely hot days (CRA 2005). While most of this peak reduction was shifted to other times of the day, Australian DPP trials have achieved a significant conservation effect (NERA 2008a). Given that demand response is highly weather dependent and, in the Australian examples at least, less likely to be transferred to other times of the day, there is strong evidence to suggest that heating and cooling services — the most energy-intensive practices undertaken during extreme weather events — are largely discretionary.

3. Efficient and controlled appliances

Efficiency measures enabled by smart meters generally take two forms: DLC, whereby electricity utilities remotely switch on and off an appliance, or series of appliances, during periods of peak demand; and TSCs, which can be attached to appliances such as air-conditioners and pool pumps to turn them on and off at specified times (NERA 2008b). Unlike DLC, TSCs allow householders to maintain complete control over their own energy consumption, overriding the time switches if they think it's necessary. Most utilities have favoured DLC over TSCs to date because it provides them with greater certainty about load

[11] The conservation effect refers to the actual amount of electricity saved or conserved, in contrast to the shifting of electricity usage to other times of the day (known as load shifting).

savings and minimises the risk of their customers' overriding the TSCs at the worst possible time, such as during peak periods. TSCs do not require a smart meter to operate but have been provided to customers as part of some smart metering trials in Queensland (NERA 2008a) and internationally (Braithwait 2000). DLC has been trialled most extensively and successfully in the USA, particularly California (Borenstein *et al.* 2002; Herter 2007; RMI 2006b), where trials have achieved load reductions of up to 60 per cent per site (see appendices 1–2). In Australia, trials of residential DLC have been conducted in NSW (Integral 2006), SA (ETSA 2007a) and Queensland (NERA 2008a) using air-conditioners and pool pumps.

Importantly, smart metering is not required to enable DLC or TSCs. Indeed, many nations including Australia already have ripple control networks that control large electricity-consuming appliances such as hot water systems, air-conditioners or heaters (Borenstein *et al.* 2002; NERA 2008b; PCE 2009; RMI 2006b). However, some argue that smart metering offers greater opportunities for automating demand responses using protocols such as ZigBee or Bluetooth (NERA 2008b; PCE 2009). These protocols enable the smart meter to interact with smart appliances around the home, signalling to them to reduce their electricity usage when required. Appliance manufacturer GE has already introduced a line of smart appliances to the USA, including refrigerators that turn off their auto-defrost cycles at peak times, and dishwashers and washing machines that slow down their cycles (PCE 2009). Other manufacturers are working on similar appliances for the New Zealand and Australian markets (PCE 2009).

These efficiency measures assume that individuals will not be willing to reduce their demand when needed (i.e. on hot summer days). This approach follows the rational actor logic, in that it assumes that the benefits of cutting demand on a hot summer's day, when many householders use their air-conditioners, will not be outweighed by an increase in the cost. These strategies therefore provide 'insurance' against heat waves lasting for several days, when the willingness of consumers to turn back their thermostats, or forego air-conditioning, has been shown to wane (CRA 2005). ETSA (2007a) argues that only DLC is likely to achieve the required peak load reductions in the state of SA, where extreme dry heatwaves with temperatures over 35 degrees lasting for four or five days in summer are common. In the 2007–08 summer a record heatwave in this state lasted for 15 days (Anon. 2008).

Despite the assumption that householders will be unwilling to reduce their demand on hot summer days, a common feature of both international and Australian air-conditioning DLC programs is the lack of impact they have on the participants' reported comfort expectations. Although small temperature increases have been recorded during DLC periods, which

typically involve the air-conditioner compressor being switched off for 15 or 30 minutes out of every hour, very few customers complain about being uncomfortable (ETSA 2007a; Integral 2006). These results correlate with the discretionary nature of comfort demonstrated in DPP trials, where peak reductions are higher during more extreme temperatures. However, they contradict one of the underlying assumptions of DLC, which is that demand for comfort is largely static or unchangeable.

The limitations of dominant smart metering demand management strategies

While there is considerable evidence to suggest that smart metering demand management strategies, either independently or in combination with one another, are capable of achieving significant resource savings (see appendices 1–3), these approaches leave unanswered important questions about the changing nature of demand. In all of the strategies discussed above, we know next to nothing about how everyday practices change in response to the instruments employed, even though demand management strategies are being introduced in *direct response* to changes in demand, i.e. changes in people's practices. This is despite the fact that the trials discussed above suggest that demand, and therefore the practices that underpin that demand, may be highly malleable. However, evaluations and reviews of smart metering demand management trials begin by highlighting the importance of implementing smart metering programs 'in a way that avoids significant impacts on comfort and lifestyle' (Reidy 2006, p. iv). Air-conditioning is considered 'an essential service in modern Australia' (McCann 2006, p. 2), even though it is acknowledged as having grown from virtually nothing in the last 40 years. As a result of these blanket assumptions, air-conditioning's role in achieving comfort is given no further thought or attention, apart from identifying more efficient ways to design, manage or use it. Similarly, by dismissing the changing nature of comfort practices in DLC programs, or by completely avoiding any reference to comfort at all, policy makers and utility providers may be missing opportunities to make their strategies more effective, or may indeed be creating *ineffective* strategies if they result in more resource-intensive comfort expectations.

For example, some utilities directly advised their trial participants to pre-cool their homes before a DPP event in order to maintain the same level of comfort (CountryEnergy 2004). This may result in a practice of overcompensation, whereby householders who otherwise might not have used their air-conditioning decide to switch it on before a DPP event 'just in case'. Similarly, DLC, which treats the symptom (i.e. peak demand) of an underlying problem (i.e. changing comfort expectations and practices), may in fact accelerate or escalate the current transition towards air-conditioned households by inadvertently justifying and legitimising this mechanically produced form of comfort. Shove (2004) makes a similar point

in regard to the current policy focus on making air-conditioning and heating appliances more efficient rather than questioning their necessity. Such issues are not addressed in DLC trials, where practices are taken for granted as non-negotiable needs rather than evolving and malleable configurations.

Similarly, consumption feedback does not directly challenge or question what people use resources for and why they use them. Instead, it encourages householders to 'switch off' unnecessary or unused appliances such as lights and televisions, or to make efficiency changes that 'save' energy or water, by installing energy-efficient light globes or water-efficient showerheads (CountryEnergy 2004; Wetherall 2008). However, as new practice 'needs' emerge that require more resources, through the use of appliances such as plasma TVs (Harrington *et al.* 2006) or air-conditioners (EES 2006), these efficiency benefits are being negated.

In order to address these issues, we need a better understanding of people's practices, and how and why they change. By focusing on overcoming 'barriers' to the effectiveness of resource consumption information, the diffusion of market signals, or by avoiding the 'consumer' altogether and remotely controlling their appliances, we overlook:

> the complex and messy terrains where personal, social, civic, local and everyday practice are rendered meaningful: the terrains, in short, where consumption habits are collectively acted out, maintained and subject to change (Allon & Sofoulis 2006, p. 46).

Before we consider this alternative understanding of demand in more detail, it is important to reflect on the persistence and almost uniform application of the dominant demand management paradigm. We are yet to fully understand why demand management practitioners and policy makers assume that householders' practices are non-negotiable when real-world trials indicate that they are, and why this view continues to persist. The final section of this chapter begins to address these questions by outlining the obduracy of the dominant demand management paradigm.

The self-reinforcing rationale of demand management

The first section of this chapter outlined the ways in which demand management programs are a product of assumptions pertaining to how infrastructures, technologies and systems of provision relate to people, how people choose to consume, and how negotiable 'demand' is. The second section identified how these assumptions have been applied to the specific case of smart metering, the questions left unanswered as a result of this application, and the

problems that arise from this approach. This final section briefly considers the ways in which these assumptions constitute a self-reproducing rationale that extends and reinforces existing demand management approaches, effectively obscuring alternative understandings of household demand.

There are arguably three main components of the rationale underpinning dominant demand management strategies discussed here. They are concepts, methodologies, and responsibilities and roles. The first concerns the ways in which economics underpins policy; the second concerns the way in which studies, trials and evaluations reproduce these concepts; and the third concerns the roles and responsibilities attributed to 'providers' and 'consumers', which legitimise and self-perpetuate this conceptual and methodological grounding.

Concepts

The application of economic principles and concepts in demand management programs is part of a broader policy approach of decision-making (i.e. cost-benefit analyses) and understandings of consumption and choice (i.e. rational action) discussed previously in this chapter. This conceptual basis informs the design and evaluation of, and justification for, smart metering demand management trials and programs, and indeed the very concept of demand management itself. This conceptual policy basis gives rise to several problematic 'blind spots' (Stern 1986) concerning householders and their consumption. Firstly, it fails to consider how consumption is a shared enterprise 'subject to collective norms of contextualised engagement' (Southerton *et al.* 2004b, p. 34). Secondly, it overlooks the routine and habitual nature of consumption by assuming that consumption decisions are explicit and calculated (Gram-Hanssen 2008). Thirdly, it ignores the co-dependent relationship and influence of infrastructures, technologies and wider systems of provision on individual consumption (Slob & Verbeek 2006; Southerton *et al.* 2004a; Van Vliet *et al.* 2005). And lastly, it takes for granted, and then largely ignores, the ways in which new 'needs' are constructed in society and the ways in which practices change over time (Shove 2003a).

Methodologies

The conceptual underpinnings of demand management are reproduced in the method of managing demand itself and in evaluations of this process. In the first instance, the assumption that demand is a non-negotiable phenomenon leads to strategies that seek to 'manage' that demand rather than strategies that seek to fundamentally question it, understand it, or modify it. After establishing that it is 'demand' that we want to 'manage', we have a choice of strategies available to us that are targeted at the individual, and assume

some form of autonomous, conscious and rational decision-making process (Southerton *et al.* 2004b). In the second instance, these assumptions form the basis of evaluations, reviews and 'customer satisfaction' surveys that inform their further deployment.

Evaluators of smart metering demand management programs, in assuming that the main motivating consumption 'drivers' are price, potential resource savings, time availability, and attitudes or beliefs, construct multiple-choice surveys or focus groups premised on these assumptions. Householders are asked about their personal opinions, independent of a wider context of social and cultural practices (which are reinforced in their taken for granted status by not being discussed or debated) and are encouraged to think and respond in an autonomous manner. Householders are constructed as 'customers' or 'consumers' of resources, which reproduces notions of service delivery that emphasise meeting the 'needs' and 'wants' of individuals. Consequently, instead of being asked how we should collectively deal with the infrastructural issues of peak demand and climate change, householders are asked if they would be 'satisfied' with a particular demand management approach or 'willing' to participate in such a program. They are asked how they 'feel' this would affect their 'lifestyle' and whether the inconvenience would be too great. Householders are therefore framed as the aggregate consumers of resources, with specific rights and limited responsibilities. Furthermore, they are encouraged to respond in a way that prioritises their individual opinions and attitudes and assumes these overwhelmingly inform their everyday practices.

A typical example of the types of qualitative evaluations produced is the Red Jelly consulting agency's consumer focus group study conducted for the Ministerial Council of Energy's (MCE) cost-benefit analysis into a national smart metering roll-out (Jelly 2008). Red Jelly was commissioned to:

> …evaluate a range of price offers attached to the roll out of the smart meter in terms of consumer appeal, likelihood of take-up and impact on consumer behaviour as related to electricity usage and consumption across Australia (Jelly 2008, p. 5).

This research reinforces the conceptual divide between the spheres of consumption and production from the outset, by presenting 'consumers' with a range of demand management responses prepared by policy and utility experts, and by asking them whether or not they would be appealing. 'Impacts' are framed as a negative by-product of 'managing' consumer demand, within the context of existing 'lifestyle habits' (Jelly 2008, p. 38). Importantly, participants were not presented with a problem (i.e. peak demand) and asked what they

thought was the best way to collectively resolve it. They were not asked how their practices were changing, how this might be contributing to the problem, or how this issue could be resolved. They were not asked to think about how they could work with utilities and governments, but rather how they thought these utilities could fix this problem with as little inconvenience to them as possible.

In framing the research in this way, it is unsurprising that DLC was found to be the most popular smart metering strategy amongst consumers, because it provides people with an opportunity to 'save money, save energy, and feel good about (their) actions, but essentially without having to think or do anything' (Jelly 2008, p. 15). Electricity supply and infrastructure was viewed (and framed) as the government's responsibility and, overall, consumers were resistant to any programs that might have an impact on their comfort, lifestyles or day-to-day practices. The 'building in' of economic concepts and individual self-interestedness into methodological approaches such as the Red Jelly focus group study thus serves to reinforce the dominant rationale of demand management.

Responsibilities and roles

In making sense of the persistence of demand management models it is useful to consider the relationships between utility providers, policy makers and householders, and how they are embedded into, and legitimised by, infrastructures, technologies and systems of provision within the sphere of production. Energy and water management has long been delegated to governments and utilities, the roles of which were cemented into large-scale energy infrastructure during what Kaika (2005) refers to as the 'Promethean project' of modernity. Given that the role of utilities has traditionally been to build and supply whatever is demanded of them, it is unsurprising that householders, who are positioned as 'consumers', continue to expect this type of service provision. Indeed, the promise of unwavering supply is embedded into water and energy 'structures' such as infrastructures and technologies (Southerton *et al.* 2004a). Invisible wires and pipes 'speak' to us about the roles and responsibilities of resource provision, which have been firmly delegated to large-scale suppliers and managers (Shove & Chappells 2001).

For example, when we flick a switch or turn on a tap, we are indirectly encouraged to forget about how the service is being provided to us, or what impact it might be having (Sofoulis 2005). The independent and separate realm of management and control which resides beyond the water faucet or light switch is promoted and maintained by governments and utilities as the only form of acceptable service provision. Utility providers maintain this division through their monumental presence and their rhetoric and marketing, which reinforces the dominant provider–consumer relationship through slogans such as: 'We do

everything in our power to deliver yours' (see Figure 2.2). In treating householders as somehow separate from this socio-technical context, evaluators fail to recognise that householders' individualised notions of acceptability and non-acceptability may in fact be *a product of the system itself*. Asking householders to 'cut back' or change their consumption or practices contradicts the current infrastructural and institutional context where utilities promote their role as one which 'does everything in their power to deliver yours'. Demand management strategies that attempt to engage householders with their demand therefore contradict the entrenched role of utilities as providers of unquestioned demand (Chappells & Shove 2004).

Figure 2.2: ETSA Utilities: 'We do everything in our power to deliver yours'

Source: ETSA Utilities, SA, 6 February 2008

Interestingly, in the water sector, where householders are framed as temporary co-managers of Australia's dwindling water resources, research suggests that the population is willing to engage in the conservation of this resource (Randolph & Troy 2008; Sofoulis 2005). This is also the case in some smart metering demand management trials, where the provider–consumer relationship may be reconfigured to engage householders in the management of a resource (Marvin *et al.* 1999). In other words, because the *dynamics* of the relationship shift in trials and implemented programs, so too do the opinions and attitudes of the participants. Treating householders as individuals who are independent of a wider socio-technical context

obscures these dynamics and limits the potential for change. In order to gauge a more accurate understanding of household practices we must consider it within this existing delegation of responsibility.

Reconfiguring the rationale of demand management through the lens of everyday life

This chapter has undertaken the crucial function of beginning to explain the hegemony of the dominant demand management paradigm and the gaps and problems it leaves in its wake. I have argued that this paradigm is based on a series of premises and assumptions such as the demarcation between the spheres of production and consumption, an understanding of householders as rational and autonomous 'consumers', and the non-negotiability of demand. Through a critical evaluation of smart metering trials and reviews, which are embedded within this dominant paradigm, I highlighted the limitations of framing consumers and their demand in this way, and the questions these limitations raise regarding the nature and negotiability of practices. I warned that these programs currently take for granted existing practices and service expectations, leaving them free to continue changing in more or less resource-intensive directions. Furthermore, I suggested that demand management strategies are part of a self-sustaining rationale underpinned by economic concepts and methodologies which are embedded and reinforced through the relationship between utilities and householders.

I have pointed towards the need for an alternative framing of demand and the assumptions underpinning it — one that contextualises consumption within the realm of everyday life. Chapter 3 undertakes this task, outlining an alternative practice-based approach for understanding and analysing demand. This chapter therefore shifts our focus from conventional assumptions of demand to the mundane and unpredictable domain of everyday life, where the consumption of resources takes place through the 'doings and sayings' of practices. In particular, I focus on the practices most relevant to energy and water smart metering; namely comfort practices, which constitute over half of a household's energy consumption and are the major contributor to peak demand; and cleanliness practices, which form the majority of residential water consumption. I argue that we need to understand and analyse these practices in order to develop and evaluate strategies that address the resource management problems they give rise to.

Chapter 3: Understanding and analysing everyday practices

In Chapter 2, I argued that the dominant demand management paradigm is characterised by a split between the spheres of production and consumption, which produces a series of inadequate assumptions for understanding human action. This self-reinforcing rationale leaves important questions about the nature of everyday life unanswered, and obscures other understandings of demand from view. In this chapter, I reframe demand in terms of people's day-to-day practices to develop useful conceptual tools for understanding how they are established, sustained and transformed. In particular, I ask: how can we understand everyday life and everyday practices? Why might this alternative conceptualisation be useful for analysing comfort and cleanliness practices? And, what do we already know, and what don't we know, about comfort and cleanliness practices in an Australian context? Drawing on social practice theorists (Bourdieu 1977; Giddens 1984; Schatzki 2002), I develop a conceptual framework for understanding and analysing household practices, particularly those concerning comfort and cleanliness, which I later employ to analyse the household practices of research participants from four RGs (see Chapter 4).

The chapter begins with an overview of everyday life, where day-to-day practices are carried out, and its significance in evaluating strategies which seek to reduce or shift energy and water consumption, such as smart metering demand management programs. I argue that social practice theories provide a useful set of concepts to understand and analyse this everyday realm. I distinguish between four intersecting theoretical concepts that constitute a practice, which I refer to as 'components': practical knowledge, common understandings, rules and recommendations, and material infrastructures. I consider how these components (and therefore practices) are established, sustained and changed through processes of reproduction and routinisation. Finally, I discuss what we do and don't know about comfort and cleanliness practices in Australian households, identifying where empirical research is urgently required to address significant gaps in our knowledge.

An introduction to everyday practices

The significance of everyday life

I have suggested previously that framing consumers as rational actors operating in a market of energy and water consumption generates common 'blind spots' (Stern 1986) and

limitations in our understanding of how demand is constituted and changing. Instead, it is useful to think about *why* people consume energy and water. Rather than viewing householders as consumers of aggregate resources such as kilowatts and kilolitres, we can reconceptualise consumption as a by-product of everyday life. In other words, 'consumption is not itself a practice but is, rather, a moment in every practice' (Warde 2005, p. 137). Therefore, people consume resources in order to carry out the day-to-day *practices* that they make possible (Wilhite *et al.* 2000). Following this understanding, smart metering demand management strategies are responding to changes in everyday life, as well as the resource constraints and challenges these pose.

However, everyday life is rarely the focus of research, nor is it easy to study. Its mundane, taken for granted and seemingly inconsequential nature led Sofoulis (2005, p. 448, emphasis in original) to remark that 'the problem with researching — or transforming — everyday water use is precisely its everydayness; so normal it retreats into the background of awareness as part of *inconspicuous consumption*.' Despite its silent and hidden characteristics, it is within the everyday realm that nearly all consumption takes place (Gronow & Warde 2001; Patterson 2006; Shove 2003a), from getting up in the morning and brushing our teeth or taking a shower, right through to preparing an evening meal and going to bed. However, everyday life is by no means stable. The myriad of 'normal' routines householders engaged in when they rose from their slumber last century are very different to those we take for granted today (Shove 2003a). It is the dynamic and transforming nature of everyday life, and in particular the everyday practices which constitute it, that make this realm so critical in addressing resource management issues. As practices are modified and introduced, so too is the resource consumption required to maintain them.

Situating everyday practices in social analyses

Understanding consumption through the lens of everyday practices differs from the two master concepts of individuality and totality on which social and cultural theory has predominantly been based (Schatzki 1997). Individuality encapsulates the rational action framework of demand discussed in Chapter 2, whereas totality is the conceptual opposite, whereby people are framed as social 'dummies', blindly following collective norms and rules (Reckwitz 2002b). In contrast, a practice-based analysis places key focal points on the 'organization of the practice and the moments of consumption enjoined. Persons confront moments of consumption neither as sovereign choosers nor as dupes' (Warde 2005, p. 146).

A body of literature referred to as social practice theory (Barnes 2001; Bourdieu 1977; Giddens 1984; Reckwitz 2002b; Schatzki 1996; Warde 2005) provides useful insights into understanding and analysing everyday practices. However, practice theory has been

criticised for being too philosophical and difficult to transpose into empirical analyses. According to Warde (2005, p. 135), 'as general theories of practice they tend to be idealized, abstract, and insufficiently attentive to the social processes involved in the creation and reproduction of practices.' A further complication in applying practice theory to empirical data is that each theorist has their own unique understanding of how practices are constituted and reproduced. Nonetheless, this diverse body of literature provides a useful starting point for identifying analytical concepts to examine and understand everyday practices.

Defining everyday practices

I use the term *everyday* practices to refer to a loosely bundled group of practices which are seemingly inconsequential, inconspicuous and mundane, but nonetheless essential to our day-to-day lives. This research refers to the everyday practices conducted in the domestic sphere, specifically those pertaining to indoor comfort and cleanliness, such as bathing, laundering, dishwashing, teeth brushing, toilet flushing, house cleaning, heating and cooling. However, at times I use this term more broadly to refer to the day-to-day activities conducted in people's everyday lives. While there is no unifying definition of a practice, it can be loosely described as an interwoven activity in a social domain (Schatzki 1997), or, 'a "bundle" of activities, that is to say, an organized nexus of actions' (Schatzki 2002, p. 71).

Practices are social phenomena, in the sense that, firstly, 'participating in them entails immersion in an extensive tissue of coexistence that embraces varying sets of people', and, secondly, their organisation is part of the 'nexuses of doings and sayings that compose them' (Schatzki 2002, p. 87). Schatzki distinguishes between practice as both a co-ordinated entity and a performance which is actualised and sustained through individuals' reproduction of them. Reckwitz (2002b, p. 250) describes this regular reproduction as 'a routinized way in which bodies are moved, objects are handled, subjects are treated, things are described and the world is understood.'

However, this does not mean that the routinisation of a practice is separate from its composition. As Giddens (1984, p. 2) argues, practices are recursive:

> that is to say, they are not brought into being by social actors but continually recreated by them via the very means whereby they express themselves *as* actors. In and through their activities agents reproduce the conditions that make these activities possible.

Practices are therefore created, sustained and transformed through their reproduction in everyday life.

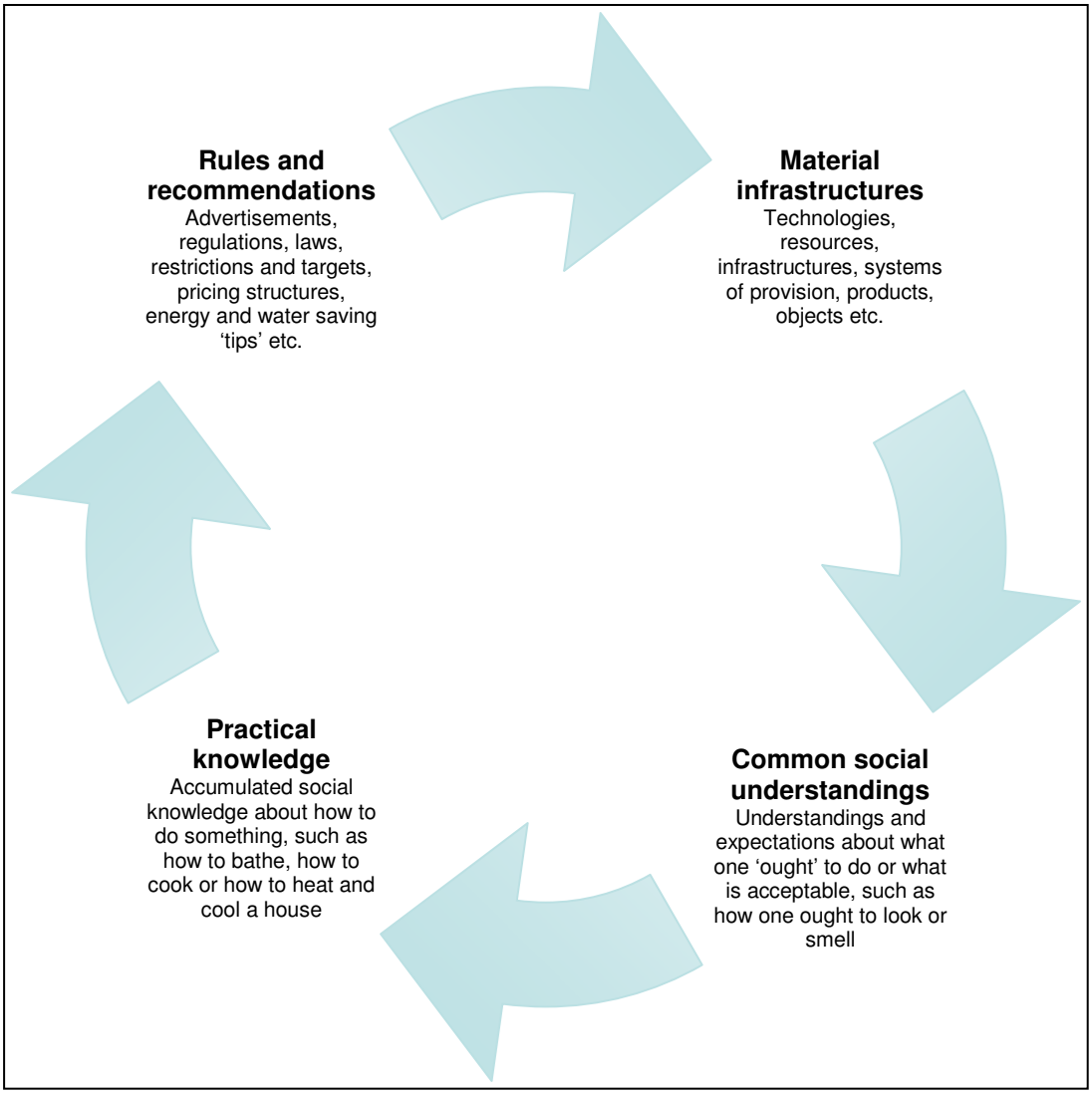
Practices are often misunderstood as relating only to what people do, or to what they say about what they do, rather than the ways in which these 'doings and sayings' are constituted and interconnected. In these instances, practices are reframed as 'behaviours', which are viewed as the product of individuals. For example, we often describe 'doings' as taken for granted and socially understood facts, such as doing the laundry, or taking a shower. Furthermore, we often analyse these doings based on what people say about them, understanding them to be the product of beliefs, attitudes, opinions and values (Ajzen 1991), or of some external social 'force' such as norms (Schultz *et al.* 2007; Turner 1991). These understandings obscure the historical, social, cultural and material configurations which shape what we do and how we explain what we do. Drawing on analytical concepts from practice theories, we can go beyond this shallow exterior to consider the factors which *constitute* and *link* doings and sayings.

A useful place to begin is to 'dissect' everyday practices. Although practices cannot be segmented in everyday life, distinguishing between various 'components' assists in establishing a conceptual grounding for analysis. Put simply, we often need to pull something apart before we can view it as an integrated whole. In the section that follows, I elaborate on the components and processes of practice reproduction that actualise and sustain them in everyday life.

A conceptual framework of everyday practices

In this section, I identify four common theoretical features of everyday practices which I refer to as 'components' (see Figure 3.1). My aim is not to represent all practice theories, but rather to identify useful analytical concepts for empirical research. I discuss firstly 'practical knowledge', which provides people with the tacit skills required to undertake a particular practice; secondly, common understandings, which are acceptable and 'normal' benchmarks or expectations for particular practices; thirdly, institutional 'rules' and recommendations, which are deliberate attempts to sanction, modify and establish certain practices; and, fourthly, material infrastructures, such as technologies, infrastructures and systems of energy and water provision, which provide the means by which many practices are undertaken and made possible (see Figure 3.1). Using examples of comfort and cleanliness, I demonstrate how these components intersect to create an 'organised nexus of actions' (Schatzki 2002, p. 71). I continue by discussing how these components are conjoined through a continual process of reproduction in everyday life.

Figure 3.1: Components of everyday practices reproduced in everyday life



Practical knowledge

Practical knowledge is a submersed layer of information and understandings which informs everyday action. What makes sense for a person to do at any given moment is, to a large extent, informed by what they have always done (Schatzki 2002). For example, when a person feels hot or cold, they draw on practical knowledge to establish what practices they should undertake, such as having a hot bath or cold shower, putting on a jumper, shutting curtains and blinds, or turning on an air-conditioner or heater. Practical knowledge is therefore learned social know-how which is accumulated through everyday experience. Practice theorists discuss practical knowledge in different ways, referring to it as *practical consciousness* (Giddens 1984), *habitus* (Bourdieu 2005), and *practical intelligibility* (Schatzki 2002). While significant distinctions can be drawn between these concepts, these theorists agree that some form of practical knowledge is embodied in actors (and, to different extents, objects and systems) and the practices they undertake. Practices therefore follow a logic —

not the logic of conscious decision-makers, but 'the embodied logic of sedimented history in everyday activity' (Sterne 2003, p. 375).

While it is not necessary to elaborately distinguish between each theorists' different interpretations of practical knowledge, it is useful to consider the contributions they make to understanding and analysing the composition of practices. Both Bourdieu's and Giddens's understandings of practical knowledge refer to a deeply embedded layer of understanding which is replicated in nearly everything we do. Giddens (1984, p. xxiii) argues that such knowledge consists of 'all the things when actors know tacitly about how to "go on" in the contexts of social life without being able to give them direct discursive expression'. Whereas Giddens distinguishes between practical, unconscious and discursive forms of consciousness, Bourdieu (1998) arguably encompasses all states of consciousness in his concept of habitus, which can unconsciously regulate our emotions — generating feelings, tastes and urges of disgust and desire. Thus, deeply embedded routines can become 'absorbed' into the body as feelings, such as the 'need' to shower every day in order to 'feel' clean (Wilk 2002).

Schatzki (1997, p. 301) criticises Bourdieu and Giddens for relying too heavily on the unconscious and submersed nature of practical knowledge given the 'garden variety fact that people can explain almost all their actions in great detail'. Rather, he refers to practical intelligibility as a skill or capacity that underlies activity. However, Giddens (1984, p. 5) also contends that people can articulate their actions through 'rationalization': 'by the rationalization of action, I mean that actors — also routinely and for the most part without fuss — maintain a continuing 'theoretical understanding' of the grounds of their activity.' The distinction Giddens (1984, p. 6) makes is that, while actors can 'explain most of what they do, if asked', they cannot necessarily do so for their motives. For example, while people may be able to clearly articulate how they shower and perhaps even why they do it, they may not be able to express where this practice has emerged from. Throughout this thesis I use the term practical knowledge to refer to both consciously reflected and semi or deeply embedded interpretations of this theoretical concept.

Importantly, practical knowledge is not something natural or inborn, but rather a product of social history, i.e. of education, upbringing and social experience. For example, Bourdieu (2005, p. 45) claims that habitus provides individuals with:

> a set of *acquired* characteristics which are the product of social conditions and which, for that reason, may be totally or partially common to people who have been the product of similar social conditions.

Thus, while practical knowledge is individually experienced, it is a product of socially shared and culturally similar conditions and experiences with practices. For example, taking a shower in order to clean one's body makes sense not only to one individual, but to many people in a particular historical, social and cultural context. In this sense, practical knowledge is produced, shared and reproduced by people undertaking socially similar practices.

Practical knowledge is therefore not a fate or destiny. As Bourdieu (2005) argues, it can be changed through awareness and 'pedagogic effort'. Nor is it the product of mere repetition, which Bourdieu (2005) argues is the distinction between habit and habitus[12]. Rather it has a generative capacity which can produce a variety of outcomes (and habits) within any given context: 'this means, that in rapidly changing societies, habitus changes constantly, continuously, but within the limits inherent in its originary structure, that is within certain bounds of continuity' (Bourdieu 2005, p. 47). Thus, practical knowledge can be understood as an accumulated history of experience with a particular practice, which may or may not be consciously expressed, and, while individually experienced, has a commonality with other participants of the same practice.

Common social understandings

Closely linked to practical knowledge, and indeed absorbed into it in Bourdieu's (2005) concept of habitus, are common social understandings about 'right' and 'wrong' ways of doing things. Often referred to as norms, conventions, customs, traditions, common sense or public opinion (Turner 1991), common understandings inform acceptable and unacceptable practices. I distinguish between practical knowledge and common understandings to highlight social expectations of appearance, smell, hygiene and cosiness which inform how and when comfort and cleanliness practices should to be undertaken (Shove 2003a; Wilhite *et al.* 1996a). Schatzki (2002, p. 75) makes a similar distinction: 'what makes sense to someone to do is not the same as what someone thinks is appropriate, right or correct'. Importantly, people may have their own particular ways of maintaining, interpreting or rebelling against common understandings. For example, a person who showers once a week (or not at all) may still uphold and maintain the same presentability and body odour expectations as a person showering every day by drawing on different practical 'know-how' regarding how to clean the body.

[12] Barnes (2001, p. 26) makes a further distinction between habit and practice, arguing that: 'habit is not enacted well or badly, but practice is'.

While common understandings convey a feeling of 'oughtness' about certain practices, I refrain from referring to them as social norms throughout this thesis because of this term's common association with social totalitarianism. As Turner (1991, p. 3) describes, social norms are defined as: 'external to the individual, being the property of a culture, and constrain the actions of individuals'. Using social practices as the unit of analysis dissolves the division between individuality and sociality. I therefore use the term 'common understandings' not to dismiss the role of norms, but to assist us in thinking about them as understandings that emerge *from* a practice, rather than being imposed *onto* it from an external social force.

Rules and recommendations

For the purposes of this research, practice 'rules' or recommendations refer to direct or deliberate attempts by institutional, commercial or other interests to reconfigure or reinforce a practice or specific components of it. Practice theorists have defined rules in several different ways. Schatzki (2002, p. 79) describes them as 'explicit formulations, principles, precepts, and instructions that enjoin, direct, or remonstrate people to perform specific actions.' This is distinct from Giddens's (1984, p. 21) broader use of the term, which he uses to refer to 'the rules of social life', which are 'techniques or generalizable procedures applied in the enactment/reproduction of social practices'. The types of 'rules' referred to in this thesis most closely resemble what Giddens calls 'formulated rules' or 'codified interpretations of rules', which are 'those that are given verbal expression as canons of law, bureaucratic rules, rules of games and so on'. In the context of comfort and cleanliness, rules refer to regulations, restrictions, targets, standards, theories and recommendations developed and/or introduced by influential or institutional bodies, which are not necessarily subject to monitoring and enforcement, but can hold the same status as many laws, becoming the source of social censure and new common understandings about appropriate and inappropriate practices.

For example, water restrictions, along with recommendations about how to save energy and water, are given credence by governments and utility providers when they devise, promote and/or enforce them. Furthermore, rules can be explicit recommendations made by commercial interests, or amalgamated bodies of them, such as the American Society of Heating, Refrigeration and Air-Conditioning Engineers' (ASHRAE 2004) 'standard of thermal environmental conditions for human occupancy', which now informs the building standards for most modern nations.

The Cleanliness Institute provides an historical example of the role of rules and recommendations in reconfiguring cleanliness practices. The Institute was an influential organisation composed of soap manufacturers established in the 1920s to promote the

biological discourtesy and potentially dangerous effects of spreading germs (Lupton & Miller 1992; Vinikas 1992). The Institute recommended regular hand, house and body cleaning practices, which are now common and accepted. Importantly, the Institute did not focus on the product it was trying to sell (i.e. soap), but rather on the *common understandings* associated with its use. The Institute targeted school children and mothers, providing them with new practical knowledge about the most effective ways to maintain a germ-free body and home (Vinikas 1992). Thus, the Cleanliness Institute was involved in a successful campaign of redefining 'normal' cleanliness practices, through which soap became implicated in the everyday compulsory maintenance of the body, clothes and home.

Riding on the back of 'the fear of the microbe' (Tomes 1998, p. 10), heightened by the actions of the Cleanliness Institute, came advertisers and marketers who Vinikas (1992, p. vii) describes as powerful 'social institutions', which 'promulgate[d] a cluster of social values and beliefs' around new cleanliness expectations. Advertising created new cleanliness 'problems', and solved them through new cleanliness 'solutions' such as the development of Listerine to treat halitosis, and deodorant 'needed' to cure body odour, both of which were repositioned as socially undesirable and offensive conditions of the body (Vinikas 1992). As this example demonstrates, the promotion of these 'rules' has significantly defined our understanding of the courteous, acceptable and desirable cleanliness practices we now consider 'normal'.

However, rules should not be thought of as institutional 'forces' that are interjected into practices. Rather, like common understandings, rules also emerge out of practices, and are often interpreted and incorporated into practices in different ways than originally intended. For example, Australia's urban water restrictions, which impose rules on 'discretionary' practices such as garden and lawn watering, have emerged out of the assumption that regular bathing and laundering practices are 'non-discretionary'. Furthermore, whilst *explicitly* regulating outdoor water practices, water restrictions may *implicitly* reinforce and legitimise indoor cleanliness practices as essential aspects of everyday life. Rules can also emerge out of changes to the material landscape. For example, Chappells and Shove (2004) demonstrate how rules pertaining to resource provision can be reconfigured when there is a breakdown or disruption in the system. Similarly, debate in Australia regarding new pricing 'rules' for energy and water have emerged out of shortages of supply, concerns about climate change, and problems with maintaining the existing system of provision (AAP 2008; Frew 2006a; Jenkins 2006; Murphy 2007, 2009).

In contrast, many new rules seek to maintain and preserve existing practices rather than reconfigure them. For example, the recent blackouts across Victoria during the 2009

heatwave prompted public debate about the provision of electricity (AAP 2009; Coster 2009; Dowling 2009; Zappone & Grace 2009). However, this did not result in an extensive discussion regarding the recent incorporation of air-conditioning into the practice of cooling, which was largely responsible for the blackouts (Coster 2009). Indeed, it is feasible that new rules could now be introduced to *strengthen* air-conditioned cooling practices by, for example, requiring the upgrade of electricity provision systems to cope with 'peaks' in demand. In this sense, rules can become embodied in 'things' (Reckwitz 2002a) through appliance standards, building codes, four-minute shower timers or, in the example above, policy and utility decisions about appropriate electricity infrastructure systems. Similarly, rules can also be *temporarily suspended* to uphold existing practices. For example, the 2009 heatwave resulted in the loosening of water restrictions and targets by the Victorian Government so that householders could use water to cool their bodies with hoses and showers (Doherty 2009).

In sum, rules are absorbed into, and emerge out of, practice. This thesis refers to rules as both regulated and enforced requirements, as well as sanctioned and endorsed recommendations. While rules are explicitly stated or inadvertently implied by influential institutional or commercial bodies, they are often subject to extensive public debate and manipulation. Importantly, rules can contribute both to the reconfiguration of a practice and to its continuation. Thus, what a rule says about a practice is just as important as what it overlooks.

Material infrastructures

Material infrastructures, encompassing objects, technologies, infrastructures and systems of provision form a pervasive and ubiquitous component of everyday life. Latour (1987) describes objects as the 'missing masses' and argues that they should be considered 'non-human actors' which carry as much agency as humans do themselves. Similarly, Reckwitz (2002a) criticises practice theorists for failing to adequately account for the role of 'things' in practices. He argues that we are currently witnessing an 'unprecedented expansion of hybrids, "quasi-objects", non-human creatures' which have become integral components of everyday practices (Reckwitz 2002a, p. 207). Indeed, households are part of a vast material infrastructure involving dams, power stations, pipes, wires, taps, drains, appliances, gadgets and switches. All comfort and cleanliness practices undertaken in the household require multiple forms of artefacts and technologies. Rather than being passive bystanders in a practice, objects often *shape the practice itself*. Akrich (1992) describes this process as 'scripting', whereby an object prescribes or recommends certain practices and outcomes. A washing machine, for example, 'scripts' a range of methods or 'cycles' used to produce appropriately clean laundry.

History is characterised by the making and remaking of material infrastructures for the home (Schwartz Cowan 1999). Most of these are developed by specific commercial interests who wish to sell a particular product, such as power (Hughes 1983), washing machines (Schwartz Cowan 1989), soap (Vinikas 1992) or air-conditioners (Ackermann 2002). Through historical accounts of these material infrastructures we can see how the 'rules' discussed in the previous section are both scripted into, and emerge out of, these objects. Jelsma (2006, p. 222) argues that the designers of material infrastructures can also script morality and immorality into them, which invite us to use more or fewer resources than needed or than we can afford. In some cases, 'immoral' objects can contradict or counteract the recommendations and 'moral' appeals and rules of governments, who encourage us to cut back or limit consumption. Jelsma (2006, p. 222) argues that these problems could be avoided if it were recognised from the outset that technologies and infrastructures guide 'patterns of unconscious actions… acting like beacons and signs'.

However, material infrastructures can be extremely difficult to change. Many are long lasting and path dependent, 'locking in' particular practices that may outlive the common understandings and material landscape they were intended for (Arthur 1989). This is compounded by 'the modernist solution to infrastructure [which] has been to seek "the one best way" and apply it at the largest scale' (Newman 2008). Such legacies and the 'connective tissue' on which they rely can pin particular practices into place (Chappells & Shove 2004). In response to the persistent nature of many objects, new compensatory artefacts have emerged to counteract 'legacy mindsets' (Patterson 2006), path dependence and 'immoral' technologies (Jelsma 2006). For example, water-efficient showerheads, shower timers and trigger nozzles attempt to overcome the saver-unfriendly scripts embedded in existing showers and garden hoses (Sofoulis 2005).

In sum, material infrastructures 'are able to mediate our sensory relationship with reality, and in doing so they transform what we perceive' (Verbeek 2006, p. 56) and, perhaps more importantly, what we do. Nonetheless, their ubiquitous and often hidden nature has led to their overlooked status in understandings of practice. Because many are persistent and difficult to change, they are often overlain with other material infrastructures or rules in an attempt to reconfigure the practices they are implicated in.

Practice as a co-ordinated entity

While the above discussion has divided practices into components for the purpose of analysing them, we cannot continue without once again reconceptualising them as an integrated and dynamic whole. Dividing practices into components runs the risk that each

one is viewed as an individual entity which is 'imposed on' and 'driven by' individual, social, institutional and/or material 'forces'. This is not my intention. Rather, as discussed above, components intersect and emerge out of a practice with reference to each other. For example, to say that water restrictions are a 'rule' imposed onto a practice would be misleading. While water restrictions can be conceptualised as a 'rule', they contribute to, and arise out of, existing common understandings and practical knowledge about household water practices, with reference to current material configurations of technologies and systems of provision. That is, they emerge out of the reproduction of existing practice.

Performing, reproducing and changing practices

Everyday practices are not 'one-off' occurrences, but rather repetitive, routine and mundane activities. The reproduced nature of practices has the crucial role of establishing 'a secure and liveable everyday life, where we are not compelled to do the overwhelming task of reflecting on every single act' (Gram-Hanssen 2008, p. 1182). These reproductions form a continuous stream of taken for granted activity (Halkier 2001). Indoor cleanliness routines, for example, encompass regular showering, laundering, dishwashing, toilet flushing and house cleaning practices, as well as routine ways of carrying out these activities, whereas comfort routines might involve common responses to particular environmental and social triggers, such as turning on a heater when the temperature reaches a certain level, or when guests are visiting the household.

Practice theorists argue that the regular performance of a practice sustains and legitimises it *as* a practice (Warde 2005). Put simply, in order for a practice to exist, it must be performed. In this sense, the introduction of a new 'rule' or material infrastructure is not influential in and of itself, but only when it forms part of the reproduction and performance of a practice. Regular showering, for example, became a common practice long after the invention of the 'power shower' (Bushman & Bushman 1988; Southerton *et al.* 2004b). When the shower was first introduced into the domestic environment, it was thought to be dangerous for the skin, particularly for women (Lupton & Miller 1992). Southerton *et al.* (2004b, pp. 43-5) argue that showering only became a common and desirable household practice after new common understandings of 'speed, immediacy and convenience', along with 'personal health, moral well-being and social respectability', became associated with it. Such arrangements are 'pinned' into place through the regular performance of showering, which sustains and legitimises this particular notion of normality (Shove 2003b).

In some ways, this seems like a contradiction. If practices are held together through their performance and reproduction, how can their reproduction also result in change? Furthermore, if practical knowledge is largely hidden or unconscious, then, as Turner (1994)

asks, how are such presuppositions implanted, imparted and transmitted so that change (and establishment) can occur? Giddens (1984, p. 2) provides a seemingly cryptic answer to these questions, arguing that practices 'are not brought into being by social actors but continually recreated by them via the very means whereby they express themselves *as* actors'. Thus, through their recursive reproduction of a practice, actors contribute to its transformation by contesting, resisting and adopting shifts in its composition, with reference to their prior experiences and interactions with it. Similarly, Warde (2005, p. 141) points out that 'practices also contain the seeds of constant change. They are dynamic by virtue of their own internal logic of operation, as people in myriad situations adapt, improvise and experiment.'

What, then, makes a 'carrier' of a practice contest, resist or adopt it? Barnes (2001, p. 24) suggests that this question can be answered by viewing human beings as 'interdependent social agents, linked by a profound mutual susceptibility, who constantly modify their habituated individual responses as they interact with others, in order to sustain a shared practice.' In other words, as participants in a social practice discuss it with each other, they mutually interpret the 'correct' ways of undertaking it, and modify their routines to either conform to, or deviate from, this new understanding. However, this only provides part of the picture. Shove and Pantzar (2005, p. 58) offer a more complex viewpoint, arguing that 'the emergence and demise of practices has to do with forging and failing links between materials, images and skills (i.e. the ingredients of any one practice)'. Therefore, different configurations of practice components lead to change. However, as these author's conclude in their analysis of Nordic walking, practice change is always set 'against the backdrop of previous, related and associated ways of "doing"' (Shove & Pantzar 2005, p. 62). In short, history is important. Furthermore, what works in one context may not work in another: 'new links have to be made and old ones broken' (Shove & Pantzar 2005, p. 60). In the case of Nordic walking, this involved, amongst other things, the successful positioning of 'walking with sticks' as a normal extension of, and alternative to, skiing during the summer months, with important health and leisure outcomes.

Reckwitz (2002b, p. 255) is more explicit, arguing that 'breaks' and 'shifts' in the reproduction of practices take place in the:

> everyday crises of routines, in constellations of interpretative interdetermancy and of the inadequacy of knowledge with which the agent, carrying out the practice, is confronted in the face of the 'situation'.

In the context of household comfort and cleanliness practices, such crises of routines might involve the introduction of water restrictions, power blackouts, a new household member, or

the ‘death’ or introduction of an appliance. In other words, ‘crises’ occur when there is a shift in the composition of a practice. Even seemingly individual ‘crises’, such as an illness in the household, may lead to modified comfort and cleanliness practices which emerge out of: common understandings about health, hygiene, cosiness and ‘wellness’; practical knowledge about how to maintain these understandings; available material infrastructures such as ‘hot water bottles’, heaters or baths; and rules and recommendations about how to care for a person with a particular illness. While sickness might only result in the temporary configuration of practices, others, such as the acquisition of air-conditioning during pregnancy, result in the installation of a permanent material infrastructure that potentially reconfigures the practice of cooling beyond pregnancy for all household members. The transformation of practices is therefore a dynamic process involving shifts and breaks in their everyday reproduction, which occur with reference to their historical and current composition.

Having introduced some basic conceptual building blocks for understanding and analysing the composition and transformation of practices, it is useful to reflect on what we know about comfort and cleanliness practices in Australian households. What are the limitations to our current understanding of these practices and where is further research needed? What evidence is there to suggest that these practices are changing and why might this be the case? In the final section of this chapter I address these important issues and develop some questions for empirical research.

Limitations in our understanding of comfort and cleanliness practices

As outlined in Chapter 2, there is a distinct lack of available research detailing how smart metering demand management programs affect comfort and cleanliness practices. Furthermore, there has been relatively little research conducted about what types of comfort and cleanliness practices exist in Australian households, what common understandings, rules and material infrastructures underpin these, and how they are reproduced and transformed in everyday life. In this final section, I outline what we do and don’t know about these practices, and what types of empirical questions this discussion raises.

Comfort practices

In recent years, comfort has become equated with the mechanical control of one’s environment. In response to this global shift, heating, ventilation and air-conditioning (HVAC) services have grown from virtually nothing in Australia in the last 40 years (McCann 2006) to account for 63 per cent of the commercial building sector’s total greenhouse gas emissions (AGO 1999) and 19 per cent of the residential sector’s emissions (ABS 2008b). Air-

conditioning is now viewed as a necessity in offices and homes, being considered 'vital to productivity, comfort and the simple ability to continuously occupy buildings, largely irrespective of the external weather conditions in almost every type of built environment' (McCann 2006, p. 3).

Despite this, at least three-quarters of the current Australian population have lived without air-conditioning at some point in their lives (EES 2006). Two-thirds of Australians now use some form of air-conditioning in their homes and this penetration is increasing rapidly (ABS 2008b). Data from the Australian Bureau of Meteorology (BOM 2009) show only a slight increase in temperature and number of very hot and cold days across the country during this 40 year period[13], implying that people are modifying their comfort practices more rapidly than the climate is changing. While thermally inefficient housing (Wilkenfeld 2007) and the urban 'heat island' effect (Santamouris 2007) may be exacerbating this problem, changes in the temperature clearly do not adequately explain the changing dynamics of comfort.

Why then, is this change occurring? Several consultants argue that the affordability and accessibility of air-conditioning has contributed greatly to this change, along with rising household incomes (EES 2006; Wilkenfeld 2004). However, the trend towards air-conditioning as the dominant form of 'coolth' has also emerged from modifications to the built environment. For example, air-conditioners, or outlets for them, are being installed by project home builders to gain a marketing edge (Wilkenfeld 2004). In addition, declining block sizes and increasing floor areas are reducing scope to optimise orientation and retain mature tree cover in new subdivisions. There is also an increasing number of high rise apartments with poor shading and glazing which are less able to rely on natural ventilation (Wilkenfeld 2004).

While this gives us a basic understanding of why householders may be prioritising air-conditioned comfort, we are yet to understand the role of common understandings, rules and practical knowledge in shaping and reproducing comfort practices. Furthermore, we have virtually no understanding of the way comfort appliances are *used* in the practices of heating or cooling. For example, we should not assume that everyone who owns an air-conditioner uses it all the time. In making such leaps in understanding we find ourselves subject to the same taken for granted assumptions as demand managers, namely that most comfort practices *require* air-conditioning. However, clearly some degree of assumption formulation is essential if we lack knowledge about actual practices.

Household comfort research conducted internationally (Gram-Hanssen 2008; Kempton *et al.* 1992a; Kempton *et al.* 1992b; Prins 1992; Shove 2003a; Wilhite *et al.* 1996a; Wilhite *et al.*

[13] Australian annual mean temperatures have increased by 0.9°C since 1910 (BOM 2009)

1996b) and to a limited extent in Australia (Williamson *et al.* 1991) suggests that comfort practices are incredibly dynamic, changing, and culturally specific. It is, therefore, very difficult to make assumptions about them. If smart metering programs seek to address these practices, understanding what they are, how they are constituted, and how they are changing is absolutely essential.

Cleanliness practices

We confront a similar lack of knowledge and understanding in regard to cleanliness practices. We know that Australians use a significant amount of water inside the home, particularly for bathing and laundering (Davidson 2008). Although water usage has dropped in response to restrictions and targets imposed during extended droughts (ABS 2006a), Australians report a strong determination to maintain their current level of shower use and a considerable reluctance to reduce toilet flushing (Troy 2008). However, Australians are now one of the most water-conscious nations in the world (Harper 2006), instigating a wide range of efficiency measures to save water both inside and outside their homes.

Like comfort, the material infrastructure of cleanliness practices, including washing machines, showers, baths, toilets, systems of provision (Davidson 2008; Sofoulis 2005) and housing stock and tenure (Randolph & Troy 2008), has been shown to greatly influence water practices. Indeed, Davidson (2008) argues that the abundant supply of cheap hot water paved the way for Australians' current fixation on showering. Consequently, since 1900, the amount of water used by the average Australian for bathing has roughly doubled. By the end of the 1900s, Australians were using more than twice as much water as their present-day English ancestors, many of whom, influenced in part by climate, maintain the traditional routine of weekly baths and sponge washes (Davidson 2008).

The history of laundering in Australia follows a similar resource-intensive pathway (Davidson 2008). Washing clothes and linen accounts for the same proportion of water consumption that it did in the 1900s (15%) even though per-capita consumption has more than doubled. Washing machines have also experienced a five fold efficiency gain during that time. This leads Davidson (2008, p. 53) to conclude that:

> the main effect of the arrival of the washing machine was not to wash the same clothes more efficiently, but to facilitate an increase in the size of people's wardrobes to accommodate the rapid changes of attire characteristic of a fashion-driven, consumer society.

In the current era of large-scale water and sewerage systems there has been little reason to question entrenched indoor cleanliness practices, although Australia's prolonged drought has prompted authorities to encourage householders to make these practices more efficient and 'save' water associated with them (Davidson 2008).

Unlike comfort practices, there has been some recent research conducted on water practices in Australian households (Allon & Sofoulis 2006; Head 2008; Sofoulis 2005). However, there are still significant limitations in our understanding of why Australian householders are attached to current frequencies of bathing, laundering and toilet flushing. We know little about the different dynamics of these practices, and how they are shaped by common understandings, existing 'rules' such as water restrictions and targets, practical knowledge and material infrastructures. Without understanding these components and their mutual co-dependence, we are left with strategies that either target the 'edges' of cleanliness practices (such as encouraging four-minute showers) or attempt to make them more efficient through, for example, the promotion of water-efficient showerheads.

Questions for empirical inquiry

Our limited understanding of comfort and cleanliness practices severely restricts our ability to develop strategies which reduce their resource intensity. However, an essential step in reconfiguring the divide between resource management and everyday life involves understanding the dynamics of what people do and why they do it. For this task, we require a number of empirical questions focused on understanding how comfort and cleanliness practices are currently constituted and changing in Australian households. Such questions include: how and why are comfort and cleanliness infrastructures and appliances implicated in comfort and cleanliness practices? What kinds of common understandings are embedded in these practices and how do they shape them? How are comfort and cleanliness practices reproduced in daily life and what, if anything, disrupts these routines? What 'rules' are these practices subject to and how do they affect what householders do? To what extent do householders' past experiences and upbringings influence their practices? How and why are comfort and cleanliness practices changing? And, how are these practices managed and negotiated within and between households? These questions are addressed in chapters 5 and 6.

Having explored the dynamics of existing and changing comfort and cleanliness practices, we are able to consider how effective smart metering demand management strategies are at changing them, and, perhaps most importantly, *why* they are effective, if indeed they are. For this task we need another set of questions such as: how do the assumptions embedded into demand management programs reconfigure or reinforce existing practices? How do demand

management programs shift the composition and reproduction of comfort and cleanliness practices? And, why are demand management strategies effective, or ineffective, in shifting everyday practices? I address these empirical questions in Chapter 7.

What these questions point towards is a clear need for empirical research that identifies the current and changing nature of comfort and cleanliness practices in households, and the role of smart metering demand management strategies in reconfiguring these practices. Without this understanding, demand management practitioners will continue to 'build into' programs their assumptions about these practices. From this empirical starting point, we are able to consider the role of demand managers in shaping everyday practices through their methods and approaches, thereby identifying opportunities for better accounting for, and responding to, changing comfort and cleanliness practices and the resource problems they contribute to — issues I address in chapters 8 and 9.

This chapter has undertaken three crucial roles. Firstly, it has highlighted the importance of everyday practices in constituting the consumption of energy and water resources in the home. Secondly, it has provided a conceptual framework for understanding and analysing existing and changing comfort and cleanliness practices in households. And, thirdly, it has identified a number of empirical questions based on limitations of our current understanding of these practices in an Australian context. I have argued that these questions are necessary to better understand the current and changing composition of comfort and cleanliness practices, the ways in which smart metering programs can and/or do reconfigure them, and to identify alternative approaches that bridge the divide between resource management and everyday life. However, I have not yet identified how such questions can be usefully answered, what methods should be employed when researching everyday practices, and what types of complications arise from these approaches. These are important questions which form the basis for the following methodological chapter of this thesis.

Chapter 4: Researching everyday practices

In Chapter 2, I argued that the self-reinforcing rationale of demand management, within which smart metering programs are situated, obscures the changing nature of everyday practices from view. Understanding these practices is an urgent priority to address the energy and water challenges they pose. The previous chapter began this task by outlining a conceptual framework for understanding and analysing everyday practices. Chapter 3 also discussed limitations in our understanding of comfort and cleanliness practices, which give rise to a series of empirical questions and two critical methodological concerns. Firstly, how do we study everyday practices? And, secondly, how do we study the role of demand management programs in reconfiguring them? In this chapter, I identify the methodological approach employed to address these issues.

I begin by identifying the research scope of this empirical study, the ways in which I came to this topic, and the research aims for which I developed my methodological approach. I continue by discussing the complexities and contradictions inherent in studying everyday practices. This forms the basis of my qualitative approach. I identify the research groups (RGs) involved in this study, outlining what I mean by this term. Each of the RGs are discussed in detail before I discuss the limitations of this approach. The second half of the chapter focuses on the methods employed with households from these RGs, namely group interviews, observation, household tours, photography and diaries, as well as the concerns and limitations associated with these methods. I also discuss the selection, purpose and process of interviews with smart metering industry stakeholders. I conclude by outlining the argument and analysis for the remainder of the thesis.

Research scope

My focus on smart metering emerged from an extensive desk-based literature review of 'smart' technologies and future digital scenarios (Castells 2001), the environmental impacts of information and communication technologies (ICTs) (Falk & Ryan 2006; Pamlin 2002; Ryan 2004), home automation technologies (Mozer 1998; Petersen *et al.* 2001; Soper 2005), 'smart' homes (Aldrich 2003; Berry *et al.* 2007; Forester 1989; Harper 2003; Trulove 2002), and 'connected' homes (Arnold 2004; Han & Tan 2002; Mozer 1998; Venkatesh *et al.* 2003). This initial direction was influenced by my scholarship agreement, which required me to investigate ICTs. Amongst this techno-literature, I was drawn to the large body of media concerning 'smart' meters and the decision to roll-out smart electricity meters in Australia (Austin 2006; Bracks 2007; Frew 2006b; Murphy 2007; Theophanous 2005).

Concurrently, I was reviewing literature relevant to my academic and professional background regarding energy and water behaviour change programs (Jacobson *et al.* 2006; McKenzie-Mohr 1999; Monroe 1999; Shipworth 2000; Stern & Aronson 1984). Several key references turned my attention to socio-technical and practice-oriented literature, such as critiques of dominant 'techno-economic' approaches to energy and water conservation (Guy & Shove 2000), the social construction of 'normal' comfort and cleanliness practices (Shove 2003a; Sofoulis 2005) and technical systems (Bijker 1999; Bijker *et al.* 1987; Hughes 1983; Summerton 1994), the ways in which systems of provision shape consumption (Guy *et al.* 2001; Southerton *et al.* 2004a; Van Vliet *et al.* 2005), and social practice theories (Bourdieu 1977; Giddens 1984; Reckwitz 2002b; Schatzki 2002; Turner 1994).

During this review, I formed a link between smart metering and the socio-technical and practice-oriented literature. I identified that smart metering programs were taking increasingly resource-intensive comfort and cleanliness practices for granted with potentially detrimental effects. Very little was known about these practices in an Australian context, and even less about how to reconfigure them through demand management programs. I became concerned that the federal government is implementing this technology on a national scale without understanding how these practices are changing and the likely ability of smart metering demand management strategies to influence their transformation. While countless evaluations of smart metering have been, and are being, undertaken (see appendices 1–3), an empirical study was required that evaluated demand management programs from a social practices perspective. However, such a study had to remain relevant to policy, addressing the constraints that face demand managers in the energy and water sectors. I sought, therefore, to juxtapose and reposition the dominant demand management paradigm characterising smart metering within an understanding of comfort and cleanliness practices. To undertake this task, I hypothesised that I would require a good understanding not only of householders' practices but also of the context within which smart metering is being introduced.

As outlined in Chapter 1, my primary research aim was therefore to analyse and identify approaches which bridge the current divide between resource management and everyday life, using smart metering demand management programs and comfort and cleanliness practices as the focus of an empirical inquiry. In order to achieve this aim, I needed to understand how comfort and cleanliness practices are currently composed and changing in households, how existing demand management programs reconfigure them, and what role smart metering stakeholders play in their current and changing composition. I therefore required a methodological approach that offered insight into everyday practices, as well as how these were, and could be, reconfigured through smart metering programs, and how

smart metering stakeholders potentially shape and limit opportunities for change. The remainder of this chapter is concerned with the approaches and methods I used to collect the empirical data necessary to address these objectives.

Researching everyday practices

Beginning with the assumption that representational, individualistic and rational models of action do not adequately account for the composition of everyday practices, this study seeks to understand how householders, as 'carriers' of practices, interpret, experience and reproduce comfort and cleanliness practices, and how these practices are reconfigured through demand management programs. To understand the ways in which householders *perform practices*, I employed a qualitative approach of studying things in situ, 'attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them' (Denzin & Lincoln 2005, p. 3). However, my goal was not only to learn about householders' comfort and cleanliness practices, but rather to produce explanations and understandings that resonate in some way, or can be generalised to, a broader social or cultural group (Mason 1996).

This research was therefore ethnographic in approach, exploring the ways in which people engage in everyday practices in order to successfully interact with others (Webster 1991). Colic-Peisker (2004, p. 84) describes ethnographers as 'nosey by profession', prying into their participants' daily lives. Likewise, in this research, my aim was to pry into householders' comfort and cleanliness practices. Although 'depth and validity is achieved at the expense of breadth and generalizability' (Wilhite & Ling 1992), the richness of material gained from ethnographic approaches gives it value. As such, Wilk & Wilhite (1985, p. 52) argue that ethnographic researchers 'yield finely grained and detailed information that cannot be obtained through questionnaires', and this leads to unexpected insights and new lines of inquiry. However, as outlined in Chapter 3, the methodological focus of social practice theory is on *practices themselves* rather than the individuals that undertake them (Reckwitz 2002a). Unfortunately, practice theorists, while arguing that attention be firmly situated on practices, have so far failed to offer practical advice on *how* to study them. We are therefore left to draw conclusions from more theoretical aspects of the literature, as well as from other related methodological approaches.

How do we study everyday practices?

Studying everyday practices is a tricky business, and one which few researchers have ventured to undertake. I did not embark on this research expecting to use practices as my primary unit of analysis. Indeed, I did not discover social practice theory until the later stages of this research, when I identified this body of literature as useful for analysing and

understanding comfort and cleanliness practices. This is not to say that I did not originally intend to understand householders' practices, but rather that I did not initially consider practices the primary unit of analysis. Instead, I focused my research methods on householders themselves. This is an important distinction as it raises a number of questions about householders' ability to articulate and reflect on an arguably non-individualistic phenomenon. For example, how do we understand the dynamics of practices through 'carriers' of them? Furthermore, how do we account for 'hidden' and 'silent' aspects of practices through people's accounts of them, such as systems of provision, historical configurations, and taken for granted assumptions? In attempting to negotiate these complications, I focused my analysis on the 'second level' of data obtained through ethnographic research, namely 'the synthetic explanations composed by ethnographers as interviews are dissected and analysed' (Wilk & Wilhite 1985, p. 57). Wilk and Wilhite (1985) argue that this second layer of analysis is uncovered when researchers place the statements of their respondents in a cultural context (or 'practice' context in this case) and seek deeper meanings to their 'folk explanations'. Using this approach, I sought to interpret householders' descriptions and understandings of their practices through the practice-based conceptual framework outlined in Chapter 3.

While focusing my research methods primarily on householders may invariably obscure other dimensions of practice and bring certain components to the fore, it is difficult to identify a viable alternative. It seems intangible to 'observe' or 'interview' something as dynamic and elusive as a practice, let alone its components. We cannot, for example, interview and observe material infrastructures and rules, although we can follow and document their development and integration into people's doings and sayings, as I do throughout this thesis. Furthermore, we can observe the performance of practices, such as showering and laundering, and note down visible components, such as the technologies and artefacts that are used. However, aside from the ethical issues this raises, this method tells us little about social understandings, practical knowledge and rules pertaining to the practice, or why people reproduce practices the way they do. For this knowledge we would need a carrier of a practice to articulate it. In light of these complications, my methods focus on householders themselves, encouraging them to explain what they do and why they do it, and observing the material context in which everyday practices are carried out.

Studying practices through quantitative methods

Primary quantitative data have not been used in this research, despite the smart meter being capable of capturing extensive and highly specific data. The reason for this is threefold. Firstly, there are a wide range of quantitative studies already available or underway concerning consumption reductions achieved through residential smart metering demand

management programs, many of which were summarised in Chapter 2. Secondly, due to confidentiality agreements between utilities and their customers, data pertaining to particular households were unavailable without lengthy negotiations and contracts. And thirdly, this research is not primarily concerned with the quantifiable consumption reductions possible through demand management approaches, but rather with the gaps and limitations that emerge from relying almost entirely on these data.

I emphasise this third point. While quantitative data indicate that DPP customers are willing and able to reduce their energy consumption by an average of 25 per cent in conjunction with IHD feedback (NERA 2008a), it doesn't tell us *why* or *how* this reduction occurs. Similarly, individual household data can tell us where and when householders consume energy and water in the home, and how much this changes in response to a smart metering demand management program, but not *why* or *how* householders change their practices. While quantitative surveys could be designed to focus specifically on practices, there is a risk that, in the process of seeking large cross-cutting generalisations, quantitative research would lose site of subtle socially and culturally situated meanings that I aim to capture (Denzin & Lincoln 2005). Therefore, qualitative research methods were considered to be the most appropriate for the purposes of this study.

Identifying and selecting research groups

Identifying and selecting research participants generally involves two key considerations: firstly, who can the researcher gain access to within the financial and time constraints of the research; and, secondly, which participants will assist in best answering the research questions? I devised a research program primarily comprising households from a number of RGs which aimed to strike a balance between these two concerns. In this section, I elaborate on why I adopted this approach and what I mean by the term *research group*. I identify and discuss the four RGs involved in this study, and conclude by outlining some limitations to this approach.

Why research groups?

I use the term *research group* (RG) to refer to a group of householders from a loosely definable geographic area, who were participating in a specific demand management program. As such, this approach is methodologically similar to a *case study* commonly adopted in qualitative research (Bryman & Burgess 1999; Platt 1988; Stake 2005). However, the term case study implies a more rigorous and focused study of a 'case' or cases. This research, although based on specific cases, is not inherently concerned with the dynamics and details of these cases. While specific 'cases' are discussed and distinctions are drawn

between them, a clear separation and segregation between them is neither common nor necessary in the analysis.

The RGs selected are closely aligned with the term *instrumental case study* (Stake 2005), where a specific case is selected for its ability to provide insight into the area of inquiry, or to challenge a generalisation. In this conceptualisation, 'the case is of secondary interest, it plays a supportive role, and it facilitates our understanding of something else' (Stake 2005, p. 445). This does not mean that depth is dismissed for brevity. Contexts are still scrutinized and everyday practices documented and analysed, but 'here the choice of case is made to advance understanding of that other interest' (Stake 2005, p. 445). In this study, I aimed to advance our understanding of comfort and cleanliness practices and the role of smart metering demand management programs in reconfiguring these. The RG approach allowed me to examine both comfort and cleanliness practices in different geographical and suburban contexts, as well as different demand management approaches, in order to address the primary research aim of bridging the conceptual and practical divide between resource management and everyday life.

In employing the RG approach, I am aware that it *prevents* as many questions as it enables. For example, it obscures a more detailed and systematic study of the practices of a representative segment of the Australian population as well as a more detailed analysis of one smart metering demand management program. Nonetheless, this research provides an important starting point for an area of inquiry which has been strikingly overlooked. The broad RG approach allows for comparative 'snapshots' that can assist in informing not only the national smart metering roll-out but other demand management programs, thereby providing a strong basis and justification for further research.

Identifying research groups

The rationale behind the RG approach was to capture a diverse selection of residential demand management programs being trialled around Australia. Identifying suitable RGs involved a number of steps. Firstly, I conducted a literature review and web search to identify smart metering trials being conducted or planned for commencement around Australia. I approached the project managers of each trial to gain further information and request an interview[14]. Negotiation for access to these RGs took place during and after these interviews or, in some cases, through additional networking with industry stakeholders at relevant conferences and events. However, rather than being a 'hand-picked' selection, the identification of RGs was an ongoing process resulting from emerging and disintegrating opportunities. For example, staff changes, technical implementation problems, delays in

[14] See section on industry stakeholder interviews later in this chapter.

program delivery, and communication breakdowns eliminated a number of potential RGs from the available selection. Ethical and privacy concerns from several companies caused significant delays, and my requests for assistance were often given low priority or ignored. In particular, two RGs selected were unable to be included due to practical and technical difficulties. They were the ETSA Utilities 'Beat the Peak' trial in SA utilising DLC (ETSA 2006, 2007a, 2007b), and the Adelaide Solar Cities Program in SA involving variable pricing regimes and IHDs for electricity usage (Origin 2006a).

While the selection of RGs was largely opportunity-driven, each was targeted based on its point of difference from other identified groups. These distinctions included the types of demand management programs employed, the stakeholders involved in delivering them, the relationship between the program deliverers and household participants, institutional and/or regulatory differences, climatic variations, and differences in the material infrastructure of the households. Four RGs were selected over a period of eighteen months: the Dromana and Frankston Australian Conservation Foundation (ACF) GreenHome program (RG1); South East Water's (SEW) EcoPioneer pilot program (RG2); the Currumbin EcoVillage housing development (RG3); and EnergyAustralia's DPP trial (RG4). Points of difference between the groups are outlined in Table 4.1. In the following discussion I outline each RG in more detail. In particular, I discuss how each group was identified and selected, relevant characteristics, the type of demand management program employed, who was delivering the program, and how I recruited households for this study.

Table 4.1: Points of difference between research groups

RG	Location	Technology	Demand management strategies	Stakeholders involved	Climate	Housing stock	Housing tenure	Material infrastructures	No. of households involved
RG1: Dromana and Frankston ACF GreenHome program	Mornington Peninsula, Victoria	Household efficiency devices (low-flow showerheads, efficient light globes etc.)	Information-based community workshops on energy, water and waste	ACF, Victorian Government (funder)	Temperate; subject to sea breezes	Predominantly suburban coastal dwellings; some farmlets	Mixture of renters and homeowners	Predominantly central water and energy supply; several participants had rainwater tanks and solar panels or solar hot water	19
RG2: SEW EcoPioneer pilot program	Melbourne south-east suburbs, Victoria	Smart meter, Landis & Gyr ecoMeter IHD, household efficiency devices	Electricity, water and gas feedback; water and energy saving tips	SEW, AGL, Alinta, Landis & Gyr	Temperate; some areas subject to sea breezes	Suburban, predominantly older-style terraced houses	Homeowners only	Predominantly central water and energy supply; several participants had rainwater tanks or solar hot water	9
RG3: Currumbin EcoVillage housing development	Currumbin, Queensland	Smart meter; EcoVision 3010 IHD	Feedback for electricity and gas usage; solar power and energy production; rainwater usage; recycled water usage; water level in potable water tanks; room temperature in two rooms; outdoor weather conditions; and hot water temperature	Landmatters and EcoVision	Sub-tropical; subject to sea breezes	Suburban old and new dwellings (before moving into EcoVIllage); ecologically sensitive design with houses clustered in 'eco-hamlets' within semi-rural setting (households within EcoVillage)	Mixture of renters and homeowners (before moving into EcoVillage); homeowners only (within EcoVillage)	Predominantly central water and energy supply (before moving into EcoVillage); autonomous water and semi-autonomous energy supply (within EcoVillage); air-conditioners banned (within EcoVillage)	14 (10 before moving into EcoVillage; 5 after moving in.
RG4: EnergyAustralia DPP trial	Sydney; central coast and Hunter regions of NSW	Smart meter; Landis & Gyr ecoMeter IHD (12 household participants only)	DPP; electricity consumption feedback (IHD households only); energy-saving tips	EnergyAustralia	Temperate; some areas subject to sea breezes	Predominantly coastal suburban dwellings	Homeowners only	Predominantly central water and energy supply; several participants had rainwater tanks and solar hot water	23

RG1: ACF GreenHome program

The ACF GreenHome program (RG1) is a behaviour change program that does not use smart metering. Therefore, while participants from this RG do not inform my analysis of smart metering demand management programs, they offer valuable insights into how and why comfort and cleanliness practices are changing. I selected this group based on its accessibility, in terms of both location and ease of access to participants. The group involved participants of the ACF GreenHome program from Dromana and Frankston, which are coastal towns on the Mornington Peninsula in Victoria. Frankston is classified as a 'regional centre', located approximately 60 kilometres south of Melbourne. Dromana is an outer-fringe suburban town located 85 kilometres south of Melbourne (25 kilometres south of Frankston).

The ACF GreenHome program aims to work with communities to develop individual and collective solutions to environmental problems (ACF 2006). The ACF is a not-for-profit environmental organisation largely funded by individual membership and donations. In Victoria, the program is currently supported by the Victorian Government's Department of Sustainability and Environment (DSE). The program involved six mid-week evening community workshops at local town halls focusing on what individuals can do to reduce their household energy, water and waste. Participants received a GreenHome Guide (ACF 2006) and some technologies to assist them in greening their homes, including a water-efficient showerhead, flow restrictors for the toilet and taps, energy-efficient light globes, and a shower timer. The Frankston and Dromana programs were held every four to six weeks during early 2007. The ACF recruited participants through local advertising, and the program was free for all participants.

I attended all six of the Dromana GreenHome workshops and one of the Frankston workshops, which both followed an identical format. During a workshop, I addressed the participants and requested volunteers for this research. Participants were invited to provide their names and contact details. Eleven households from the Dromana program and 14 from Frankston volunteered. A total of 19 households were involved in this research in mid-2007 — ten from the Dromana program and nine from Frankston. These households were located all over the Mornington Peninsula and outer south-eastern suburbs of Melbourne. I include findings from this RG in the analysis provided in chapters 5 and 6. However, I do not analyse the reconfiguration of comfort and cleanliness practices in response to the ACF GreenHome program.

RG2: SEW EcoPioneer pilot program

The SEW EcoPioneer pilot program is a smart metering demand management program delivering 'real-time' energy (electricity and gas) and water consumption feedback. The aim of the trial was to reduce and sustain energy and water consumption in participating households over a period of 12 months (Wetherall 2008). The trial used a Landis & Gyr (formerly AMPY Metering) 'ecoMeter' IHD (Figure 4.1), which is the first in Australia to provide water feedback. The program was conducted by SEW in association with Landis & Gyr, the Australian Gas and Light Company (AGL) and Alinta Asset Management and ran for one year from 2007 to 2008. Fifty households from the south-eastern suburbs of Melbourne in Victoria participated in the pilot study (Wetherall 2008).

Figure 4.1: Landys & Gyr ecoMeter IHD

Source: http://www.ecometer.com.au/

The ecoMeter provides near instantaneous, weekly averaged and historical household consumption data for water, gas and electricity, and can be plugged into any electricity socket in the home (SEW 2007). It also displays utility tariff rates; daily, weekly and monthly consumption costs; and greenhouse gas emissions which are offset by AGL (SEW 2007;

Wetherall 2008). Data are provided in tables and graphs. More detailed consumption data are provided to participants through a website portal. The ecoMeter also includes a light-emitting diode (LED) 'traffic light' display for electricity consumption, where green indicates lowest demand, orange indicates medium demand and red indicates high demand (SEW 2007). Project partners sent short messages (emails) through the IHD to trial households, suggesting ways to save water and energy in the home (Wetherall 2008).

SEW recruited EcoPioneer households through a range of methods, such as an information stall located at a local shopping strip, an advertisement in a local primary school newsletter, verbal invitations to members of a local junior college's parents' environmental association, and invitations to employees of SEW (Wetherall 2008). In order to participate, households were required to be the owner of their residence, a SEW customer, an AGL electricity or natural gas customer, located in an Alinta electricity distribution area, and signed up for the full 12-month trial period. They were also required to agree to the installation of new meters and associated meter work, and allow each utility to use information collected from their meter for data analysis and profiling. Due to privacy laws, these data were not made available for this research. Site inspections were made before participants were able to participate in the pilot (Wetherall 2008). There was no cost to participating households.

Once recruited, contractors installed the relevant technology and undertook system testing. An ecoMeter was provided to participants through a community meeting and launch, along with an information pack (SEW 2007) and other eco-efficient technologies, such as a shower timer and water-efficient showerhead. SEW offered training and support over the 12-month pilot program (Wetherall 2008) and recommended that householders plug their ecoMeter into a highly visible and readily accessible area, such as the kitchen or lounge room (SEW 2007; see Figure 4.2).

I recruited half of the households (five) from this RG at the EcoPioneer community meeting and launch, where I addressed pilot participants and requested volunteers. SEW also sent out an email to the participants on my behalf asking them to volunteer for this research. A further five households were recruited through this method. I contacted volunteers by phone and email to arrange an appropriate date and time for a household visit. Nine households were included from this RG in mid-2007 after participating in the EcoPioneer pilot program for three to six months.

Figure 4.2: Landys & Gyr ecoMeter IHD in a household

Source: RG2, 20, 24 August 2007

RG3: Currumbin EcoVillage housing development

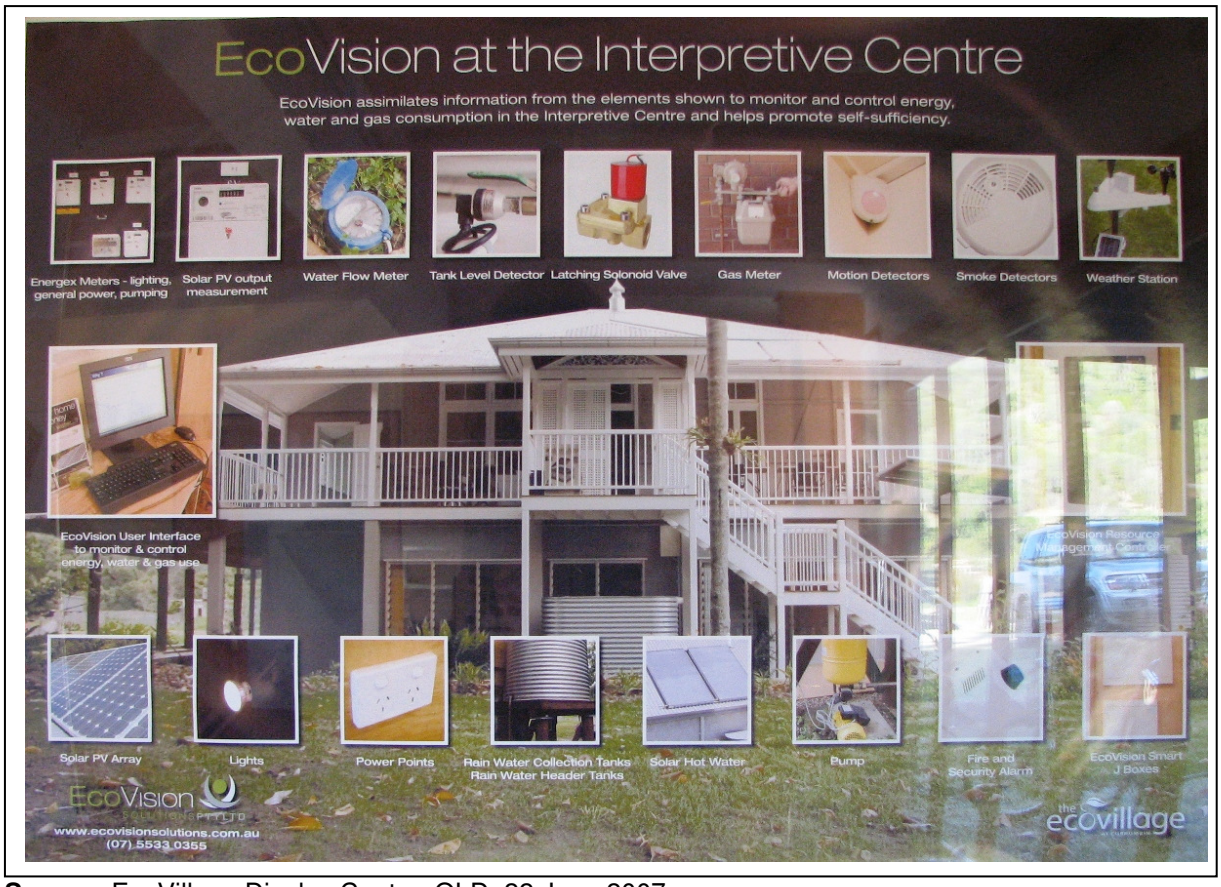
The Currumbin EcoVillage in south-east Queensland is a private housing development with approximately 150 lots clustered into 'eco-hamlets' in a peri-urban setting (Landmatters 2008). The decision to include smart metering in the EcoVillage was made by the housing developer Landmatters, rather than an energy or water utility as in RGs 2 and 4. This development requires residents to purchase and install an EcoVision IHD (EcoVision 2007; Landmatters 2008), which is designed to assist residents in managing their sustainably designed houses and to quantify the consumption of the whole village. Air-conditioning is banned in the new development, and house designs must meet strict passive thermal performance standards.

EcoVision offers a range of IHDs which they call *home resource management systems*. Households living in the Currumbin EcoVillage had installed, or were installing, an EcoVision 3010 system which individually tracked occupants' lighting, water pumping and general power use; solar power and energy production; rainwater usage; recycled water usage; gas usage; water level in potable water tanks; room temperature in two rooms; outdoor weather conditions; and hot water temperature (EcoVision 2007; see figures 4.3 and 4.4). The installation of the EcoVision 3010 was complex, involved many parties, and cost residents several thousand dollars. The EcoVision display was the size of a small computer screen and was installed permanently in a prominent location inside the home (EcoVision 2007; see Figure 4.5).

Figure 4.3: Screen shot of an EcoVision IHD

Source: EcoVillage Display Centre, QLD, 22 June 2007

Figure 4.4: EcoVision IHD functions at the Currumbin EcoVillage



Source: EcoVillage Display Centre, QLD, 22 June 2007

Figure 4.5: EcoVision IHD inside an EcoVillage household

Source: RG3, 37, 25 April 2008

I recruited participants through several methods. Firstly, I sent an email to householders buying property at the EcoVillage asking them to volunteer (see Appendix 4). Secondly, a Landmatters sales manager individually recruited volunteers through direct requests. And, thirdly, I recruited additional participants through a 'snowballing' method after interviewing others. I originally intended to interview participants from this RG twice — before and after they moved into the EcoVillage. The first interview discussed participants' comfort and cleanliness practices before they were living in the EcoVillage. Ten households were interviewed during this first stage. The second interview assessed how these practices changed after moving into the EcoVillage and, in particular, what role the EcoVision IHD played in any reconfigurations. However, due to architectural, planning, building and technology delays, only one household interviewed during the first round had moved into the EcoVillage by the second. I therefore recruited four additional households who had recently moved into the EcoVillage. A total of five households were interviewed during this second stage, although only four had their EcoVision IHDs operating, and not all had every function. Of the four households who had their IHDs, all had been using them for one to six months. Altogether, 14 households were involved from this RG.

Due to the delays outlined above, this research does not comparatively analyse findings from these households as initially intended. Instead, in chapters 5 and 6, the research draws on findings from all households to analyse the existing and evolving composition of comfort and cleanliness practices. Furthermore, research activities conducted with the four households living in the EcoVillage with EcoVision IHDs are analysed in Chapter 7, where I consider how practices are reconfigured through smart metering demand management programs.

RG4: EnergyAustralia's DPP trial

EnergyAustralia's DPP trial in NSW was the longest and largest trial of DPP in Australia at the time this research was conducted, running for two years from 2006 to 2008. The trial took place in EnergyAustralia's electricity distribution area, which covers Sydney and the central coast and Hunter regions of NSW (EA 2007c). EnergyAustralia is a government-owned distribution and retail electricity business. The DPP trial was part of this company's Strategic Pricing Study (Amos 2008). The entire pricing study involved 756 residential and 544 commercial retail electricity customers and was considered representative of the company's distribution area (Miller 2007). Residential participants were divided up into a control group; a TOU tariff group; a DPP 'medium' group with a DPP rate of approximately $1 per kWh (around 20 times the off-peak rate) and an IHD; a DPP 'high' group with a DPP rate of approximately $2 per kWh (around 40 times the off-peak rate) both with and without an IHD; and an 'information-only' group which received notification of a DPP event without any price increase (Miller 2007). I targeted the DPP 'medium' and 'high' groups both with and without

an IHD for this RG. All participants received $100 credit on their electricity bill for joining the trial and $200 for completing it.

EnergyAustralia called a maximum of 12 DPP events per year for each year of the trial, which were half an hour to four hours in duration (Miller 2007). The retail and distributor arms of EnergyAustralia could each call six of these events. Householders were generally notified within 24 hours of when an event would occur, with a minimum of two hours notice. Notification was delivered through an IHD (where applicable), SMS, phone message and/or email as elected by participants. During an event, the DPP tariff would apply. The 309 residential DPP households with a Landis & Gyr ecoMeter IHD (Figure 4.1) received the same electricity consumption feedback as EcoPioneer householders. However, in contrast to RG2, the traffic light system was used to provide households with notification of tariff changes, where green corresponded to an off-peak rate, orange to a shoulder rate and red to a DPP event. None of the households participating in the pricing study received any water or gas consumption feedback.

I recruited participants through a letter sent to 366 DPP 'medium' and 'high' tariff households both with and without an IHD (see Appendix 5). A total of 38 people responded to this letter and eight were undeliverable, representing a response rate of over ten per cent. Twenty-three volunteers were available to participate during a seven-day period in August 2008. Of these households, 12 had an ecoMeter IHD which they had been using for approximately two years. I intentionally overloaded my schedule whilst planning this interstate week of fieldwork due to expected cancellations. However, all households remained available and committed to the research.

Research group issues and concerns

The final selection of the RGs raises a number of methodological issues. The first is the 'environmental' focus of three of them (RGs 1–3), which is not typical of other smart metering demand management programs. Self-selected RG4 households may have also been environmentally biased, although this was not obviously evident through research activities with these participants. Unfortunately, this bias was unavoidable due to the selection issues outlined previously. However, it played an important role in highlighting householders' distinctively *non-environmental* associations with comfort and cleanliness practices within and between RGs. This is not to suggest that comfort and cleanliness practices do not have an environmental impact, but rather that their resource implications are taken for granted in everyday life.

Another potential concern is the absence of financial compensation provided to households for participating in this research. We could hypothesise that this biased the research towards the inclusion of non-financially motivated people, potentially undermining one of the findings discussed later in this thesis, that householders' comfort and cleanliness practices are not primarily motivated by financial loss or gain. However, this research did not find that householders were disinterested in the cost of electricity and water. On the contrary, many talked about financial aspects a great deal. Rather, like the environment, they rarely discussed these financial considerations in regard to comfort and cleanliness practices, many of which were taken for granted or considered non-negotiable. Instead, economic 'savings' were discussed in relation to efficiency measures, 'wasteful' practices, and practices which could be easily modified (such as switching off lights).

A third concern relates specifically to RG4 participants, who experienced mild summer weather conditions whilst participating in the DPP trial, which may have enhanced these householders' ability to modify their comfort practices during a DPP event. Temperatures rarely exceeded 40 degrees Celsius during the two year trial and there were no heatwaves. Future research regarding the malleability of comfort practices and householders' ability to respond to DPP events on consecutive extremely hot days should address this issue.

One final concern is that participants from RGs 2 and 3 had IHDs installed one to six months before the interview. Other studies have shown that consumption reductions resulting from feedback can wane after the 'novelty effect' wears off (Challis 2004). If I had not been constrained by a three year timeframe, I would have interviewed or re-interviewed households after using an IHD for a longer period of time. Nonetheless, this issue was offset by the inclusion of households from RG4, 12 of which had been using an IHD for two years in conjunction with DPP. Having said that, the analysis presented in Chapter 7 indicates that IHDs, on their own, are largely ineffective in reconfiguring comfort and cleanliness practices, and therefore whether or not there is waning interest in them is largely irrelevant to this research.

Overview of RG methods with households

Because there has been a lack of research concerning everyday practices and how to study them, I employed a range of methods with households from all RGs. Drawing on multiple methods in the study of social phenomena is referred to as *triangulation* (Bryman 2001). While commonly used to cross-check findings within or between both quantitative and qualitative methods (Bryman 2001), I used triangulation to 'add rigor, breadth, complexity, richness, and depth' to my inquiry (Denzin & Lincoln 2005, p. 5), and to identify what methods are useful in understanding everyday practices.

In total, 65 households were involved in this research (122 individual participants) from the four RGs identified above (see Table 4.2). A broad range of household types were self-selected for this study, including single-person households of varying ages, young couples, young families, old couples and families with teenage or adult children. Householders held a broad range of occupations and some were retired or unemployed. The study included both renters and homeowners, most of which were living in semi-detached suburban housing. Noticeably absent were recent migrants and non-family households (i.e. student households). While this study offers valuable insights into the comfort and cleanliness practices of Australian householders participating in specific demand management programs, the households involved are non-representative of any population and therefore the findings should be treated with caution.

Table 4.2: Breakdown of research participants

Research group	No. of households	No. of individual participants
Frankston and Dromana GreenHome program (RG1)	19	37
SEW EcoPioneer pilot program (RG2)	9	24
Currumbin EcoVillage housing development (RG3)	14	20
EnergyAustralia DPP trial (RG4)	23	41
TOTAL	**65**	**122**

Throughout this thesis, I anonymously refer to these households by their research group (RGs 1–4) and household number (1–65). Dates on which research activities were conducted are identified in the primary references section at the conclusion of this thesis. I do not distinguish between individuals within households unless a particular attribute (i.e. age or gender) is relevant to the discussion. I undertook group interviews, participant observation, household tours and photography with households from all RGs. I discuss each of these methods below, focusing particularly on interviews. I outline the use of comfort and cleanliness diaries, which I discontinued after a trial with RGs 1 and 2. I conclude this section by discussing some issues and concerns associated with these methods.

Household interviews

Overview of interviews

Interviews were semi-structured and conversational in format although a series of themes and questions were covered (see Appendix 6). I used open-ended questions often directed by householders' reactions or observations which focused specifically on comfort and

cleanliness practices — predominantly bathing, laundering, house cleaning, toilet flushing, heating and cooling. Householders were also asked about the demand management program they were participating in, their relationship with their energy and/or water utility, and their life experiences with energy and water technologies and infrastructures. I was particularly interested in householders' historical experiences with practices to understand where practices emerged from, and how past experiences had shaped their current composition. I started the interview with the least personal questions, reserving more sensitive cleanliness practices (such as toilet flushing and bathing) towards the end of the interview or during the household tour (see below). My objectives were to identify *where* current practices had emerged from, *why* they were undertaken, *how* they were being carried out, and *how* they were changing, if at all.

I made contact with one person from each household to set-up a convenient interview time. During this initial phone call, I told potential participants that I wished to ask them questions about their energy and water practices and any changes resulting from the demand management program they were participating in. I asked to interview as many members of the household as possible. Interviews were generally conducted in the evenings, when most householders were home together, and nearly always took place at the household's residence, although on several occasions this was not possible and the interview was conducted at an alternative location, but still face to face. On arrival, the household was provided with a letter explaining the research and an ethics consent form which each participant signed (appendices 7 and 8). The whole visit to the household, encompassing an interview and the range of other methods, took 45 minutes to two hours, with an average time of just over an hour.

On most occasions (apart from two exceptions) the entire visit was voice-recorded. Seventeen interviews were transcribed professionally and the remainder were partially transcribed by me due to time and monetary constraints. During the partial transcriptions I prioritised highly relevant sections that addressed the research questions. Once the transcriptions were prepared, participants were sent an email to give them the option to review this material in accordance with the ethics proposal approved by RMIT University. Transcriptions were combined with observational notes from each household (see below) and all data were imported into NVIVO software for coding. I grouped quotes and notes into themes or 'nodes' which later became hierarchically structured into 'tree nodes' for analysis.

Dynamics of the group interview

I undertook what Bryman & Burgess (1999) refer to as a *group interview*, interviewing entire households where possible, including children and teenagers, in order to obtain a holistic

picture of household comfort and cleanliness expectations and practices. Individuals less than 18 years of age were asked questions in the presence of a parent or guardian in accordance with RMIT University's ethics guidelines. A central aim of the group interview was to depart from a solely individual-centred analysis of comfort and cleanliness practices. While other researchers have considered households the focal point of their analysis (Bell *et al.* 2005; Noorman *et al.* 1998; Silverstone *et al.* 1992; Sofoulis *et al.* 2005), or have focused on particular segments of the household unit, such as teenagers (Gram-Hanssen 2007), mothers (Schwartz Cowan 1989) or couples (Kaufmann 1998), my aim here was not to analyse *households* per se but rather to consider whether comfort and cleanliness practices are composed in part through the dynamics of a household. Group interviews encouraged interaction between householders so that contradictions, agreements and/or disagreements, approval and/or disapproval about various comfort and cleanliness practices, were drawn out. This approach thus served to highlight the tensions, manipulation, control and differences in householders' practices discussed in Chapter 6.

Interrogating the mundane

Fontana & Frey (2005) argue that despite the subjective nature of the interview, it is still one of the most socially accepted ways of asking someone about topics that they would normally be reluctant to discuss with a stranger, if at all. Fontana & Frey (2005) refer to this phenomenon as the 'interview society', in which the interview is taken for granted, becoming 'a routine and nearly unnoticed part of everyday life' (Fontana & Frey 2005, p. 699). There is considerable irony in using one socially accepted practice (i.e. interviewing) to understand others (i.e. comfort and cleanliness). Nonetheless, the routine nature of interviewing allowed me and my participants to focus on the invisible realm of domestic practice without significant discomfort or displeasure. Participants who would be otherwise unwilling or reluctant to share private information about their household practices were situated in a context where such interrogation was largely accepted and expected.

While other methods such as surveys could also be viewed as accepted forms of exchange, they were not considered appropriate for soliciting the depth of responses sought. I was concerned that participants would misunderstand questions about their practices if they were written down, or consider it inappropriate to write down extensive detail about seemingly 'personal' practices. Even during the interview, householders often required verbal 'prodding' to address the questions. This involved trying to uncover, through questions and prompts, why a participant did something. However, there is a risk that householders 'picked' one of my suggestions, rather than reflecting on their own practices, thus resulting in a form of research bias. Nonetheless, Becker and Geer (2004, p. 248) describe this approach as necessary when a researcher is questioning people about topics 'they cannot or prefer not to

talk about'. In any case, most householders elaborated on their practices without prompts once they understood the level of detail and reflection I required.

To uncover the taken for granted practices of comfort and cleanliness, I employed the methodological strategy of viewing participants as 'problematic', which is a way of interrogating people about an issue which is normally taken for granted (Parkinson & Drislane 2008). This concept has links with 'naturalisation', which is described by Bell *et al.* (2005, p. 152) as 'the way in which cultural phenomena gradually come to be seen as natural, the only possible way to do things, until their cultural roots are thoroughly obscured.' Applying this approach to the interviews assisted in uncovering the composition of normally unquestioned practices. For example, Bell *et al.* (2005) argue that simply describing an observation or ethnographic description renders a practice strange, thereby opening it up for analysis and reflection. At a methodological level, these authors note that it can be difficult to ask questions about seemingly obvious activities, such as why people shower or turn the heater on. In the context of these 'normal' practices, Bell *et al.* (2005, p. 153) argue that the researcher must 'defamiliarise' both themselves and their participants from the area of inquiry by encouraging them 'to talk about it as if s/he were talking to someone from Mars'. Using this technique, I encouraged householders to elaborate and reflect on their comfort and cleanliness practices at length.

Observation

Both observation and household tours (discussed below) were used to complement and cross-reference the interviews during the household visit. Observations were twofold, involving householders' responses and reactions to the interview questions, and material observations of the home. These were recorded via written and voice-recorded notes and photography (discussed below).

The aim of participant observation is to see the world through the eyes of the research subjects using an 'empathetic understanding' (Bryman & Burgess, p. 168). While one hour is not long enough to see the world from someone else's perspective, participant observation did assist in the identification of socially sensitive and deeply embedded practices. For example, many participants exhibited body language indicating they were uncomfortable or embarrassed showing me their home. Others were surprised and bemused by the interview questions (see Appendix 6), which targeted comfort and cleanliness practices, rather than those actions usually associated with energy and water conservation. These observations therefore highlighted the taken for granted nature of particular practices, as well as their personal and sensitive nature.

Material observations of participants' homes demonstrated an extraordinary diversity in comfort and cleanliness expectations and the methods of achieving these. For example, there was a significant observed (and photographed) difference in what householders considered 'clean' or 'comfortable', such as householders' definitions of a 'clean' or 'tidy' house. Material observations also highlighted commonalities and differences in the material infrastructure between households. For example, there was significant difference between the comfort infrastructure of households from RG3, who were living in the Currumbin EcoVillage, and those from the other RGs. These different configurations greatly shaped the comfort practices reported by these households — issues which I discuss in chapters 5–7.

Household tour

Household tours were conducted with most households and were premised on the successful use of a 'technology tour' adopted by researchers in the CHI field (Blythe & Monk 2002; Mateas *et al.* 1996). The aims of the tour were threefold. Firstly, to prompt householders to elaborate further on their comfort and cleanliness practices by visiting the context in which they are undertaken (i.e. discussing showering in the bathroom or toilet flushing in the toilet). Secondly, to observe the material infrastructures used to undertake these practices (see above); and, thirdly, to cross-check, where possible, householders' reported practices with evidence of their *actual* practices. The tour achieved these aims by serving as a prompt for participants to remember details they had forgotten to mention, or to elaborate on their practices in more detail. For example, many householders were reluctant to discuss infrequent flushing activities until we were literally standing beside the toilet.

I requested the tour at the beginning of the interview and was taken on one at the conclusion of it. Householders were not informed of the tour during my initial contact because I wanted to view the household in its 'normal' state; that is, I feared that householders would clean before my arrival if they knew the tour was planned. Indeed, householders had often cleaned the room intended for the interview, but had not cleaned other areas. The impromptu tour therefore caused minor embarrassment and discomfort for most participants who were concerned about their 'messy' home. However, householders' uneasiness was normally short-lived when they saw that I was not concerned or bothered with the state of their home.

The tour was recorded via photography (see below) and a digital voice recorder. On most occasions, only one householder from the group interview led the tour. I asked householders to show me any artefacts or technologies they used to carry out comfort and cleanliness practices, as well as any technologies connected to their smart meter, such as an IHD. Most householders were confused by these requests and showed me their entire house, focusing particularly on efficiency measures and visible 'green' improvements they had undertaken.

This served to reinforce the misalignment between participants' understanding of comfort and cleanliness practices and the resources they consume.

Photography

Photographs were taken of material infrastructures used to undertake comfort and cleanliness practices during the household tour. The photographs were used to record my observations and to support the descriptions and explanations provided by participants during the tour and interview. Photographs were not analysed as part of this research but have been included in the thesis where they serve to illustrate my observations, or where they depict a particular practice, context, material artefact, or perception of 'normality'.

Comfort and cleanliness diary

A comfort and cleanliness diary was trialled with households from RGs 1 and 2. This method was inspired by a diary approach used in a related project on household water practices in Sydney (Sofoulis *et al.* 2005). Several variations of the diary were trialled with householders, all of which aimed to uncover further depth regarding householders' comfort and cleanliness practices. Participants were given one copy of the diary per household and asked to complete it over a three-week period. Each household was provided with a stamped self-addressed envelope. Approximately one-third of participants returned the diary.

Unfortunately, the diary comments lacked the detail obtained through other methods, or were repetitive with the data already collected. In many cases, they served as a descriptive approach, with participants recounting their comfort and cleanliness practices but not explaining *why* they were undertaking them. Initially this was thought to be a design flaw and the diary was revised following the first ten interviews with Dromana GreenHome participants. The new version included prompts and examples to encourage householders to include details about their practices. However, this sometimes encouraged a 'copy-cat' response, where participants circled or ticked the prompts. Given the large amount of empirical data collected in this study and the lack of continuity or consistency in the diary design and the data obtained from it, material from these diaries is used sparingly throughout this thesis to complement other data. Where used, diary responses are referenced with the word 'diary' along with other relevant referencing information (e.g. RG and household number). Examples of a copy-cat and in-depth diary response are provided in Appendix 9.

Methodological concerns

The methods employed with RGs brought forward a number of methodological concerns. Firstly, participants often asked questions about my own energy and water practices, as well as my opinions on issues such as climate change and water restrictions. I tried to avoid

these questions or leave them to the conclusion of the household visit in order to minimise my influence on householders' responses. However, in some cases, householders weren't comfortable discussing their practices unless I had discussed mine. In these instances, I provided a brief description of my own practices. While there is some risk that this biased the participants' responses towards mine (Cialdini 2003), this was unavoidable in these situations.

Secondly, some participants viewed me as an energy or water consultant and requested an informal 'audit' of their home. For example, I was asked whether installing a rainwater tank was 'better' or 'worse' for the environment than a solar hot water system. In these cases I made suggestions where possible and advised householders to contact a qualified auditor for more detailed information. A third concern was participants' continual desire to discuss efficiency and infrastructural measures rather than their actual practices. However, as discussed previously, participants' focus on 'saving' energy and water became an important finding, demonstrating the overlooked resource impact of normalised practices such as bathing and laundering.

A final concern was self-reporting action bias. Previous studies benchmarking actual behaviour against reported behaviour have found considerable variation in results (Shipworth 2000) because respondents tend to report what they believe the interviewer wishes to hear, what portrays them in the best light, or what they think is a socially desirable answer (Foddy 1993). The group interview eliminated some degree of this bias. For example, claims from one householder (such as the number of minutes spent in the shower) were corrected by other householders during the interview. However, in other instances, householders couldn't remember what they did or why they did it, and may have produced 'false' answers when pressed for a response. This is a concern when interviewing people about seemingly inconsequential practices (Lutzenhiser 1993), and suggests that the research findings should be treated with caution. While cross-checking these self-reports with consumption data might demonstrate whether householders provide accurate accounts of how much energy and water they consume, it cannot be used to confirm or dismiss their descriptions of *how* or *why* they undertake practices. Observation may indicate *how* householders undertake practices but, aside from the ethical issues associated with this method, it raises further concerns regarding observational bias and the Hawthorn Effect[15]. I therefore employed multiple qualitative methods to alleviate as much of this bias as possible, whilst still focusing on the nature, dynamics and transformation of practices.

[15] The Hawthorne Effect or experimental effect occurs when research participants alter their behaviour or actions because they believe they are part of a study.

Smart metering stakeholder interviews: selection, purpose and process

In addition to the RG methods, 27 semi-structured interviews were conducted with 32 stakeholders from 24 different organisations and businesses involved or implicated in the delivery of residential smart metering demand management programs. These interviews were primarily conducted with stakeholders developing and delivering programs in RGs 2–4 (i.e. RGs characterised by a smart metering trial), particularly utilities, government departments and technology providers. The types of organisations and businesses represented by these stakeholders are shown in Table 4.3 (Appendix 10 is a complete list). In addition to representing RGs 2–4, interviews represented all Australian residential smart metering demand management trials with a 'behavioural' component known to myself as of February 2008. Several interviews were also conducted with housing developers and housing interest groups. Throughout this thesis, I refer to the collection of these interviewees as 'industry' or 'smart metering' stakeholders, unless referring to a specific sub-group, such as housing stakeholders or demand managers. Stakeholder interviewees are individually and anonymously referenced throughout this thesis by organisation type (i.e. energy retailer) and number (1–32).

The purpose of the stakeholder interview was threefold. Firstly, to establish what was happening in the industry in regard to new, planned and future smart metering demand management programs, given that a lot of this information is not available in the public domain. Secondly, to collaborate with smart metering stakeholders on the identification and selection of RGs. And, thirdly, to uncover how these stakeholders and their organisations understood comfort and cleanliness practices, how and why they thought they were changing, and how demand management programs might reconfigure them (particularly in regard to the RGs).

Table 4.3: Industry stakeholder interviews

Type of organisation	No. of interviews conducted	No. of separate organisations interviewed	No. of participants interviewed
Smart metering or IHD manufacturer	5	4	5
Consultancy agency	4	4	4
Government department	2	2	3
Electricity distributor	1	1	3
Joint electricity distributor/ retailer	6	5	8
Energy retailer	3	2	3
Water retailer	2	2	2
Energy lobby group	1	1	1
Housing stakeholder	3	3	3
TOTAL	**27**	**24**	**32**

Stakeholder participants generally held a middle or senior management position, although four company directors were also interviewed. Most had direct involvement in the design and implementation of residential smart metering demand management programs. Interviews with stakeholders were selected on a case-by-case basis, with one interview often 'snowballing' into others. Other participants were recruited by cold-calling a company's customer service department, emailing individuals listed on smart metering reports and online documents, and talking to people at conferences and meetings. Housing stakeholders were interviewed towards the end of the data collection, because these stakeholders were identified by other interviewees as greatly contributing to increasing thermal comfort expectations in the residential sector.

Most interviews were conducted face-to-face in the participants' offices. On three occasions, interviews were undertaken in small groups with multiple people from the same organisation who were working in demand management teams. Interviews were voice-recorded and later transcribed in full or part by me. However, two interviews were unable to be recorded. Notes were taken on these occasions and cross-checked with the participants via email. All stakeholders were emailed a copy of their transcript, which most participants reviewed and amended for accuracy.

As in the household interview, this method provided a safe and accepted environment to discuss the interview questions (see Appendix 11). RMIT University's ethics process alleviated most participants' concerns regarding discussing controversial information about their companies and organisations. The ethics process involved a letter explaining the research and a signed ethics consent form where participants could elect to remain anonymous (see appendices 7 and 12). Although some stakeholders agreed to be identified, I have protected all identities throughout this thesis.

Argument and analysis

The aim of my empirical inquiry was to analyse and identify opportunities for bridging the divide between the policies and programs of smart metering demand managers and the everyday practices of comfort and cleanliness As such, my research focused on how householders' everyday comfort and cleanliness practices are established, composed and changing, particularly in response to smart metering demand management programs, and how smart metering stakeholders shape and enable this composition. In this final section, I set out the questions addressed at each stage of the analysis, detail the stakeholders and RGs involved to address these questions, and outline how each stage contributes to the thesis as a whole.

My first concern was to understand what householders currently do, and how and why they do it. In analysing householders' current comfort and cleanliness practices across all RGs, I found both commonality and diversity in their 'doings and sayings'. **Chapter 5** maps out these diverse and common threads and analyses them using the practice-based conceptual framework outlined in Chapter 3. In particular, I focus on common understandings and material infrastructures to demonstrate how different configurations of these components result in diverse *and* common outcomes. In **Chapter 6**, I analyse the reproductions and transformations of comfort and cleanliness across all RGs. Here I am concerned with how these practices are established and how they change through their everyday performance. **Chapter 7** analyses how comfort and cleanliness practices are reconfigured through smart metering demand management programs, focusing particularly on IHDs and DPP. Here I draw on the empirical data from RGs 2–4 to ask how and why the practices outlined in chapters 5 and 6 are changing or becoming further entrenched in response to these programs. I highlight not only the everyday practices that are changing, but also those that aren't. Through my analysis, I show how IHDs and DPP are capable of subtlety reconfiguring the reproduction of comfort and cleanliness practices by *indirectly* targeting them or by engaging householders in co-managers of them. However, I also show how these programs have serious limitations because they frame householders as individual consumers and micro-resource managers without accounting for the dynamics of practice.

Chapter 8 shifts focus to the sphere of production, where demand management programs are developed and delivered, to identify how smart metering stakeholders shape and limit opportunities for reconfiguring comfort and cleanliness practices. Here I draw on the empirical data from stakeholder interviews to ask how these actors understand householders' changing practices and stakeholders' responsibility for them, and how the provider–consumer relationship shapes householders' comfort and cleanliness practices, thereby creating demand. I show how demand managers' relationship with and understanding of 'consumers' greatly limits opportunities for change. Instead, I argue that an alternative relationship is required, one which positions both consumers and providers of resources as participants in social practices. **Chapter 9** builds on this alternative relationship, suggesting a new resource management paradigm involving the co-management of *everyday practices*, and considering the role of smart metering in facilitating a transition towards this approach.

Together, these chapters aim to identify, elaborate and refine understandings about comfort and cleanliness practices, how they change, and how they can be reconfigured using smart metering programs. While chapters 5–7 provide 'base-line' information about how these

practices are composed and changing, particularly in response to smart metering programs, chapters 8 and 9 deal with resistance and opportunities for change. In the following chapter I begin this analysis by exploring the diversity and commonality between householders' existing comfort and cleanliness practices.

Chapter 5: Comfort and cleanliness practices: diversity and commonality

In this chapter and the one that follows it, I return to the first set of empirical questions raised at the conclusion of Chapter 3, applying them to the data obtained through the research methods outlined in Chapter 4. Broadly, I ask how practices are composed in Australian households (Chapter 5), and how these practices are established, sustained and transformed (Chapter 6). This first chapter is concerned with what binds practices together *and* separates them within and between households, drawing on the empirical findings from all RGs. I am interested in what constitutes householders' practices in their current form and what kinds of commonalities we can identify across all RGs. I focus specifically on the practices of heating, cooling, bathing, laundering, house cleaning and toilet flushing.

Taking householders accounts of their practices as faithful recollections of what they do, at least in a broad sense (see Chapter 4), I argue that despite significant variations between householders' 'doings and sayings', all attempt to achieve common outcomes. I suggest that this seemingly contradictory commonality and diversity can be explained by analysing the components which constitute a practice, focusing specifically on common understandings and material infrastructures to illustrate this point. Using examples from the empirical data, I argue that householders' practices are neither the product of an independent social force (Turner 1991), nor personal convictions and beliefs (Ajzen 1991; Coltrane *et al.* 1986; Costanzo *et al.* 1986), but rather a historically specific configuration of practice entities. This chapter therefore contributes to the limited qualitative research on comfort and cleanliness practices in households (Gram-Hanssen 2007, 2008; Kaufmann 1998; Medd & Chappells 2008; Shove 2003a; Sofoulis *et al.* 2005; Strang 2004; Williamson *et al.* 1991) and, in particular, identifies current configurations of these practices in an Australian suburban context.

Diversity and commonality

Householders reported undertaking a significantly diverse array of 'doings' in their homes, which they explained through an equally varied assortment of 'sayings'. In the case of comfort, heating and cooling one's house did not always involve the use of electrical appliances, such as heaters, air-conditioners, electric blankets and fans. Householders identified a range of 'manual' or 'adaptive' comfort practices, such as opening or closing windows, curtains, blinds and doors to let in, or block out, breezes and sunshine. In winter, householders used heat packs, 'snuggle rugs' (RG1, 14), hot water bottles, buckets of hot

water, thermal underwear, ‘trackies and ugg boots’ (RG3, 38) to stay warm in addition to, or instead of, using heating appliances. In summer, householders reported moving around the house to find the coolest place to work, relax or sleep; leaving the house to visit air-conditioned public spaces such as shopping centres or cinemas; or consuming cold drinks, icy poles and fruit. Many householders used water to stay cool by swimming at the beach or in a pool, using cold wet flannel cloths, spraying the body with cool water, having a number of showers throughout the day, or drinking large quantities of water.

A number of householders interviewed had made comfort modifications to their home, such as installing insulation, double-glazed or tinted windows, shade cloths, awnings, verandas and/or eaves. These actions were generally carried out to reduce or remove the need for heating and cooling appliances. Householders moving into the Currumbin EcoVillage (RG3) were required to design their homes to achieve thermal comfort without the use of air-conditioning and with minimal heating appliances. In contrast, in some households from other RGs, air-conditioning replaced a range of other cooling practices, such as frequent showering in hot weather, or opening a window. Nonetheless, even in those households where air-conditioners and heaters were installed, there was significant diversity in how they were used. Householders explained this diversity by discussing what they considered to be a comfortable environment, and what beliefs, feelings and opinions they held about particular comfort practices.

Table 5.1 illustrates this variation using the example of air-conditioning cooling practices. The table demonstrates how certain ‘sayings’ about appropriate and inappropriate air-conditioner usage dramatically shaped the way householders used this appliance. Following Kempton and Montgomery (1982), we can understand householders’ sayings as ‘folk theories’, through which they express their preference or strong dislike of air-conditioning in terms of how this appliance should be used and how it affects the body. Using the framework outlined in Chapter 3, we can also conceptualise these folk theories as common understandings and practical knowledge pertaining to the practice of cooling, and air-conditioning’s role in it. Such understandings have emerged out of householders’ experiences with a practice and its material configuration. For example, householders who have not previously used or experienced air-conditioning are sometimes distrustful and concerned about the ‘air’ it produces (see Table 5.1). Thus, air-conditioning can be appropriated and incorporated into comfort practices in diverse ways based on their current and historical configuration.

Table 5.1: Air-conditioning doings and sayings

Air-conditioning doings	Air-conditioning sayings
No use or frugal use of air-conditioning	**Preference for natural conditions and ventilation:** It's more comfortable to have a bit of a breeze coming through than having your air-conditioner on (RG4, 54). We ripped it out… we don't like air-conditioning and we use fans instead. …We kind of like the heat a little bit (RG1, 15).
	Strong dislike of air-conditioning: We're not big believers of air-conditioning (RG3, 41). I'm not a fan of air-conditioning. I hate it (RG3, 31) I don't like them. I'm an anti-air-conditioner person....I don't think we need them (RG4, 63).
	Dangerous or unpleasant 'air': I find that it dries you out more than makes you cool (RG1, 11). I just find it very claustrophobic and very overpowering (RG1, 5). They are not natural to me. I like the fresh air. I've never like air-conditioning, whether it's hot or cold (RG3, 36). I don't like artificial air. I have to work in it … five days a week and I hate it. It's not natural and it's not good for the environment (RG4, 60). I think they're wrong, but I also don't like the 'air' of air-conditioners (RG3, 34) I don't like air-conditioning... I don't think it's natural, and every time I go into a place with air-conditioning I come out gasping. … My nose, I can't breathe out of my nose (RG3, 42).
	Luxury appliance: We think, 'oh it would be nice'. … But we probably wouldn't get one because we'd think, well, 'it's only two days of the year [that we'd need it]' (RG1, 18).
Prioritisation of 'natural' climatic conditions over air-conditioning	**Unpleasant extremes between outside and indoor environments:** Well to … spend a week in hospital in a nice, warm environment and then to come home to this freezing, cold place. It was like coming back to Antarctica or something (RG4, 60). I don't like the change from the room to when you go outside and it's hot. I'd rather get my body temperature acclimatised and then I'll be fine (RG3, 41). You walk out of the air-conditioning and it's like someone's put an oven on you. Yes, boy do I notice it! (RG1, 14).
Regular use of air-conditioning	**Necessity for comfort:** So I've got one air-conditioner, and that's very important to me. I wouldn't have a house now without an air-conditioner in one room, and probably the bedroom. ... I'm aware that it uses quite a bit of power, but to me, that is important (RG1, 19). The first thing we did when we came to Australia... when we had enough money, was we bought an air-conditioner. So comfort is really important. I'm not prepared to forego comfort in order to lower the cost of the amount of power we use (RG2, 26). We need air-conditioning. ... Because my friend doesn't have it in her place and her house is *so hot*! (RG2, 28)
Use of air-conditioning only in 'extremes'	**Necessary luxury in extreme weather conditions:** The idea is that we would put it on only in extremes. Only when it gets unbearable (RG1, 14). In summer I open the windows but if it's a really, really stinking hot day I'd put the air-conditioner on at the start of the day and then switch it off and then probably in the late afternoon put it on again (RG4, 59). We rarely use it at all. It has to be stinking hot, and not be able to sleep, before we turn it on (RG3, 29, prior to moving).
Sporadic use of air-conditioning *outside* hot days	**Room refresher:** I must admit I use the air-conditioner as well to get that air through, but that'd only be five to ten minutes when I'm cleaning (RG1, 10).

A similar level of diversity was reported in bathing, laundering, house cleaning and toilet flushing practices. Householders reported bathing from twice a week to several times a day and their shower times varied from 38 seconds to 30 minutes. While most showered, some used baths, and several took 'sponge baths' using a small bowl or basin of water and a flannelette cloth. Similarly, householders varied in their laundering frequencies for particular clothing and linen items (from every day to up to six months for some items) and in their methods of producing clean laundry. Various combinations of technologies such as washing machines, clothes dryers, clothes lines and irons were used in conjunction with particular methods of identifying, separating, washing, hanging, drying, sorting, folding and storing clothing and linen (see Figure 5.1). Householders acknowledged the complexity and persistence of these different doings and sayings in themselves and others: 'you have conversations with people who are very strict about how they do their laundry' (RG1, 15).

As with comfort, householders expressed particular views, beliefs, opinions, preferences and feelings about why they undertook these practices in seemingly individual ways. Table 5.2 illustrates these variations using the example of bathing. Once again, we can understand these sayings as folk theories or common understandings and accumulated practical knowledge about how soap works, what the purpose of bathing is, and about how much water is required or available for this practice.

Figure 5.1: Diverse laundering practices

Source: From top left: RG1, 3, 22 May 2007; RG1, 2, 9 May 2007; RG4, 55, 29 April 2008; RG1, 2, 9 May 2007; RG2, 28, 9 December 2008; RG1, 2, 9 May 2007; RG1, 11; 4 September 2007; RG1, 14, 4 September 2007

Table 5.2: Bathing doings and sayings

Bathing doings	Bathing sayings
Long showers and baths	**Warming, relaxing, rejuvenating, pleasurable experience:** You know what it's like when you're in the shower. It's all beautiful and warm (RG2, 23). It's not long enough for me. I love my warm showers (RG4, 56). Water is like therapy for me. There's a huge difference in whether I have a shower or not. There's a cleansing, rejuvenating aspect to it. I might mean to have a four-minute shower but when I get in there I go, 'mmmm, it's so nice' (RG3, 33). He just loves showers. There's something good about being under the shower and having the hot water on your back (RG3, 33). I think you feel refreshed and revived after having a shower (RG4, 47). That's part of calming and soothing, that's their bed routine and because they're dirty (RG4, 59).
	'Time out' from everyday life: That's my own time, I don't get time out so that's my little time out and usually I have a kid in there anyway talking to me (RG4, 59).
	Water play: But as far as the children are concerned, if they want to do some water play, I can't see anything wrong with that. …I'm not going to say to a two year old, 'you can't play in the water and learn about how things move and how things work' (RG2, 24).
	Abundance of water: If anything we take longer [in the shower]. We have just got water galore (RG3, 41). It's also good knowing you're on tank water. … We know we don't use so much so I don't feel so guilty about the shower (RG1, 14).
Turning the tap on and off whilst showering	**Understandings of how soap works:** Before, you'd be soaping yourself and the shower's washing it off as you soap yourself. You shouldn't actually do that. You have got to soap yourself and actually leave the soap on for a short while, otherwise it doesn't do its job. And then you rinse off at the end (RG4, 48).
	Perceived water shortages: So what I do now, this is getting personal isn't it? While the water's running … I put my squeegee underneath the shower and soak it up, and then I soap myself all up with that sponge, and splash a bit of cold water on, and by that time the hot water comes through so I just rinse off. Instead of standing there waiting losing how ever many litres of water. …And another personal thing, I shave my legs while I'm waiting for the water to get warm [Laughter] (RG3, 37). The other thing I have started to do and now I have got into the habit and I can't imagine not doing it anymore, is when I shower, I'll use the water to rinse myself and then I will turn the shower off and I will soap myself, then I'll turn the water on and rinse myself off and I also wash my hair at the same time. … so the water's going on and off all the time. I can't imagine, I can't shower now and leave the water running (RG4, 48).
Short showers	**Perceived water shortages:** It was my wake up time, my mediation time, but with the publicity on water issues I've really cut down and I find I don't have that thinking time in the shower that I used to (RG1, 10). I used to kind of mediate in the shower, but I've changed my ways (RG3, 32). To me that's a waste of water. You can just splash yourself in the face to wake yourself up (RG4, 42). Only when the grandson comes do we use it [the bath]. There's been many times I would have liked to laze in there, but when I give him a bath I only put a little bit of water in and he says, 'not much water Grandma! I have more at home'. And I say, 'I know, but we've got water restrictions' (RG4, 53).
	Getting clean: But briefly, I go in there to wash myself, I don't go in there to stand or muse or sing songs or play with myself or anything. Not anymore anyway (RG2, 27). I get in to get clean, that's it. I don't stand there thinking, 'this is wonderful, I'll massage myself' (RG3, 35).
Routine daily showering	**Feeling clean and fresh:** My feelings are that I need to be clean for the day or whatever but I don't have a long shower (RG4, 49). We have one in the morning and then if you're going to bed at night you have one to freshen up (RG4, 53).

Bathing doings	Bathing sayings
	I just feel smelly without my shower (RG2, 28)
	Removing body odour and avoiding smell: I'd probably stink if I didn't bathe every day (RG3, 37). [I shower every day] mainly because I smell. I work at a petrol station and I smell and sweat (RG4, 60).
	Caring for bodily conditions: It's an older thing to get the joints moving, especially in winter (RG1, 5). I've got to wash my hair every day, because it's oily. And if I don't, it gets itchy (RG4, 53).
	Waking up: It gets me going in the morning (RG1, 14).
	Looking presentable: I [shower to] make my hair sit down. …You don't want you're hair standing on the wrong angle (RG2, 21). With my job especially I have to be professional and have a certain appearance (RG1, 9).
	Multi-tasking and multiple reasonings: I'm processing the day while I'm in there, I'm multi-tasking. … I even clean the thing while I'm going. Stretching, I might be stretching my hamstrings … so I do a whole heap of things which, you know, it's a good place, but that's more like processing the day (RG4, 59). It's just natural hygiene I think, although I do have a view that we probably shower too much and that you wash some of the natural oils from your skin, but for me it's habit and I've been doing it for a long time. I just feel the need ... I feel, I don't know, sweaty or something if I don't have a shower in the morning (RG4, 49).
Washing hair in laundry sink	**Perceived water shortages:** I must admit, I don't always wash my hair in the shower. I'll wash it in the laundry sink, because it does take less water (RG4, 48).
Taking 'extra' baths and showers	**Warming up and cooling down:** It [a shower] warms me up to get into bed (EcoPioneer, 22). …sometimes in the cold weather I like being under the warm water (RG4, 49).
Daily baths	**Soaking to clean the body:** I like to pickle myself in a bath. I can't get clean in a shower. I simply can't (RG4, 45).
	Private time: It's my thinking time. That's my private time in the bath (RG3, 42).
Bathing every second or third day	**Protecting the skin:** With me my skin get's irritated. … My skin get's really itchy and I have troubles (RG4, 50). The thing I really notice [not showering every day] is how much better my skin is (RG3, 29) … one of the things the dermatologists say is that when we shower and wash with soap all the time it washes away all the natural parts of our skin (RG3, 33).
Sponge bathing	**Time constraints:** I wouldn't have time to shower. I think it's quicker to have a good wash than have to strip off, get under the shower and do all those bits and pieces. You still don't need one every day I don't think (RG4, 48, emphasis added).
Skipping showers	**Swimming as a replacement for showering:** I don't shower after I have had a swim. I would often count the swim as a shower (RG4, 63).
	Perceived water shortages: With this weather I have gone down to one shower every second day; every other day I have a birdbath (RG3, 29).

At first glance the commonality between the examples of air-conditioning and bathing provided in tables 5.1 and 5.2 is the seemingly individual and diverse array of preferences and particularities used to justify the 'doing' of a practice. A representational analysis of these 'sayings' would assume that they are a product of an individual's attitudes, opinions and beliefs (Jackson 2005). Indeed, this is the way many householders understood and explained their own practices. For example, householders often gave personal accounts of their particular circumstances or bodily requirements. As illustrated in Table 5.2, skin conditions shaped the way householders undertook bathing and laundering practices and the types of technologies, cleaning products and infrastructures they used. Similarly, householders discussed how their lifestyles, jobs, and the time pressures associated with these, shaped the way they bathed:

> And it depends what I'm doing at work. Like if I get a really stressful day and have sweated a lot, I'm going to have a shower (RG1, 19).

> I just don't have time to do it [bathe every day]. … I usually would have a half hour bath and it just takes too long (RG4, 63).

Similarly, significant personal life changes, such as pregnancy, illness or aging, prompted householders to develop practices specific to their circumstances:

> You feel five degrees hotter when you're pregnant. … I nearly died through the first pregnancy (RG2, 27).

> I feel the cold and the heat. … Plus the fact that I'm on *Warfarin*[16], so I'm not allowed to go out in the sun anyway, not if I can help it. I've got a hot water bottle here on my back. I do have that most of the winter. But I do have to have the air-conditioning on because it does get too hot (RG4, 48).

Despite these individual accounts, many of the practices householders engaged in were similar to those of others. Indeed, various states of 'being', such as 'being' on medication, 'being' pregnant, or 'being' exposed to extreme weather conditions, while individually experienced, are also commonly shared. In particular, *what makes sense for people to do* in response to these experiences emerges from their common understandings, practical knowledge, available infrastructures, and interpretation of rules and recommendations pertaining to the practices of comfort and cleanliness.

[16] A common anticoagulant drug

Similarly, while comfort practices were highly dependent on particular 'triggers' related to temperature, humidity and the availability of breezes and other environmental conditions, once householders were motivated to act, there were clear routines about what actions they undertook to achieve comfort, as the following householder indicates:

> If it's a warm day and it's cold inside, all the doors get opened, all the windows get opened and the warmth comes in. If it's a hot day and we know it's going to be a hot day, everything gets closed. The blinds get closed, the shades come down. We try to use those sorts of things as opposed to using electricity (RG4, 50).

Like this householder, others reported using similar infrastructures, such as windows, doors, blinds and shades, as well as heaters and air-conditioners, in response to changes in the environment.

To illustrate this commonality further, Table 5.3 provides a summary of the common infrastructures and technologies, understandings, and outcomes of comfort and cleanliness practices. These similarities serve to illustrate how diversity is embedded within the historically common composition of a practice. While these common doings and sayings may seem obvious to present-day householders, they have not always being configured as they are now. Regular showering, for example, has only become common in the last 50–100 years (Davidson 2008). Similarly, the air-conditioner has been in Australian homes for less than 40 years (EES 2006). Unsurprisingly, the common doings and sayings outlined in Table 5.3 closely match those of other modern western nations (Gram-Hanssen 2008; Kaufmann 1998; Medd & Chappells 2008; Shove 2003a) as did the diversity reported earlier. How then, do we account for the ways in which practices are seemingly tied together but at the same time disparate, across local, national and even international scales? We can begin to address this question by dissecting the ways in which everyday practices are composed.

Table 5.3: Common comfort and cleanliness practices

	Common infrastructures and technologies	Common understandings	Common outcomes
Laundering	Instant water and energy delivered to the laundry room; washing machines; detergents; clothes dryers; clothes lines; sinks; irons; washing baskets; clothes; linen; fabrics.	Body odours are unpleasant; bodily substances can be dangerous and are unsightly. Clothes should be regularly changed.	Clean laundry is regularly produced. It must be unmarked and free from odours; ideally smells 'fresh'.
Bathing	Instant water and energy delivered to the bathroom; showers; baths; soaps; shampoos; conditioners; towels.	Body odours are unpleasant; bodily substances can be dangerous and are unsightly; bodies should look 'maintained' and 'fresh'.	Bodies are regularly cleaned to be free from any outside substances and personal odours.
Toilet flushing	Water, energy and sewage networks; toilets.	Bodily waste is dangerous and harmful; bodily waste smells unpleasant and is unsightly; only 'clean' water is appropriate for the home.	Waste is frequently removed from the house with drinking water.
House cleaning	Water and energy networks inside home; cleaning products; domestic technologies such as vacuum cleaners, brooms and bins.	'Mess' is unsightly; bodily and animal waste can be dangerous; food remnants are unhygienic; lingering bodily, animal and food smells are unpleasant.	Household items are organised and orderly; surfaces are clean and tidy.
Cooling	Water and energy networks inside home; showers; fans or air-conditioners; windows; clothing.	Sweat and smell are unpleasant and potentially dangerous; extreme heat is unpleasant and dangerous.	Practices that reduce or avoid sweat, smell and excessive heat.
Heating	Energy networks inside the home; heaters; blankets; insulation; bedding; showers; baths.	Being cold is unhealthy and unpleasant. A cold house is not a 'home'.	Practices that warm the body or home.

Composition of comfort and cleanliness practices

As outlined in Chapter 3, practices are best understood as a constantly transforming process, and therefore separating out individual components is likely to oversimplify their complexity. Nonetheless, for the purpose of this research, where so little is known about comfort and cleanliness practices and where one of the objectives is to identify and evaluate ways of changing them, it is useful to begin with a dissection. In the discussion that follows, I focus on two practice components to identify and explain the diversity and commonality reported above. I begin by identifying some common understandings of smell and sweat, hygiene and health, cosiness, presentability, and the environment, which cross-cut through various comfort and cleanliness practices. I continue by exploring the common material infrastructures implicated in these practices and how they 'script' or 'moralise' particular doings and sayings. I show how householders explain their practices through the interpretation, incorporation and adaptation of these components with reference to all others.

Common understandings

Common understandings of what one 'ought' to do to achieve comfort and cleanliness have long been associated with heating, cooling and cleaning homes and bodies. For example, qualitative research shows that householders in westernising tropical nations feel socially obliged to provide their western guests with mechanically produced coolth (Agbemabiese *et*

al. 1996). Similarly, in America and some European countries, where heating technologies are ubiquitous and regularly used, the constant flow of heating through a house is not only considered normal but is also *expected* (Lovins 1992; Prins 1992; Wilhite & Ling 1992). Cleanliness is arguably more normatively grounded than comfort, conjuring up clear ideas of what is right, proper and responsible behaviour in society — common understandings which are learned from a young age and embedded into our practical knowledge. In particular, social and cultural conceptions and conventions of hygiene, body odour and presentability are now instrumental to the doings and sayings of cleanliness, arousing feelings of sympathy, shame, disgust, concern and revulsion (Davidson 2008; Shove 2003a). More recently, new environmental understandings have been deliberately introduced by governments and utility providers (in the form of rules or recommendations) to co-exist, or compete, with these pervasive understandings. In this section, I demonstrate through empirical examples how these common understandings manifested themselves in householders' comfort and cleanliness practices.

Presentability

Common understandings of presentability, that is, of *looking* a particular way, were pervasive through all cleanliness practices investigated in this research, and also related to householders' definitions of a 'comfortable' or 'cosy' home environment. While householders' understandings of presentability were strikingly similar, there was significant diversity in how they were achieved and maintained — that is, how people made themselves presentable or how they produced presentable clothes, linen, toilets and homes. Quotes illustrating householders' presentability understandings are identified in Table 5.4 with respect to bathing, laundering, house cleaning and toilet flushing practices. As these quotes depict, this understanding manifested itself as a desire to make the body appear fresh, clean and maintained. In the laundry, presentability understandings were evident in householders' desires to produce white, clean, fresh, crisp and/or unwrinkled clothes and linen. In the toilet, householders flushed so that others wouldn't have to look at (or smell) their waste. In the home, presentability was a reflection on oneself and, in particular, on women.

This is not to say that there was one 'standard' of presentability. Householders acknowledged that notions of 'acceptable' presentability varied between households. Consequently, some householders described how they would be prompted to undertake a 'major clean' when 'super clean' people were visiting their household: 'People who are like super, super clean I go, "Oh God! I can't let them see my house like this!"' (RG2, 34). Similarly, one woman explained how she needed a new visitor to motivate her to clean: 'Once someone's come and it's messy, well it doesn't matter if they come again. So you need a new person for motivation' (RG1, 2).

Table 5.4: Manifestations of presentability understandings in cleanliness practices

Bathing	Laundering	House cleaning	Toilet flushing
I [shower to] make my hair sit down. …You don't want your hair standing on the wrong angle (RG2, 21).	I like to look smart when I go to work … I enjoy ironing and keeping my clothes ship-shape, it is true. I think what it is, for me when I see other people who don't have their clothes ironed, I just don't like that look. I think that's probably what it is (RG3, 40).	If they get dirty… you don't want your mother to see them! (RG2, 21)	We don't flush much, to the disadvantage of crystallised urea getting in the bowl (RG2, 27).
With my job especially I have to be professional and have a certain appearance (RG1, 9).	And because I work for council, there's an image... I have to try and look a bit professional, whereas if I was working in a community group it wouldn't be that same expectation (RG1, 19).	I would make an extra effort if we were having guests (RG4, 55).	It's a bit offensive … You don't end up with that socially approved cleanliness standard (RG1, 19).
I'm dealing with the public. … It's a sense of dealing with people and hygiene (RG1, 10).	Usually I suppose what happens, because we have three animals in the house, if they look particularly fluffy they go in the washing machine (RG1, 13)	I don't like the embarrassment if people come here and it's not clean (RG1, 11).	We tried that doodad [flow restrictor] that was in the [RG2] showbag but I don't like it. ... I think it gets dirtier faster. And I'm the one who cleans it. And I wouldn't trust it with the kids, I just think, 'no, they can't judge that' (RG2, 21).
		We tidy up so we don't look too sloppy (RG2, 28).	We never *not* flush, and I'm sorry, but I'm not changing that (RG2, 21).
		I might clean before Grand Final Day because people are coming here and people are staying here so I shall make sure the place is sparkling to the point of even cleaning the oven, which is an oddball thing for someone to do (RG2, 27).	
		You can't have visitors come into a dirty house. [Laughter] It's never dirty really (RG3, 44).	

In this sense, householders' decisions to clean their bodies, clothes and homes were not 'free' choices, but premised on a mutually held understanding that people *outside* the household would be inspecting them and making particular judgements about their appearance. The notion that presentable laundry, bodies, toilets and homes is a reflection on oneself has long been associated with these practices, and holds particular relevance for women, who have been historically positioned as the primary domestic caretakers of the home (Martens 2007; Schwartz Cowan 1989; Shove 2003a). Presentability understandings have not randomly appeared nor naturally evolved, but rather emerged out of what Schwartz Cowan (1999) refers to as the 'industrial revolution of the home', or what Vinikas (1992) describes as the commercial institutionalisation of cleanliness expectations.

The pervasiveness of the presentability understanding was most evident when I asked householders for a tour of their homes following the interview. As illustrated in Table 5.5, many householders 'admitted' to cleaning before my arrival. Their light-hearted and jovial

responses suggested that talking about cleaning in front of their 'guest' was embarrassing. Householders also expressed embarrassment when they *hadn't* cleaned before I arrived (see Table 5.5). Similarly, some householders became particularly uncomfortable or embarrassed when I requested a tour of their home if they had not expected this request.

Table 5.5: House presentability: cleaning prior to the researcher's arrival

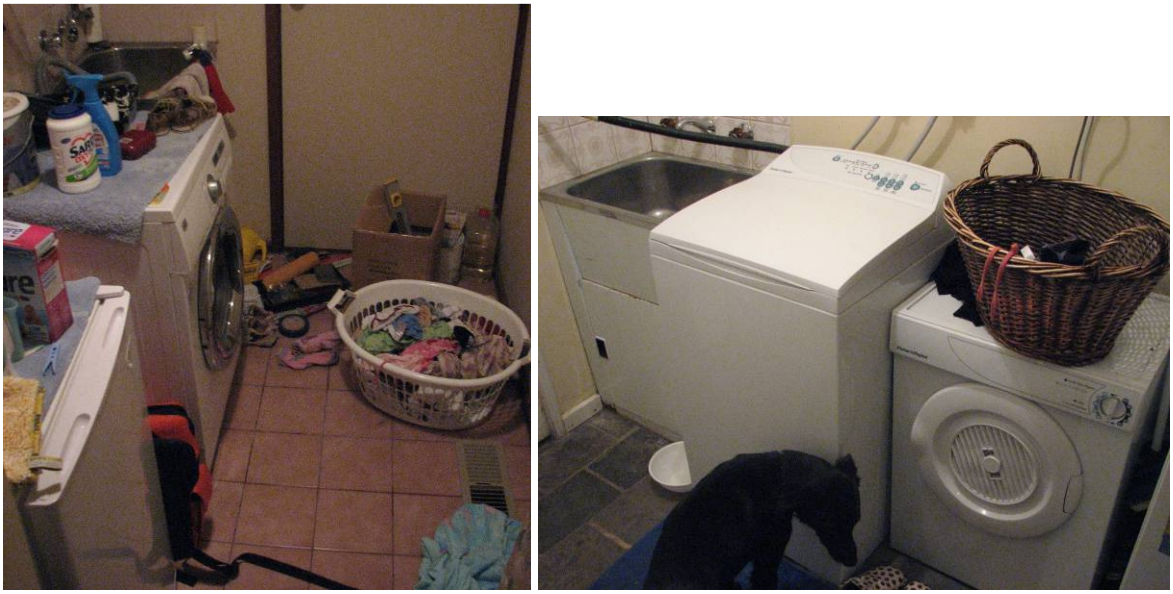
I dusted the piano for you (RG4, 55).
I must admit I checked the toilet (RG2, 20).
I must admit I did vacuum for you (RG3, 31)
I cleaned up the house thinking 'oh yeah, she's coming, I'll clean up the house' and I just shoved everything in there [laughter, pointing to cupboard] (RG4, 50).
WOMAN: Oh yeah. I like to make sure the house is tidy before somebody important is coming. MAN: We dusted that table because you were coming. WOMAN/ MAN: [Laughter]. (RG4, 53).
I'm glad I cleaned on the weekend. It's funny because if you'd come last weekend I would have been quite embarrassed (RG1, 9).
I would have cleaned more if I'd known you were going to go around! (RG2, 26).
[You can have a tour] as long as you don't comment on my dusting! (RG4, 55).
You've got a strong stomach haven't you? It's not that bad. I'm just conscious of it, that's all (RG2, 27).
Just don't send them [photos taken by the researcher] to someone and say that my house is really grubby (RG4, 60).

Despite widespread apologies for the 'state' of their homes, observation and discussion with householders revealed significant differences in what they considered acceptable levels of presentability. For example, the householders responsible for the laundries shown in Figure 5.2 both apologised for the 'mess'. In both examples, householders were concerned that their everyday laundering practices were on display, despite the photo on the left displaying dramatically more of the laundry's day-to-day functions than the other. Nonetheless, these householders shared a common understanding about how a home should look, despite neither of them thinking they had met the perceived acceptable standard.

Such variation can be explained in part by householders' experiences and interactions with other householders' house cleaning practices. Whereas the body and its adornments are commonly taken into the outside world daily, where we expose it, both intentionally and unintentionally, to a variety of social contexts such as public spaces, workplaces and social venues, we have far greater influence over who enters our home. Furthermore, while our presentability understandings of the body and clothes are based on extensive social contact with other bodies and clothes in diverse contexts, we base our presentability understandings

for the home on a more limited exposure to other people's homes, which are normally those within our own family and social circles. Table 5.6 illustrates this point with quotes from householders indicating how they benchmark their house presentability understandings against those of other people they interact with. The quotes depict how these understandings, while common across households, are interpreted in different ways.

Figure 5.2: Two laundries



Source: From left: RG1, 17, 19 September 2007; RG1, 9, 22 May 2007

I am not suggesting that there is less diversity in what householders consider to be presentable bodies and laundry but rather that diverse house cleaning practices are premised on a more limited degree of social interaction. This makes the images and messages of advertisements and media representations of the home particularly influential (Rybczynski 1986) and perhaps explains why all householders apologised for the state of their homes, but not their bodies or clothes — benchmarking themselves against a spotless and almost unattainable image of the home depicted in popular media, where evidence of everyday practices is obscured from view. In contrast, householders' bodies and clothes bear witness, and contribute, to a wider degree of presentability diversity in an array of social contexts as householders interact with friends, family, workmates and the wider public. However, as with the home, in each of these contexts there are expectations about how the body and its adornments should look and, as I argue in the following section, should smell.

Table 5.6: Understandings of house presentability expectations

I'm probably cleaner than most people but I'm not obsessive (RG4, 59).
Well, every day we completely dry out the whole shower. I don't have any friends who do that. I don't know why… because, you know, bathrooms, you've got to keep them clean (RG4, 44).
But yeah, it's not feral in the way compared to … some people's places and well they've got dirty nappies everywhere and you know stuff all over the walls and piles of clothes sitting in the lounge room. We're not — I'd say we're midway — we're not grubby but we're not exactly clean either (RG4, 60).
Most people I know clean every day. They sweep the kids' floors every day. We're working on germs. We're building up immunity [Laughter] (RG2, 24).
I think all of our friends keep clean houses (RG3, 44).
Well, when I go to their house, … [his partner], being Chinese, she's always cleaning so I come back and start cleaning the house (RG4, 65).

Smell and sweat

Like presentability, common understandings concerning smell and sweat were particularly influential in the composition of bathing, laundering, toilet flushing and cooling practices. In general, householders demonstrated a strong desire to avoid smelling of body odour or sweating. Most householders did not refer directly to these understandings in their accounts of practices, although there were exceptions:

> [I shower] so I don't smell … In our society we've got used to nobody smelling. That's something we've got used to in Western society (RG1, 18).

> I think New Zealanders and Australians wash a lot. I think we're all, as a nation, very sensitive to personal odour and you wouldn't want to run any risks (RG4, 61).

Another householder explained how this understanding changed in different social contexts. For example, body odours, which are normally undesirable, were accepted by her peers whilst backpacking:

> …everyone that I was travelling with was exactly the same and we all smelled and we all didn't care and we were all just living like we were living in a tent, camping on beaches. … Whereas here, if I didn't have a shower for five days I'd feel really quite revolting and be worried that I'd be smelly and people would be talking about me and wouldn't want to sit next to me and things like that, so it's funny how you can change depending on where you are and depending on who you're with as well (RG1, 9).

However, most householders did not reflect on their understanding of smell and sweat as negotiable, debateable or transitory. Rather, smell and sweat were simply referred to as conditions of the body that should be avoided. In the examples shown in Table 5.7, householders describe how they were motivated to clean their clothing or bodies when they smelt, or when they had sweated. These findings correlate with Ashenburg's (2007, p. 8) recent historical analysis of cleanliness practices, in which she argues that body odour understandings have become thoroughly embedded into modern bathing practices:

> The surreptitious way people reveal their deviations to me indicates how thoroughly we have been conditioned: to risk smelling like a human is a misdemeanour, and the goal is to smell like an exotic fruit (mango, papaya, passionfruit) or a cookie (vanilla, coconut, ginger).

Table 5.7: Avoiding smell and sweat in bathing and laundering practices

This is the third time I've worn it, and it doesn't smell (RG1, 15).
That's four wearings I've got out of it, and it doesn't smell (RG4, 62).
They're mostly not dirty as such, they've just got that smell about them, you know? (RG1, 11).
Since I haven't been working I've been wearing a shirt two days in a row and then throwing it out. I'll just sniff it in the morning and see if it smells all right but it generally does and I get two days out of it (RG4, 49).
It's just for sweat and things like that… It's just his shirts because obviously he sweats and it's close to your face and you can smell it and feel it. I mean it's the same with my shirts. My work shirts … I wash them after every use. (RG4, 50).
As for the linen, if it's summertime and we've been sweating a lot, I like to change them twice a week (RG4, 53).
I like it to get a bit dirty and a bit smelly before I throw it in the washing machine [Laughter]. If it still smells fresh I'll put it back in the drawer (RG3, 39).
If I'm hot and sweaty, yes, I've got to have a shower but if I feel fine, you know, I get dressed, have my shave, wash my face, obviously, that sort of stuff. But, yeah, no-one complains that I smell [Laughter] (RG4, 50).
In the hot sticky weather I find it's always a necessity [to have a shower], when you're really sticky. Just before bed's a really nice time to wash off that stickiness — the Queensland stickiness (RG3, 33).
People who do sweat a lot … they do need to wash more often. But people who don't sweat a lot, they can get away without it (RG4, 48).

Similarly, other researchers have commented on the pervasiveness of sweat and smell in the frequencies and methods of bathing and laundering (Davidson 2008; Gram-Hanssen 2007; Kaika 2005; Shove 2003a; Strang 2004; Vinikas 1992). Vinikas (1992) argues that, like presentability, body odour understandings have become 'institutionalised' into these practices through powerful commercial interests, such as soap and cosmetic manufacturers,

who make money from generating feelings of disgust in association with bodily fluids and smells. In his 20th century analysis of the rise of soap products, or goods which seek to gratify 'a private need to placate one's public', Vinikas (1992, p. 107) argues that the understandings of sweat and smell we take for granted today are not innate or inborn phenomena, but rather emerge out of explicit recommendations, which now constitute common understandings in the practices of bathing and laundering. Australian television is constantly subject to advertisements attempting to increase the undesirability of these odours, by promoting new and more powerful deodorants, soaps, toothpastes, mouthwashes, shampoos, conditioners, air fresheners and cleaning products.

Cooling practices are also becoming increasingly connected to common understandings of sweat and smell. Some householders used air-conditioning in order to avoid sweating and, in several cases, air-conditioning replaced other practices used to cool the body and remove sweat, such as frequent showering. Sweat was therefore considered uncomfortable by some householders, even though it is the body's natural mechanism for staying cool. Wilk (2002) argues that these 'feelings', such as the undesirable feeling of sweat on the body, can emerge out of the naturalisation of a practice. In other words, as practices such as showering or air-conditioned cooling become taken for granted and the original motives for undertaking them are embedded into the unconscious layers of practical knowledge, the outcomes they avoid, such as smell as sweat, are repositioned as disgusting and unattractive. Thus, through the submersion of common understandings such as smell and sweat, practices can become positioned as non-negotiable aspects of everyday life.

Hygiene and health

Common hygiene and health understandings manifested themselves in a number of ways in householders' cleanliness practices. Germs and bodily wastes were considered harmful and consequently contributed to regular laundering, bathing, toilet flushing and house cleaning practices. For example, nearly all householders washed their underwear every day and the majority washed their sheets and towels weekly or fortnightly (although some householders washed them as frequently as once a day) for hygiene reasons. Hygiene and health understandings also influenced the ways in which particular practices were undertaken, and the types of resources and technologies used. For example, householders reported using hot water and particular detergents because of their germ-removing properties in the laundry. However, unlike understandings of sweat and smell, there was significant confusion amongst householders about what was considered hygienic and healthy. Ideas about necessary water temperatures required to produce germ-free laundry illustrate this uncertainty (Table 5.8). In these examples, householders believe that some degree of heat, achieved through the use of hot water or sunshine, is required to kill germs. However, many others reported only using

cold water, believing that the detergent and washing machine agitation killed germs.

Table 5.8: Necessary water temperatures required to produce hygienic laundry

Forty's better than 20 [degrees] for getting things clean. … I just think it kills the germs... it just makes you feel better that the towels are cleaner (RG1, 15).
Warm is a compromise. I don't quite know if you need the heat to kill the germs. ... I started thinking maybe they'd be cleaner if I used the warm or hot water, so the warm was a compromise. … I just started thinking about it and I thought, 'am I really killing the germs in cold water?' So I thought, perhaps I'll go halfway (RG1, 14).
I think it needs some temperature to kill the germs (RG2, 25).
[I use hot water] to kill germs and bacteria, which is silly because if you put it in the sun it does it all for you, really (RG3, 39)

Confusion about hygiene understandings also emerged in the bathroom, where some householders believed sharing baths was 'yuck' (RG1, 3), whereas others believed that 'even dirty water cleans' (RG3, 36):

> Working in construction, I have to wash the dirt off myself each day and I can't get into a bath with someone else if it's going to be dirty (RG3, 40).

> He has a bath before he goes to football [referring to husband] but then the kids get in afterwards, so they reuse the water (RG4, 59).

A similar diversity in hygiene understandings was evident in householders' house cleaning doings and sayings, although here understandings of presentability were more influential.

Like understandings of presentability, smell and sweat, historical and current accounts of cleanliness practices (Ashenburg 2007; Shove 2003a; Vinikas 1992) illustrate how marketing agencies have capitalised on confusion surrounding definitions of hygiene and health by positioning all germs as dangerous and harmful, potentially escalating existing cleanliness expectations. A recent report promising to assist companies with 'capitalizing on consumers' desire for safe products and good hygiene' demonstrates how such understandings are explicitly targeted by marketing agencies (Datamonitor 2008b). The report aims to help companies generate higher profits by assisting them 'to identify large addressable growth segments and create propositions to meet these consumers' needs' or, in other words, to identify areas where there is potential to escalate existing understandings of 'safe' and 'acceptable' hygiene standards in order to sell cleaning products. Such understandings are therefore open to interpretation by householders and subject to constant manipulation by

commercial interests, with very little 'factual' information available[17].

Cosiness

Wilhite *et al.* (1996a, p. 799) define cosiness as a 'cultural energy service' to which particular material infrastructures, namely heating technologies, are tied; or as 'a set of energy use behaviours deeply rooted in the social, cultural and symbolic presentation of the home'. Their research found that cosiness manifested itself in the practice of 'overheating' the home to avoid social failure. A similar practice was reported by householders involved in this research, some of whom used more heating, and in some cases cooling, on the arrival of guests. Sometimes guests were asked if they were too hot or cold. However, householders predominantly pre-empted what level of comfort they thought their guests would require or desire, and pre-cooled or pre-warmed the home in anticipation: 'Yes, if I've got guests and its cold, I'll put on one of the gas heaters early in the morning' (RG4, 44).

Householders sometimes justified this response through their belief that their guests' comfort expectations were higher than their own. This was often the case with householders from RGs 1–3, many of whom identified themselves as being more 'environmentally friendly' than average citizens. Importantly, householders' desire to create a cosy environment normally took precedence over these environmental values:

> I'm aware that I seem a bit weirdly frugal. I mean if I've got friends coming around, I'm conscious of ... the house being warm. … I don't expect people to bring an extra jumper just because they're coming to dinner. ... But if it's me, it's not an issue (RG1, 19).

For most householders, meeting the perceived comfort requirements of one's guests was considered socially desirable and necessary. Implicit in householders' accounts was the assumption that it would be rude to leave guests feeling too cold or hot: 'Yes, I've left it [the heater] on for you [Laughter]. You'd be much more conscious if you had guests rather than what you would be for yourself' (RG4, 55).

This was particularly the case for women, who often reported being more sensitive to their

[17] For example, the UK's 'Hygiene Expert' website (HygieneExpert 2009) states that 'washing and bathing are the most important ways of maintaining good health and protecting ourselves from infections, illnesses and ailments'. However, they cite the 'main purpose of washing' as the removal of 'dirt and odours'. The frequency of bathing is said to be 'very individual' and 'dependent on culture'. In the same paragraph, the site states that 'skin and healthcare professionals recommend that the face, underarms and genitals are cleansed once a day but not more often, as this can take essential oils away from the skin leading to irritation'. In contrast, medical research suggests that 'frequent bathing has aesthetic and stress-relieving benefits but serves little microbiologic purpose' (Larson 2001, p. 227).

guests' comfort than their male partners. For example, in the following discussion between two householders, the man was not even aware that his female partner was increasing the heating when guests arrived, and he didn't understand why she did this:

INTERVIEWER:	Do you ever heat or cool the house for guests?
MAN:	We would only put it on if we needed it on because we were here. We wouldn't put it on any more or less for guests.
WOMAN:	Yes, I would. Definitely.
MAN:	Really?
WOMAN:	Yeah.
INTERVIEWER:	Can you give an example?
WOMAN:	When your Mum was here I turned it on. Yeah, I have done that before. If people are coming over you tend to cool the house more.
MAN:	Can we agree to disagree on that? (EcoPioneer, 22).

This gender sensitivity to guest comfort is likely related to the traditional role of women as the primary caretakers and caregivers of the home (Schwartz Cowan 1989).

The importance of cosiness understandings has been highlighted in a number of ethnographic studies around the world in regard to both heating and cooling practices (Agbemabiese *et al.* 1996; Gram-Hanssen 2008; Haruyuki & Lutzenhiser 1992; Wilhite & Ling 1992; Wilhite *et al.* 1996a). For example, Wilhite and Ling (1992, p. 10.179), in their ethnographic study of comfort practices in Norway, found that 'for a guest in a home to give any signs that they are uncomfortably cold is a serious disgrace to the host.' Similarly, Haruyuki and Lutzenhiser (1992) argue that the diffusion of central heating and cooling systems in Japan has led to the association between social politeness and air-conditioned spaces in households. In their research, 30 per cent of the sample group cooled their rooms only for visitors or members of the family (Haruyuki & Lutzenhiser 1992).

While householders in this study reported being more sensitive to the comfort of their guests than their own, this cosiness understanding was only beginning to include air-conditioned cooling practices. However, given the rapid diffusion of air-conditioning in Australian households, it is likely that such expectations will soon apply to mechanised cooling as well as heating practices. Given that the desire to create a warm (or cool) and cosy environment for guests overrides environmental considerations relating to heating (and potentially cooling) homes, despite the fact that no-one's comfort may actually be improved, this issue deserves

further attention from those seeking to minimise the impact of resource-intensive comfort expectations.

Emerging environmental understandings

New environmental understandings emerging out of concern for climate change and water shortages existed alongside, and in some cases overrode, those of smell and sweat, hygiene, presentability and cosiness, particularly for practices which relied on water consumption in the home, such as toilet flushing, showering and laundering. For example, some householders discussed how previously unacceptable practices, like letting the 'yellow mellow' in the toilet, were becoming socially acceptable due to water awareness:

> I used to think that it was a social embarrassment to sort of forget. … But it wasn't sort of forgetting so much as being concerned about water use and stuff. But now that I know it's socially acceptable, then, OK, yeah, that's made a difference (RG1, 14).

However, other householders reported that technologies designed to save water, and new practices such as flushing infrequently, were accepted reluctantly or not accepted at all if they did not maintain other understandings of presentability, hygiene or smell. Not flushing, for example, was only considered acceptable when this practice could not be viewed by household guests. Similarly, some householders would not change the practice of flushing if they considered the alternative of not flushing the toilet unhealthy or unhygienic.

New environmental understandings were also resulting in householders questioning the use of 'luxury' appliances, such as air-conditioners and clothes dryers. As highlighted earlier in Table 5.1, some householders only used air-conditioning frugally or in 'extreme' situations. Similarly, householders with a clothes dryer described how they used it 'very rarely' (RG4, 48), only in 'unusual circumstances' (RG4, 45) or 'emergencies' (RG1, 2; RG4, 64), 'once in a blue moon' (RG2, 23), to 'finish off' laundry (RG4, 55), or when it was 'rain, rain, rain, rain, rain' (RG4, 48). Many householders explained that they'd adopted these frugal practices because they believed clothes dryers were wasteful appliances: 'I would never have a dryer. Too much energy. No, No, No!' (RG2, 22). 'I think it's just a waste of everything' (RG3, 40). Consequently, it was rare for householders to use an electric dryer as the predominant method of drying clothes, and those that did described it as their 'downfall' (RG2, 21).

While the convenience of the clothes dryer sometimes took precedence over other less energy-consuming laundry drying practices, environmental understandings regarding acceptable energy usage normally took precedence over presentability understandings in the

laundry (such as concerns about drying laundry around the house or hanging it in view of the neighbours). Unlike countries such as the USA, where hanging laundry outside 'is seen as aesthetically unappealing and harmful to property values' (Browne 2008), households involved in this study found it acceptable. This is likely related to the cultural significance of the Hills Hoist clothesline, which was invented in Australia, and has been a desirable feature of the quintessential suburban backyard for more than 60 years (Browne 2008).

As with clothes dryers, many householders believed that taking a bath was 'such a waste' (RG1, 17), although exceptions were made for children. Some householders talked nostalgically about the time when taking baths was socially acceptable:

> Only when the grandson comes do we use it. There's been many times I would have liked to laze in there, but when I give him a bath I only put a little bit of water in and he says, 'not much water Grandma! I have more at home'. And I say 'I know, but we've got water restrictions!' (RG4, 53).

In some cases, householders justified taking weekly or more frequent baths by washing infrequently, not filling up the bath, sharing the bath with others, or bucketing bathwater to the garden. Thus, they attempted to compensate for their understanding of baths as a wasteful activity through other means. Similarly, there were many other instances where householders reported making modifications to their comfort and cleanliness practices in order to 'save' energy and water, such as turning down heaters and air-conditioners; taking shorter showers; using water-efficient showerheads, flow restrictors or buckets in the shower; and installing water tanks or grey-water systems. However, in these examples, while practices were modified to meet new environmental understandings, they *co-existed with* existing understandings of smell, sweat, hygiene and presentability, rather than replacing them.

Many householders considered being identifiable as an 'environmental' citizen and displaying these actions to others important. Signs were hung both inside and outside the home to indicate householders' commitment to the environment (see figures 5.3 and 5.4), and householders were excited to show me all of their 'environmental' acquisitions and inventions during the household tour. In this sense, common understandings of presentability were merging with new environmental understandings as householders took pride in their new 'green' status symbols. For example, householders had predominantly chosen to undertake visible actions, such as changing their light bulbs or purchasing energy or water-efficient appliances, rather than less visible actions, such as draught-proofing their house or installing insulation. Wilk and Wilhite (1985) report similar findings in their ethnographic study of weather-proofing actions, which they argue are largely unattractive to householders because

of their invisible and unglamorous nature. Furthermore, like presentability, smell and hygiene, environmental understandings are becoming increasingly 'policed' in society as neighbours 'dob in' each other for inappropriate water usage such as the flaunting of outside water restrictions. This was another reason why householders signposted their 'green' acquisitions, such as water tanks and grey-water systems (see Figure 5.3).

Figure 5.3: Water tank sign outside a residential property

Source: RG1, 7, 9 May 2007

Figure 5.4: 'Fixaflush' toilet sign hanging above a household's toilet

Source: RG2, 20, 24 August 2007

Dynamic understandings

Although I have discussed common understandings pertaining to comfort and cleanliness practices separately in this section, these understandings were often intermingled and not openly expressed, manifesting themselves in the frequencies with which bathing, laundering, house cleaning and toilet flushing practices were undertaken:

> Most things are worn once and then they go in the wash. We will reuse our clothes that we wear at home. I don't wash all my stuff every time because a lot of it's hand wash, so when I get home from work I change and then I put on some pants and a t-shirt and I wouldn't wash that every day; every third day, second or third day. Same as him, he reuses his shirts when he gets home — I wash his business shirt every day and the kids' uniforms I wash each day. Their pyjamas I wash usually every day, maybe every second day (RG4, 59).

In this example, clothes that are worn *inside* the home (and therefore not subject to close encounters with other people who may be able to *see* or *smell* them) can be worn more than once, whereas clothes worn *outside* require more frequent laundering. However, some items, such as pyjamas, which are close to the body but are not subject to public scrutiny, may also require frequent laundering, presumably for hygiene reasons. Similarly, Table 5.9 illustrates how additional activities which led to sweating or social contact encouraged householders to shower more frequently. Thus, common understandings of sweat, smell and presentability intermingled to encourage individual practice variations based on householders' interactions with others and the alternative practices they were engaged in.

Table 5.9: Interruptions to showering routines attributed to common understandings of smell, sweat and presentability

If you're going out every day, we have a shower every day … I mean if I've got three funerals in a week at the church I'll have a shower every day sort of thing but if I don't, then yeah, I'll go a couple of days without (RG4, 52).
Yeah, I might shower twice a day. If we're going out at night I'll always shower before we go out (RG4, 51).
If you're going to someone's house on Saturday, well, you're not going to turn up sweaty and smelly, and if I'm home, even if I'm not going out somewhere, I would have worked in the garden (RG1, 17).
Once a week I play tennis so I shower before I go and I shower when I come home (RG4, 53).
He has … a bath to warm up [for football] and then he has the shower afterwards when he gets home (RG4, 59).

Practice variations emerging from dynamic understandings also emerged from the visual and sensory monitoring of household comfort and cleanliness practices, a process which Martens (2007) refers to as 'deregulation', whereby householders respond to 'trigger points' rather than engaging in regular routines. For example, some householders described how they only washed linen and towels on an: 'as needs basis, like I think, "I wouldn't want to use that again!"' (RG2, 27); or: 'when they start to smell' (RG4, 61). Other householders only cleaned their homes when they: 'absolutely have to. When It's so disgusting that I have to do something about it' (RG1, 2); or when it's: 'getting to the stage where it's getting fertile' (RG2, 23). In these cases, householders reached a 'tolerance point' that prompted them to clean (RG1, 8). For example, householders reported inspecting and 'sniff-testing' articles of clothing to decide whether or not they required laundering:

> If they look clean and they're not going too crinkly they just go back in the cupboard (RG3, 34).

> [My partner], he's good, he'll say 'I've hung that back up', or 'I'll get another wear out of that', or 'I'll wear that tomorrow' (RG4, 47).

> [Pants] get hung up again if I haven't been real sweaty (RG4, 45).

In contrast, other householders had routinised these practices to help them keep their house cleaning to a 'manageable level' (RG1, 14): 'if you don't clean it gets worse and worse' (RG1, 15).

As discussed previously, such understandings were neither universal nor persistent. Indeed some householders actively resisted or rebelled against these understandings. However, they did so with an awareness that a common understanding existed, and were often careful not to reveal their resistance to others. In most cases, householders did not contest common understandings of smell or presentability, but rather the normative frequencies with which most people were thought to shower, launder and clean in order to maintain acceptable 'standards'. For example, while the following householder discussed how she was 'naughty' because she didn't shower every day, she still conformed to common body odour understandings:

> It's a bit naughty, but I don't always bathe every day now. … I've actually told a few friends because I'm interested in their reactions … but I sort of think … I don't offend people with my smell, so if I only shower four times a week that's three showers less of water (RG1, 19).

Other householders expressed embarrassment when they rebelled against their understanding of appropriate showering, laundering or house cleaning frequencies and expectations. For example, some householders felt they should wash their pants, jackets or jumpers more often, even though they did not smell and were not obviously marked: 'The pants I've got on haven't been washed in… a while [Laughter]. It'll last us a week's worth of wear… or maybe longer [Laughter]' (RG4, 50).

In contrast, children were often unaware of common understandings of smell, sweat, presentability or hygiene, and were being taught these by their parents. Therefore children were often more receptive to environmental understandings promoted in schools, leading to practices such as infrequent bathing. However, in these cases the recommendations (or enforcements) of their parents often overrode these children's disregard for personal body odour, hygiene and presentability:

> [They shower] every two or three days when they can get away with it (RG2, 28).
>
> I have to chuck him in (RG1, 2, referring to young son).
>
> Mum's trying to get you to shower more, isn't she? (RG1, 4).

Children were also taught to bathe more frequently when they started attending school, demonstrating how bathing practices emerge from social contexts and contact: 'I like to have them sort of clean when they go to school, so he would have a shower every morning generally when he's here' (RG4, 49). Similarly, parents were teaching their children when it was appropriate, and not appropriate, to flush the toilet. This led to difficulties where children didn't understand the social distinction between flushing for 'Number Twos', which can be smelly and unpresentable, but not for 'Number Ones':

> The girls flush once a year … they can't be bothered. It's a real problem. Well that's the problem, they don't flush at all (RG2, 23).
>
> We flush for Number Twos only, but that leads to problems because [my son] just doesn't flush toilet at all (RG2, 28).

The examples discussed in this section suggest that common understandings form an influential social and cultural backdrop for setting appropriate expectations, standards and practices — even though they are interpreted, manipulated and contested in different ways —

an issue I return to in Chapter 6. I now turn to another influential component of householders' comfort and cleanliness practices, namely their material composition.

Material infrastructures

Material infrastructures, from pipes, electrical sockets and everyday household technologies through to the housing envelope itself, are an integral component of current comfort and cleanliness configurations. Similarly, energy, water, soap and detergents are integral resources used to undertake these practices. Such everyday objects and services are so pervasive and ubiquitous that it is hard to imagine life without them. However, their mundane and often hidden status has led some researchers to overlook or undervalue their role in the composition of practices (Reckwitz 2002a).

Having said that, historical and current accounts of comfort and cleanliness are littered with examples of how material infrastructures, technologies and systems of resource provision shape and 'lock in' the practices they support (Ackermann 2002; Ashenburg 2007; Bijker 1999; Bijker *et al.* 1987; Cooper 1998; Rybczynski 1986; Schwartz Cowan 1989; Vinikas 1992). For example, Lin and Iyer (2007) discuss how the introduction of drum washing machines in China is changing the practice of laundering by 'scripting' in the use of hot water. Similarly, Schwartz Cowan (1989) argues that the introduction of washing machines and other domestic technologies has paved the way for common body odour, presentability and hygiene understandings discussed previously. Likewise, air-conditioning and heating technologies have led to new definitions of comfort which prioritise the control of temperature and humidity in indoor environments (Cooper 1998).

How, then, did the material infrastructure of the home and the objects within it shape householders' doings and sayings in this study? To what extent were these technologies 'scripting' and 'moralising' particular practice configurations? In this section, I address these questions by discussing the types of practices prioritised and legitimised through current comfort and cleanliness appliances and housing infrastructures. Although I focus on visible material infrastructures inside the home, it is important to acknowledge the invisible infrastructures that make such technologies and housing formats possible, such as piped hot and cold water, and unwavering electricity supply — an issue I return to in later chapters of this thesis.

Scripting practices into appliances

Appliances and technologies directly shaped many householders' comfort and cleanliness practices. One example was the prioritisation of particular temperature ranges in householders' comfort practices through thermostatically controlled heaters and air-

conditioners. While householders reported setting their thermostats at 15–23 degrees in winter and 20–25 in summer, they also reported feeling comfortable in a much wider band of temperatures. For example, householders with air-conditioning reported feeling comfortable at 30–35 degrees:

> I've got no problem with opening a window with anything up to probably 30 odd degrees, but for me really It's just when it gets up above 35 that I've got a preference for air-conditioning (RG2, 24).

> Thirty degrees would be when I'd start to think about it. But I wouldn't really feel uncomfortable at 30 degrees in here, particularly if there's a bit of a breeze. … I like it [the air-conditioner temperature] a little bit colder. I like my beer cold and I like my house cooler (RG4, 62).

As the last quote demonstrates, householders reported setting their air-conditioner thermostats to a much lower temperature than they found comfortable because they liked the coolth that it generated (Prins 1992).

Following Akrich (1992) we can hypothesise that the heating and cooling appliances in these households 'scripted' particular thermostatic ranges into comfort practices. This may relate to householders' understandings of how air-conditioners and heaters operate (Kempton *et al.* 1992a; Lutzenhiser 1992), their past experiences of homogenised artificial heating and cooling in office environments (de Dear & Brager 2002) or, indeed, how they are told these appliances *should* be operated by energy providers, appliance manufacturers and government campaigns (EA 2007a; SV 2009). As a result, air-conditioners and heaters inadvertently legitimise cooler or warmer temperatures than most householders report needing in order to feel comfortable. Furthermore, the energy, monetary and environmental impact of heating or cooling a home to a lower or higher temperature than 'normal' is invisible at the time of usage — only reflected indirectly in monthly or quarterly energy bills.

Similar discrepancies in definitions of 'comfortable' environments have been reported in comparative studies between naturally ventilated and climate-controlled commercial buildings, where researchers have found that occupants are willing to accept a wider range of temperatures when offices are naturally heated or cooled (Brager & de Dear 2003; Brager *et al.* 2004; Busch 1992; de Dear 2007; de Dear & Brager 2002; Nicol & Roaf 2007). In contrast, most respondents in climate-controlled environments report being uncomfortable outside the narrow range of temperatures prioritised by comfort appliances and standards such as ASHRAE's (2004). The narrowing of temperature tolerances in air-conditioned office

environments is attributed to the addictive nature of homogenous and static indoor climatic regimes (Brager & de Dear 2003; Prins 1992), as well as occupants' inability to control their own environment, for example, by opening a window (Brager *et al.* 2004). Such studies clearly demonstrate the ways in which particular forms of comfort can be scripted into heating and cooling appliances.

Washing machines (along with clothing labels) made more direct requests of householders than air-conditioners, advising explicit conditions necessary to produce 'clean' articles or categories of clothing and linen, such as 'woolens' or 'delicates'. The legacies of previous washing machines also influenced laundering practices based on householders' practical experiences (and accumulated knowledge) with historical versions of these machines. For example, in Table 5.10, householders with front-loading washing machines discuss how they used warm or hot water because these machines used fewer resources than 'conventional' top-loading machines, or because they were less vigorous in their washing action. Similarly, householders used water-saving and energy-saving features to justify actions, such as not washing full loads of laundry because of water level sensors, or washing laundry in hot water because the cycle is shorter than 'normal'. Likewise, householders' understandings of how detergents work and recommendations made by detergent companies scripted particular actions into laundering practices (see Table 5.10).

In contrast, the use of 'wasteful' washing machines was sometimes justified by householders because the water they consumed was implicated in other practices, such as watering the garden:

> The washing machine is very wasteful and I feel guilty. But I can't throw out something that's working, and I've got a second problem. Once I change the washing machine, where am I going to get the garden water from? This is all a circular bit of madness here, but I use it to grow my vegetables (RG3, 27).

These findings correlate with other research which has found that washing machines are becoming increasingly more efficient but invoking less-efficient practices as householders wash more articles in smaller quantities (Slob & Verbeek 2006). Thus, material infrastructures can be extremely instrumental in establishing new practices (i.e. air-conditioned cooling) and modifying existing ones (i.e. laundering) through new and historical scripts.

Table 5.10: Scripting laundering practices into washing machines

WOMAN:	I always used to use cold water. But now apparently this one it's more efficient with warm water.
MAN:	Well it doesn't use a lot of water. You have to be careful with these, with what we have, because there are a number of things that could go wrong if you don't follow the instructions fairly well. I think, because it doesn't use a lot of water … if it says you need warm water, then you have warm water for what you are doing. …
INTERVIEWER:	And have you found that in practice that is true? That clothes are cleaner in warm water?
WOMAN:	I don't think so. I mean sweaters and things like that I would always wash in warm water, whether it was this new machine or the old machine we had. But underclothes, I spray them all first before I wash them anyway. So I think cold water makes them come out just as clean (RG4, 48).

Forty [degrees is] fine for most things. … Towels and sheets get washed at 70 degrees because it takes less time with the washing machine cycle (RG2, 23).

I think the perception is that unless you use cold water detergent you have to use warm water. ... and the stuff we use is a green detergent (RG1, 18).

Because it's a front loader, it's saving on water but you have to buy the special powder for the front loader and as far as I can see it's not for cold water wash. Before we had the front loader we used to … buy Cold Power and all those detergents for cold water, but as far as I can see the front loader powders, which there aren't many of, and they're expensive, …. they don't mention cold water (RG4, 61).

I probably got talked into this front-end loader but I feel like I don't want to put as many clothes in the front-end loader as the top one... I just don't think they sort of go around as well. I like the agitator: 'swosh, swosh, swosh'. I don't know if I'd buy another one (RG4, 47).

Scripting comfort practices into housing infrastructures

Changing housing infrastructures, such as the decline in insulation, eaves, solar orientation, shading, windows and sectioned rooms, were prioritising new mechanical forms of comfort in households:

> I get a real bee in my bonnet about new houses because really practical basic things are not being done, like no eaves. It's really crazy for a country like ours to have houses built without eaves. It's so easy to put insulation in the walls and the roof at the building stage. It's not, compared to the overall cost of the house, it's not a big cost. It should be mandatory or, like the rebates for the solar panels, they should be rebating insulation in houses (RG3, 40).

While Australian consultants have argued that the declining cost of air-conditioners is a key factor in their rapid diffusion (EES 2006; Wilkenfeld 2004), householders often cited this as secondary to the lack of comfort features in their housing infrastructure. Therefore, the fundamental motivation for wanting air-conditioning (or better heating) emerged from

householders' perceptions that their houses were excessively or uncomfortably hot (or cold). The declining cost of these appliances allowed householders to purchase or install air-conditioning *in response* to this underlying issue. The following householders illustrate this point:

> We couldn't afford it for years. We would absolutely sweat up here like a hot box because I couldn't afford to get the curtains when the builder went bankrupt. … It would be lovely in the winter because it was warmer, but in the summer it was shocking (RG4, 48).

> It has no insulation. It's awful in summer and freezing in winter (RG3, 34)

> It was awful. The wooden blinds don't hold out any heat and there's no eaves. We thought we could survive without it [air-conditioning] but we couldn't (RG2, 21).

In contrast, householders that didn't have air-conditioning described how the careful design and control of their housing infrastructure kept them cool:

> MAN: Being light coloured brick with Venetians and shutters on all the windows, we can keep it fairly cool.
> WOMAN: But if we have had terribly hot days, we just close up all the room shutters all around the house and the house stays beautifully cool. It's not a cold house either really is it?
> MAN: The roof insulation I think has kept the temperature down probably two degrees Celsius in the heat (RG4, 44).

> It's double brick on sandstone so it stays quite cool anyway. It's only when you really get the super heat for days on end this house heats up and then it takes a long time to cool down the thermal masses of the bricks (RG4, 56).

Similarly, householders moving into the Currumbin EcoVillage (RG3), where air-conditioning is banned and heating appliances discouraged, had thought significantly about the design of their house to maximise comfort; indeed it was a requirement of living there to do so. Comfort practices in these households were based on an 'adaptive' or 'manual' model of comfort (Humphreys & Nicol 1998) which required constant engagement with, and management of, the housing infrastructure. RG3 householders who had moved into the EcoVillage talked

about how the 'manual' features of their home had replaced mechanical heating and cooling appliances:

> I don't think we'll need it [a heater] because the key to it is learning how to operate the windows and doors… It's about learning to control the house (RG3, 38).

> Instead of pressing buttons and having an electrical mechanism heating and cooling our house, he [referring to EcoVillage Sales Manager] said, 'this is a manual house. You open and close windows. You shade off certain parts of the house for certain periods of the year and you keep hot sun out and you open shade and let winter sun in, and it's all done manually. You stay conscious of your house and the climatic change around your house to heat and cool your house.' And it works (RG3, 40).

These householders were highly satisfied with the comfort provided by this adaptive approach: 'it's just the nicest environment inside the house. It really, truly is' (RG3, 40). Such examples serve to demonstrate how housing infrastructures can prioritise both adaptive and mechanical forms of comfort and how these different approaches can be considered equally desirable and comfortable by householders.

The scripts of everyday life

While recognition of technology's scripting role is prompting the invention of new persuasive domestic technologies (Arroyo *et al.* 2005), there has been scant attention paid to the scripts embedded into *existing* domestic technologies and infrastructures which are pervasive aspects of everyday life (Shove *et al.* 2007; Verbeek 2006). However, these findings suggest that analyses of material infrastructures and their role in configuring practices are urgently required. Appliances can inadvertently legitimise and justify specific practices, such as not washing full loads of laundry in a water-efficient washing machine (Slob & Verbeek 2006), as well as explicitly recommend practices, such as washing woollens at 40 degrees Celsius. Similarly, the decline of thermally adaptive housing infrastructures in Australia (Pears 2007; Wilkenfeld 2007) is likely to promote and prioritise air-conditioned comfort. However, alternative housing formats, such as those mandated in the Currumbin EcoVillage, demonstrate that 'manual' comfort practices can be as or more desirable than those relying on heating and cooling appliances. Thus, householders' understandings about 'necessary' comfort requirements, as well as their desire for particular types of comfort, are embodied within, and emerge out of, their available material infrastructures.

Dynamic composition

This chapter has undertaken the crucial role of dissecting a limited selection of householders' comfort and cleanliness doings and sayings in order to offer an explanation of their composition that diverges from representational accounts of behaviour. I began this chapter by highlighting the diversity and commonality between householders' practices. I argued that this seeming contradiction could be explained by examining the components binding practices together. I homed in on two of these components which came to the forefront in my analysis of householders' practices. In particular, I showed how understandings of presentability, sweat and smell, hygiene, cosiness and new environmental expectations overlapped and intermingled to produce loosely based definitions of appropriate, normal and necessary practices. I also demonstrated how aspects of householders' practices were 'scripted' through particular appliances and infrastructures implicated in achieving comfort and cleanliness. In the case of laundering, such understandings and infrastructures manifest themselves in the production of 'clean' clothing and linen, which must look and smell a particular way, achieve a particular standard of hygiene, and commonly involve a washing machine and the resources it depends on, such as water, electricity and detergent. A similar common set of characteristics can be identified for heating and cooling practices, which rely on a range of appliances, infrastructures and understandings used to produce and maintain a comfortable and cosy environment.

However, such technologies, infrastructures and understandings are not static components of practices, but rather changing and overlapping processes. New emerging understandings, such as environmental expectations, converge, compete and mingle with others, such as presentability or hygiene. Similarly, material infrastructures continue to change, such as the recent rise in air-conditioners and front-loading washing machines. Furthermore, understandings and material infrastructures do not *determine* a practice — they are only part of it. Indeed the characteristics of a practice are often contested, resisted and interpreted in different ways. How then, do we explain and understand how practices emerge, persist and change? In the following chapter, I address this question, and the tensions and complexities it raises, through an analysis of the processes of practice reproduction in households.

Chapter 6: Comfort and cleanliness practices: emergence, persistence and change

As outlined in Chapter 3, a practice is both a co-ordinated entity of doings and sayings and a recurring performance — the role of which 'actualizes and sustains practices in the sense of nexuses' (Schatzki 2002, p. 134). The routinisation of these day-to-day performances is necessary to create 'a secure and liveable everyday life, where we are not compelled to do the overwhelming task of reflecting on every single act' (Gram-Hanssen 2008, p. 1182). It is through this reproduction that practices are established, sustained and transformed. In this chapter I am concerned with how the common and diverse doings and sayings discussed in Chapter 5 emerge, persist and change in the course of everyday life. In analysing householders' comfort and cleanliness practices as processes of reproduction, I demonstrate how practices do not change in large and obvious 'chunks', nor necessarily through conscious reflection, but rather through 'changes in the social organisation of everyday life' (Gram-Hanssen 2008, p. 1181).

This chapter is divided into three types of practice reproduction and reconfiguration identified from the data analysis of household research activities conducted in all RGs. I begin with *faithful reproductions*, which refer to practice performances consistent with householders' practical knowledge of how a practice *should* be undertaken, based on their childhood and life experiences with it. I show how this practical knowledge can become deeply embedded within practices, so that householders are no longer able to account for why they undertake them, making them extremely resistant to change. Secondly, I discuss the *active reconfiguration* of practices, whereby performances are negotiated, debated and contested within and between households, becoming a constant source of change. Thirdly, I show how householders reproduce practices that reflect attempts by institutions and other interest groups to *deliberately reconfigure* them in more or less resource-intensive directions. Householders accept or reject these deliberate reconfigurations in the context of their faithful reproductions and active reconfigurations. I conclude this chapter by arguing that these processes of reproduction and reconfiguration interact in everyday life to produce subtle transformations, as well as pockets of persistence and resistance.

Faithful reproductions

Householders learned and relearned what constituted an appropriate practice and how to undertake it during their childhood and throughout their lives through their direct experiences with it. Unsurprisingly, many of these experiences and reproductions were similar to those of

other householders, due to the historically and culturally specific understandings, conventions and infrastructures that loosely hold a practice together at particular points in time. Householders often identified these faithful reproductions as the reason for their practices, referring to their childhood or life experiences, and interactions with energy or water supply systems and infrastructures. In this section, I discuss various processes of faithful reproduction and show how they can become deeply embodied in a practice — that is, largely unconscious or taken for granted by the 'carrier' of the practice. I conclude by arguing that, while faithful reproductions can be changed through influential life experiences, they do so with reference to their historical composition. Thus, this analysis serves to highlight how householders' practices persist as a result of their experiences with a practice — which often represents a largely non-negotiable platform from which reconfiguration and transformation occurs.

Faithful childhood reproductions

Many householders explained their practices with respect to their childhoods or upbringings: 'I think most of the things I do are second nature from growing up' (RG4, 50). The relative stability of cleanliness technologies and infrastructures during most householders' lifetimes was a major factor in the persistent influence of childhood experiences in householders' current bathing, laundering and house cleaning practices. Only elderly householders were able to discuss changes to these practices which had occurred throughout their lifetimes. Nonetheless, older householders still described how remnants of their childhood experiences influenced current practices, such as their conservative use of water:

> Most old people are more protective of water than young people are, because we were brought up that way … What I was saying about our age group, is that we come from a time when people didn't shower or bath every day. You were lucky if you had one once a week I think, when we were kids (RG1, 12).

Such faithful reproductions were therefore incredibly persistent, even though they were often not evident in their original form (i.e. weekly bathing). As the householder above describes, they often formed a backdrop from which other practices emerged. Similarly, some householders described their cleanliness practices as a type of instinct based on knowledge learnt at a young age. Table 6.1 provides illustrative examples of this childhood practical knowledge faithfully informing laundering, house cleaning and bathing reproductions.

Table 6.1: Faithful reproductions of showering, house cleaning and laundering practices

Showering	House cleaning	Laundering
I was always brought up, a shower every day, that's just not negotiable (RG1, 19).	Oh, I like the place clean. I couldn't live in a pigsty. I was brought up like that and my Mum's place was always like that. It's something I've always done (RG4, 53).	I use the special Cold Power [laundry detergent]. I don't know why. … that's just the way I've always been brought up, yeah (RG4, 60).
It's one of those things that's drummed into you (RG3, 29).	I think you're brought up with a certain standard that you want to keep (RG1, 3).	I think that comes from my mother. She was like that. She was very house proud (RG4, 62).
That's what you do! … That's the way we've been brought up from the year dot (RG4, 52).		MAN: We always got told to use cold water. WOMAN: I grew up using cold water. INTERVIEWER: You always got told by whom? MAN: My Mum. Cold water, cold water, cold water (RG4, 59).
		And I guess I was just doing it out of habit, from what I'd learned through the ages from my mother and, because I've always done my own washing. I mean we were ironing our own washing at age eight or nine. It's just the way it was done. There were nine kids in our house and when I went to my own places, yeah 30 degrees for colours and 40 degrees for whites is what I've always ever done. … We've been trained that heat will get that actual stain out of the clothes (RG4, 40).

Although air-conditioned cooling practices were less likely to be influenced by childhood experiences due to the relatively recent diffusion of this appliance (EES 2006), householders reported learning a range of other comfort practices during their childhoods which they continued to undertake:

> Well my mother always told me to seal it [the house] up (RG4, 61).

> Yeah, I think Mum used to shut the hallway door all the time and so she'd keep the cool or the heat in the three rooms and here'd be little me sitting in my room freezing my butt off or sweating my butt off, one or the other. But yeah, I think that's just the way I've always been brought up. If you're not using it, close the door (RG4, 60).

In some cases, householders discussed how faithful reproductions were difficult to change when they moved to Australia from another country, even though these practices were not considered appropriate in their new country:

> I think that's also habit [sleeping with extra blankets], because in England you're so use to sleeping with so much weight for warmth that I really miss the weight (RG3, 41).

Similarly, in Table 6.2, householders discuss how they had continued with their English bathing routines after migrating to Australia. As the emphasis added to these quotes suggests, these householders were sensitive to the fact that the frequency of their bathing practices was inconsistent with their understanding of Australian showering practices. Therefore, in some instances, new understandings specific to the Australian culture overrode householders' practical experiences from England as they adapted to the 'Australian way' (RG4, 48; see Table 6.2).

Table 6.2: Faithful English bathing reproductions

I shower ever other day*, and that's not to say I'm a dirty Pom* (RG4, 46, emphasis added).
MAN: And half of us who come from England bathe once a week or once a month. WOMAN: *That's naughty.* MAN: Well, that's the habit in England (RG4, 44, emphasis added).
Coming from England, I don't take particularly long showers anyway... It's too cold in England and I think you get into the habit of having very quick, short showers (RG3, 41).
But once again, coming from England, you were lucky to have a bath once a week there because we didn't have showers. We come from pretty poor families didn't we? You didn't have proper bathrooms over there. So therefore I think that sort of rubs off a little bit. …*but after a while you just get into the Australian way*. I used to shower every single day when I was working because I needed to. Sometimes it used to be twice a day. But now, because I'm retired and have a different lifestyle, I don't think I need to (RG4, 48, emphasis added).
WOMAN: It's probably not necessary [to shower every day]. MAN: I didn't have a bath or shower every day when I was a kid. ... People have just got a cleanliness fascination ... WOMAN: Cultural understandings. MAN: I don't want to be thought of as British by not showering (RG2, 25).

In other instances, householders discussed how they had rebelled against their childhood experiences:

> I grew up in … my grandmother's house, where all the blinds were drawn shut because the sun would fade everything and I couldn't stand it. You know when I'd walk in as a teenager, I'd go open the blinds so that the light would

> come in and she would go around behind me and close them again. So I vowed and declared — and I've always, ever since I've been married, I've always loved light and fresh air, and in this house that we built from scratch, I said I want plenty of windows (RG4, 56).

Thus, childhood experiences, while often faithfully reproduced by householders, were also subject to change based on householders' positive or negative impressions of them and their perceived relevance within alternative social and cultural contexts.

Life experiences

In addition to childhood experiences, householders' life experiences significantly informed their faithful reproduction of cleanliness practices and, to a lesser extent, comfort practices. In the following examples householders discuss how their experiences with water and energy restrictions in the navy and army were instilled into their showering practices today:

> I think it's sort of something from my navy days, you know. You come out of the engine room and the first thing you do, you have a shower, and a couple of beers of course. … I just don't feel right if I don't do it, you know? (RG4, 64).

> I'm an old navy man, we didn't have much water in the ships so therefore you have a quick shower. You do all your necessary things (RG4, 58).

MAN:	Well the first ship I was on, we ran out of water, 1958, there was no desalination plant on then so we had to shower and that in salt water and save the drinking water for cooking and drinking …
INTERVIEWER:	But how has that changed the way you might use water now?
MAN:	I'm very careful how I use water (RG4, 62)

In other examples shown in Table 6.3, householders discussed how their life experiences with frugal water usage were only drawn on when necessary, such as during the recent drought and consequent water restrictions. While these life experiences were not reproduced on a daily basis, they represented the first bank of knowledge householders drew on when water conservation was required. Thus householders drew on these faithful accounts of their own life experiences to determine what would make sense for them to do in a period of drought or water restrictions.

These findings support Head's (2008) study of water practices in Australia, and Sofoulis *et al.*'s (2005) analysis of Sydneysiders' cleanliness practices, which both found that many participants' response to the current drought were built on a longstanding ethic of not wasting that emerged from past water-conserving practices. However, not all householders were exposed to these personal experiences that informed them about alternative practices and, as with childhood experiences, householders sometimes rebelled against them: 'I don't like cold showers [on hot days] because I had them in the army' (RG4, 44). Thus, these experiences led to new and persistent faithful reproductions in differing and varying ways and contexts.

Table 6.3: Drawing on past experiences to save water

And then it clicked, I remembered that as a child, and living in Africa, we would fill up the bath with water — I mean the children washed, then the woman then the men last, and that went into the garden. So we really saved water. We were really conscious, and I thought, I better go back to this (RG3, 35).
I lived at sea for four years so I can … [shower] very quickly if I have to. At sea you have water restrictions. A couple of minutes I can get in and out (RG4, 65).
We've travelled a lot so we've learnt how to compromise with a small amount of clothes and switch and change them around and that (RG4, 56).
Going around Australia in a caravan you have to learn with very minimal things …so we only have a shower once a day (RG3, 33).
We were inadvertently learning this way of living by travelling in a caravan for two or three years in national parks where we had limited facilities. We only had solar power and we had to be more conservative with everything we were doing (RG3, 37).
When I went on a Navy ship … we were guests on board, but … because they'd reduced water, you were only allowed, I can't remember the time limit now, but … you had an instructional video shown to you and you had to watch this video and it was for all the parents and siblings that were there. You go in, get wet, turn the water off, lather up, go in, and wash off again. Since then, I tend to dive into the shower. I get wet, lather up. My partner sits there and goes 'gee', you know, like it's ten seconds and I'm out of the shower again (RG4, 50).

Past interactions with water infrastructures

Householders' past interactions with various water supply systems also shaped their cleanliness practices. As shown in Table 6.4, householders who had grown up on rainwater reported being naturally conscious of their usage during the current drought, as well as more willing and able to do something about it. Similarly, householders who had grown up during previous droughts, in a rural setting, or who had experienced water shortages, discussed how some of their current cleanliness practices were faithfully reproduced based on past experiences with limited supply systems, and how they used this practical knowledge to save water in the current drought (see Table 6.4). Support for this finding comes from a related study conducted by researchers from the University of Western Sydney, who found that

people from a rural background were more willing and able to take action to save water during what they perceived as a natural crisis or water shortage (Sofoulis *et al.* 2005). In contrast, householders' did not report any current practice reconfigurations resulting from past interactions with energy systems and infrastructures.

Table 6.4: Past experiences with water supply systems

I was brought up on a small farm in West Ireland where resources and the conserving of resources was fairly important and I think that's embedded in my brain and I think that whatever my financial circumstances were, I'd be aware of the necessity not to be just an arch-consumer (RG4, 49).
I've always been a water-saver, having been brought up in the country, but now I try and make the water, I give it two uses, by that I mean, if I'm rinsing something I save all that water in the sink (RG3, 29).
Growing up on a farm you grow up with tanks and so showers are one minute showers. You're in and out. I mean I grew up not wasting water. … You don't leave the tap running, because you run out of water too quickly. And we only had one tank to run a household with four people in it, so I grew up trying to save water (RG4, 50).
We knew how to conserve from our farming days, when you couldn't afford to waste. … It comes back to when we were on the farm, because [my partner] grew up on a farm and so did I, and water was very, very precious ... and that's been built into us from when we were babies. … It comes back to habits – from when we were on the farm. I mean water was precious everywhere (RG4, 54).
I think that's what made me a bit water-savvy. Because when we were kids, we had to be very careful with water and … Terrigal Lake used to be lovely and clean. And when the water tank was getting low you'd go down to the lake and you'd have a big swim and then you'd have a wash in the lake, because you couldn't afford to waste the water (RG4, 53).

However, householders' past experiences with water shortages and the frugal cleanliness practices often resulting from them did not always lead to faithful reproductions when access to a centrally supplied water system was restored:

> INTERVIEWER: So do you think differently about water because of those experiences?
>
> MAN: No. I just think it's marvellous that you can drink water out of a tap. It's so much easier. No dead frogs that you can see in tanks and that sort of thing! (RG4, 61)

Nonetheless, these householders reported being more appreciative of current water supply systems as a result of their previous experiences:

> WOMAN: Yes, I used to live in the bush when I was young. We had 2000 gallon tanks and we survived, my grandparents and myself.
>
> INTERVIEWER: Do you think you're more frugal with water as a result of that?

WOMAN: Oh very much more frugal. Then we were.

INTERVIEWER: And now?

WOMAN: Now? No, I don't think it has any effect now but... oh, I suppose but you become conditioned I think. ... Well even when I moved and did my nursing training in … a big town and there was showers and hot and cold running water... I can remember I'd go home on my days off, to the bush again, and come back and think 'wow!' — first thing I did was hop in the shower (RG4, 52)

Thus, householders' past experiences with local supply systems, such as rainwater tanks, and water shortages may lead to faithful reproductions that increase or decrease the resource intensity of current cleanliness practices.

Embodied faithful reproductions

In the conceptual framework of practices introduced in Chapter 3, I suggested that layers of tacit and unquestioned knowledge can become embodied in practices as unconscious or taken for granted practical knowledge (Bourdieu 2005; Giddens 1984) so that the reasons for undertaking the practice are no longer easily identifiable to the person reproducing it. In this sense, routines can be viewed as a force in their own right, embedded in the flow of everyday life (Gram-Hanssen 2008; Shove 2003a). Evidence of these embodied reproductions was demonstrated by many householders involved in this research who were unable to explain or account for their routines: 'It's an automatic thing. Some things we wear again and again, but other things — underwear and socks — are in the wash every day' (RG2, 26).

Following Wilk (1999, p. 6.2), we can understand householders' seeming inability to provide reasons for some of their practices as evidence of the 'unconscious (doxic) realm of taken for granted common sense and habitual practice'. Wilk (2002) argues that these 'doxic' habits can become absorbed into the body as feelings or needs, such as disgust or comfort. Examples of these 'needs' were provided by householders discussing cleanliness practices such as ironing:

> I cannot *bear* to take out a tea towel that hasn't been ironed (RG3, 44).

> [I iron] tea-towels, hankies, pillowcases, but nothing that I don't need to (RG2, 26).

> Everything that you'd say needs to be ironed, I iron. Well, not singlets, but tops and all that — I like to press those (RG4, 47).

Similarly, many householders talked about 'needing' to do the laundry as a type of intuitive practice: 'I guess it's just intuition if I feel it needs to be washed' (RG1, 13). Other householders couldn't articulate, when asked, why they washed their laundry in warm instead of cold water:

> I guess I'm used to doing it. … Maybe it's a psychological belief? It's just habit, so maybe I need to look into doing it differently (RG4, 43).

In the bathroom, householders expressed a strong need to shower or bath regularly which they could not explain:

> I don't think I smell but my body doesn't feel right unless I do. It's what I am used to I suppose (RG1, 13).

> It just becomes a habit. Your body feels like you have to. You get used to it (RG4 54).

> I don't jump in there for any particular reason. It's out of habit I suppose (RG1, 15).

Following these discussions, some householders began to question their own practices and search for reasons for them: 'yeah, I'm wondering why I do that now' (RG1, 19). Similarly, diary entries written following the interview prompted some respondents to begin questioning their taken for granted routines:

> Since our discussion a week ago I have been rethinking what we do. We have been more aware of heater use, shower length and what is necessary washing (RG2, 21, diary).

Thus, simply asking someone to explain why they undertake a seemingly non-negotiable or obvious practice can call it into question if the person undertaking it is unable to articulate why they are doing it (Wilk 2002). However, not all practices are so easily modified, as the householder quoted above indicated at the conclusion of her diary entry: 'Sorry — I still use the drier!!!' (RG2, 21).

Such findings raise questions about people's personal preferences, beliefs and needs. Are they the product of an individual, or rather an expression of the practice they have become accustomed to? These findings suggest that the latter may in fact be the case. Indeed, one householder self-reflected on his own routines to suggest that his practices were the product of a 'cultural feeling':

> There's a hell of a lot of automatic in all this stuff. You do it, because you do it, because you do it, and all right, why do you do it that way? You develop, you have a cultural feeling to do things a certain way. ... and you get into your comfort zone and you just keep doing it because that's the way you do it. You don't necessarily question any of it (RG2, 26).

Kaufmann (1998), in his ethnographic study of laundering practices, reports similar findings. He found that not every practice or action requires an explicit definition or identification of motives. Instead, he argues that householders rely on 'habits embedded in the infinite interplay with familiar people and objects' (Kaufmann 1998, p. 21). Kaufmann (1998, p. 21), drawing on Klausmann, calls this the 'injunction', that is:

> a social construction (historical, family based, personal) which has produced the framework of assumptions triggering the action — the thing that simply has to be done. The perfect injunction is embedded somewhere beyond thought, in our ingrained automatic reflexes. … It is silent, invisible.

Thus, routines and habits which are expressed as individual tastes, urges, impulses or needs may be a product of the social and cultural history of a practice and a householder's experience of it.

How then, do embodied faithful reproductions change? This research suggests that they can be both surprisingly simple and extremely difficult to shift. While in some interviews householders were already questioning their seemingly non-negotiable routines simply because I asked them to explain them, in other cases they were expressed as non-negotiable 'needs' and modification was considered undesirable if not impossible. This is unsurprising if we view embodied reproductions as a product of naturalised or normalised *practices*, rather than as a product of specific individuals. For example, regular showering has become faithfully reproduced through our social and cultural history and experience with it, scripted into showering infrastructures, and maintained through systems of energy and water

provision. In the following discussion, I elaborate on how these faithful reproductions persist and change in households.

Sustaining and transforming faithful reproductions

As outlined above, this research suggests that faithful reproductions, which are arguably established in early childhood, change in part through new faithful reproductions resulting from life experiences and interactions with material infrastructures. However, this is not a linear process of change. People do not logically evolve to new practices as they progress through their life journey, but rather adhere to, or rebel against, their faithful reproductions in diverse ways. Therefore, faithful reproductions are best thought of as a backdrop or reference point from which practice transformation does or doesn't occur. For example, the following householder drew on her faithful laundering reproductions to discuss her observation of generational differences in the practice of laundering:

> But I've got a daughter-in-law who'll wash everything. It might only be on ten minutes and it'll be in the wash, and I can't pick on her because she's a lovely girl, but she'll say, … 'I've got a couple of things in the washing machine', and you'll look in there and all there'll be is this little top whooshing around and you think, that's a whole lot of water. So that's not very economically, but you know, that's what the young ones do — people your age (RG4, 47).

These observations challenged this women's understanding of wasteful laundering practices. Other householders acknowledged generational shifts in their own cleanliness practices as they departed from those of their upbringing, a process described by Martens (2007) as 'deregulation':

> INTERVIEWER: Do you separate the clothes out? Like colours, whites?
>
> MAN: Not like Mum used to do, no. Only something new, coloured, I'm wary of (RG4, 61).

> Like when I grew up at home Mum washed every Monday, she cleaned every Friday, and you had a routine whereas I don't really have a routine anymore (RG4, 47).

Similarly, the following householder compared faithful accounts of her own practices against others around her to determine what was 'normal' or 'acceptable':

> People are getting a bit borderline obsessive with cleanliness these days … Like my friend does a load of washing for socks and a load of washing for tops. … I could not believe it when she told me because I thought. A, it's really weird and obsessive, and B, water, you know, like, how can you do that? But she got that from her Mum whereas me, I don't even separate my whites or anything because I just don't really care enough. I don't spend money on clothes (RG1, 9).

As suggested by these quotes, faithful reproductions do not only change in response to individual experiences, but rather are rejected or sustained in response to householders' interactions with friends, family members and peers, who both actively (and indirectly) challenge and endorse current ways of doing things. In this sense, active reconfigurations can intersect with faithful reproductions, allowing previously embodied or taken for granted doings and sayings to be debated, contested and manipulated. I discuss this interaction in the following section.

Active reconfigurations

Comfort and cleanliness practices are actively reconfigured in the context of the household, where householders constantly argue, dispute and influence particular practices. These practices are also subject to conscious reflection, contestation and debate in other social contexts. In this section, I consider the social dynamics actively engaging householders with their routines. Firstly, I discuss how householders debated and negotiated their practices within the household in order to reach a compromise. Secondly, I consider how householders who were sensitive or vulnerable to particular comfort and cleanliness practices shaped those of the entire household. Thirdly, I discuss how some householders managed the practices of 'wasteful' householders. And, finally, I discuss how householders actively compared and benchmarked their practices against people *outside* their household.

Debate and negotiation within the household

Households have been described as having their own 'moral order', or as being a community in their own right, rather than a collection of autonomous decision-makers (Silverstone *et al.* 1992; Strain 2003). Within this context, people contest and manage their comfort and cleanliness practices in relation to each other. In this research, these tensions were most evident when householders first moved in with each other, bringing their subtly different (and faithfully reproduced) 'doings and sayings' to the fore of their relationship. Group interviews highlighted these dynamics within households. For example, some householders reported dramatic differences in comfort expectations between their fellow inhabitants: 'we're

incompatible, thermostatically speaking' (RG1, 12). This was the source of constant debate, negotiation and compromise, some of which took place during interviews, as the following excerpt between two elderly householders demonstrates:

WOMAN:	Well we have a split level air-conditioner that is going to end up around my husband's neck.
INTERVIEWER:	Why's that?
WOMAN:	Well I wanted ducted and no, he wouldn't have it, and I think that … this wretched thing is useless. I hate it! …
INTERVIEWER:	So you obviously feel the heat and cold differently to each other?
WOMAN:	That's right. I'm always freezing.
MAN:	And I'm the other way around.
INTERVIEWER:	And how do you resolve that issue?
WOMAN:	Nagging. [Laughter] …
INTERVIEWER:	Will you be changing it [air-conditioning] now then do you think?
MAN:	Not at our age, no.
WOMAN:	Yes. I can't see why not.
MAN:	Not at our age!
WOMAN:	Oh fiddle faddle! Well, why shouldn't we have comfort? (RG4, 58)

Unlike this couple who had unresolved comfort tensions, other householders talked about how they'd achieved a compromise between their divergent expectations:

> I struggle to keep cool and [my partner] struggles to keep hot so we just have a balance. She has an electric blanket on one side and I open the door a bit, and she closes it a bit. So mostly we manage (RG4, 45).

> It's a compromise, yeah. … [he says], 'why do you want the air-conditioner on?' [and I say], 'because I'm hot and I've just come home from work. Please?' [Then he says], 'okay then' (RG4, 60).

In other instances, one person controlled the household's comfort practices by deceiving or misleading other householders into believing their comfort expectations were being met: 'Sometimes I turn it down, unbeknownst to [my partner], because she'd spit the dummy, to 19 [degrees Celsius], because I figure that's all right' (RG2, 27). Some householders

resolved these differences with changes to the physical body rather than to the temperature of the entire household:

> I feel the heat more than what he does and I'm a colder person than what he is. He's going around today wearing shorts and I'm rugged up in a track suit (RG4, 60).

> [My partner] will sit there and say 'I'm cold, I'm cold', and I'm walking around in board shorts or something! (RG4, 50)

These findings illustrate not only the diversity and malleability of comfort practices and expectations between households, but also *within* them.

In contrast to the relatively gender-equal negotiation of comfort practices — aside from the arrival of guests, which saw women take a more active role — women overwhelmingly dominated the cleanliness practices and expectations of the entire household through their heightened sensitivity to common understandings of presentability, hygiene and body odour (see Chapter 5). While this finding should be treated with caution given the non-representative nature of this study, it correlates with the actual female-dominated 'doing' of cleanliness practices in Australian households (ABS 2009). As discussed in Chapter 5, a gendered sensitivity to cleanliness expectations has been reported in other ethnographic studies (Gram-Hanssen 2007, 2008; Kaufmann 1998) and discussed in historical analyses of these practices (Ashenburg 2007; Schwartz Cowan 1989; Tomes 1998; Vinikas 1992). Several female householders self-reflected on this situation:

> I think that's partly how we're socialised and our roles and that sort of thing but I think it's the mother's fault, like if they raise their boys to expect women to do everything then they're going to. Other guys I know think they're weak if they do the woman's job (RG1, 9).

This is not to suggest that male householders interviewed were devoid of cleanliness responsibilities, but rather that the standard or expectation for many cleanliness practices was often set by their female partners:

> WOMAN: I wash nearly every day.
> INTERVIEWER: So you wash everything once it's been worn?
> WOMAN: Absolutely, yes.

INTERVIEWER:	Have you got similar standards around that? [question directed at male householder] Would you be washing as much?
WOMAN:	If I wasn't around? Probably not.
MAN:	Probably not, no (RG4, 51).

In another similar example, a male respondent reported showering 'to keep wifey happy' (RG1, 4, diary). In other households, men sometimes discussed how it was difficult to maintain their female partner's expectations: 'When you're trying to clean to someone else's expectations it makes it tough' (RG1, 15). This particular householder had an aversion to undertaking shared cleanliness practices, such as house cleaning and laundering, because he didn't think he could meet the expectations of his female partner: 'I don't want to go there' (RG1, 15). Other men attempted to contest their female partner's practices without success: 'I argue about the amount of times floors have to be washed' (RG1, 4, diary entry). In some households, these dynamics resulted in a feeling of resentment from women that they had to do everything, and a sense of 'overkill' from men (RG4, 59). Sometimes during the interview, a debate which highlighted this tension would start between householders:

WOMAN:	[I iron] all of [my partner's] shirts.
MAN:	Which I think is silly.
WOMAN:	Oh, nonsense! You can't go out with them unironed.
MAN:	They can drip dry. … I buy shirts that don't require ironing but they get ironed. …
WOMAN:	All right, I'll stop ironing them! (RG3, 44).

Of course, there were exceptions. In a small number of households, men were more fastidious with their cleaning practices than women: 'I get a bit more bothered by the dirt and the mess' (RG2, 27, male householder); or female householders ironed to uphold the expectations their partners had been used to whilst growing up:

WOMAN:	He likes the sheets ironed and the underwear ironed. It's the one thing he is extra picky about.
INTERVIEWER:	Why do you like everything ironed?
MAN:	I don't know. Because they feel new.
INTERVIEWER:	Have you always had that feeling?
WOMAN:	Yeah, his Mum used to do it (RG4 56).

Thus, while householders may have their own faithful 'doings and sayings', these are adapted or modified through a process of active reconfiguration within the household. Such

findings draw our attention once again to the diversity and commonality within and between householders' doings and sayings highlighted in Chapter 5. Furthermore, they provide useful insights into how practices adapt and change in the context of a household in order to please or placate one's partner, often in the more resource-intensive direction of women's higher cleanliness expectations and enhanced sensitivity to common understandings.

Managing sensitive and vulnerable householders

In addition to actively contesting and debating comfort and cleanliness reproductions, some householders' personal circumstances made them particularly sensitive or vulnerable to certain practices, leading to the active modification of these practices for an entire household. For example, the following householder discussed how regular house cleaning was required to manage the health of her partner who suffered from emphysema, which was exacerbated by another householder, the dog:

> Oh the dog, he sheds hair so [we clean the house] because of that. I suppose for health reasons I guess. With … [my husband's] chest we've got to sort of make sure there's not too much dust around (RG4, 52).

Often sensitive and vulnerable householders, such as babies, pets and the sick or very elderly, were unable to communicate their particular requirements, so other householders would step in to make these judgements. For example, pets were sometimes considered to be particularly vulnerable to hot or cold conditions and the comfort of the entire household was adjusted to suit them:

> [The dog] loves the fan when it's hot. He doesn't like the heat, and the cat doesn't like the heat either (RG4, 52).

> The dog was sitting in front of the heater looking at it and we were sitting there quite comfortably and I said, 'all right, we'll stick it on' (RG4, 50).

Babies and young children were also considered particularly sensitive and vulnerable to hot and cold temperatures:

> [We got an air-conditioner] because he was so little and we thought he would suffer in the heat. He would sweat and we thought it was better for him to have it a little bit cooler (RG2, 25).

> He gets really sensitive. When he gets sensitive, he actually gets sick, literally sick. He just goes all red in the face and spews (RG4, 60).

Similarly, young children were considered to be more susceptible to germs and dirt, leading some householders to clean more frequently. In these cases, women often set a new standard of cleanliness for the entire household based on the perceived hygiene needs of these children:

> For cleanliness sake, and especially now with the baby. He's crawling around and I have to make sure he can't pick up anything and put it in his mouth (RG4, 56).

> You've got to be clean for kids, otherwise they'll get sick. … You just don't realise how much dirt is on the floor until you get a two-year old who runs around all over it and comes up covered in dog hair (RG2, 21).

Thus, the actual and *assumed* vulnerabilities of people and animals within a household, often premised on common understandings of hygiene and health (see Chapter 5), can significantly reconfigure the comfort and cleanliness practices of everyone within it.

Managing excessive householders

While the previous section highlighted how young children often *passively* dominated the comfort and cleanliness expectations of the household through their perceived 'needs', many parents described how teenagers *actively* dominated the household's comfort and cleanliness practices through their 'excessive' expectations:

> In winter our daughters walk in and say, 'this house is freezing!' and the ducted heating is turned on immediately. I say to them, 'if you put on a jumper it might help!' (RG1, 7).

> Teenagers are shockers. They're just wasteful. They don't really think (RG3, 38).

Teenagers were also described as being excessive in regard to cleanliness practices, particularly bathing and clothes washing:

> Five minutes on and it'd be in the basket, but most often they're on the floor [and then] we struggle with them to pick them up (RG4, 57).

> We've tried to restrict the kids to four-minute showers but it's nearly impossible because of their long hair. We're constant bangers on the wall (RG3, 32).

Consequently, parents discussed how they were monitoring and restricting their teenagers' comfort and cleanliness practices:

> I go cross at them if they put a light on instead of opening a blind, put a heater on instead of putting a jumper on, that sort of thing (RG1, 2).

> You're quality control for when things get washed (RG3, 30, referring to female partner).

> MAN: I get up first, I shower quickly and then I spend three-quarters of an hour marshalling women through the shower. One of the 16-year-olds…
> WOMAN: If I wasn't around she'd be in for half an hour. … We're conscious of them going for ages (RG4, 57).

Similarly, teenagers reported being policed by their parents: 'Dad comes in and says, "get out of the shower!"' (RG2, 28).

One plausible explanation for teenagers' 'excessive' showering and laundering requirements is they are more sensitive to their personal presentability and body odour, a finding which is supported by Gram-Hanssen's (2007) ethnographic study of teenage cleanliness practices. Similarly, teenagers or parents of teenagers involved in this research reported teenagers' blatant disregard for the cleanliness of their home and room, in contrast to their 'obsession' with personal grooming and image (RG4, 57). Thus, these findings suggest that teenagers are particularly sensitive to common understandings of sweat, smell and presentability of the body.

Management of 'excessive' householders was not restricted to teenagers. In some cases, adult householders described how one of them was more 'wasteful' than the other and therefore required monitoring and management. The following excerpt illustrates how 'nagging' from one partner was used to change the bathing practice of another:

MAN: I used to have a bath *every single night*; I used to have a bath.

WOMAN: And we had that big spa bath.

MAN: Yeah, and she used to hate it.

WOMAN: You see I went from the farm with no water to moving with him having this huge corner spa bath … every night, and I'm like, 'the water!', I'm like 'can't we just save it and heat it up the next night or something!' I hated it. It really bugged me.

MAN: Yeah, so it's worked. I've reduced but as I said, we've been here for four years and I suppose it really, yeah in four years they really started to talk about water and that sort of thing. So — I think that as well as [my partner] complaining about it — I think that as well made me more aware. …

WOMAN: It's worth it. You wasted it! You were just letting buckets of water running down the drain for no reason! (RG4, 50).

These examples highlight how householders were constantly engaged in the reproduction of particular practice configurations based on their current understandings of excessive or wasteful practices, which were referenced against their faithful reproductions.

Social comparisons and benchmarking

In addition to negotiating and debating practices within the householder, research participants benchmarked themselves against what other people do. These comparisons were either rejected or incorporated into existing practices with reference to existing reproductions. In particular, the desire to conform to common understandings, that is, the desire to be 'normal', was an important consideration for householders in their everyday life, encouraging them to reflect on, or reconsider, their current reproductions:

> Well I hope [I'm normal]! … I think I am! There's probably a lot of other people who are more fastidious but then there's probably others that aren't as good (RG4, 47).

What householders considered normal was based on their faithful reproductions and their interactions with and observations of other people within a limited social and cultural context:

> Just looking at other people's practices I could see that there were better ways to do the washing and things like that than just wasting it (RG1, 6).

WOMAN: [We wash the towels] not as often as we should.
MAN: Not as often as Mum does.
WOMAN: But more often than my sister does [Laughter] (RG2, 21).

Most of our friends are the same (RG4, 51).

There might be friends of ours that are more scrupulous about the number of times they'd change the sheets or the towels. I know friends of mine that sort of wash the towels, change the towels every few days or something or other; we're not that fussy (RG4, 61).

While for many householders these comparisons simply served as interesting observations, others reported that discussion with friends or family members about particular practices had changed the way they undertook them. For example, the following householders discussed how they switched to cold water in the laundry because a friend had convinced them that it would clean their clothes effectively:

I used to wash in warm water thinking well at least a bit of warmth gets the dirt out and a friend said that she washed in cold water all the time and I tried it and it was fine, so I just use cold water now (RG1, 19).

Years ago a friend said, 'do it in cold, what's the difference between warm and cold?' So I've cold washed for years (RG2, 26)

We used to wash in 30 degrees and then everyone convinced me that it makes no difference (RG3, 40).

Similarly, 'just talking to people' had made one householder extend the frequency of sheet washing from one to two weeks: 'You hear about your friends doing it and you kind of think, oh, that's OK to do' (RG2, 22). In other examples, householders shortened their bathing frequencies in response to discussion with friends and respected acquaintances:

I was talking to a friend and she said, 'well it's ridiculous. We really don't need to shower every day' (RG1, 7).

I was in the hospital and the occupational therapist said in her opinion, when the water problem was on, depending on your lifestyle, you don't need to have a small shower every day. So, mostly I will have a wash every other

> day, a basin wash and shower the other day and I'm very conscious of having a short shower (RG4, 44).

These findings demonstrate the importance of interactions in maintaining and changing the common understandings discussed in Chapter 5, and the embodied faithful reproductions discussed earlier in this chapter. Where householders reported changing from hot to cold water in the washing machine, they did so because others had assured them that socially acceptable expectations of hygiene and presentability would be maintained. Similarly, householders reported reducing the frequency of their bathing and laundering practices when they were assured by their peers or a respected authority that this was acceptable and safe.

An analysis of householders' comfort practices highlights a similar process of benchmarking. This was most evident in the emerging practice of air-conditioning household spaces. Based on their childhood and life experiences of air-conditioning as a luxury or unnecessary appliance, many householders expressed surprise, alarm and disapproval at the amount of air-conditioning some people used. This practice was particularly obvious and visible to householders through the tell-tale sounds this appliance makes when it is being used. Table 6.5 provides some examples of householders expressing their displeasure at other householders' 'excessive' air-conditioner usage. In these examples, observation and discussion of this relatively new practice is debated and contested.

While the examples in Table 6.5 highlight householders' disapproval of other people's practice in order to justify their own, other householders quoted in Table 6.6 reported how extreme weather events had 'beaten [them] into submission' to adopt the practice of air-conditioned cooling even though they 'really didn't want [it]'. However, it is not Australia's weather conditions that have undergone the most change in the history of air-conditioning (BOM 2009), but rather people's response to them. Thus, the use of air-conditioning during hot weather conditions, evident through householders' constant exposure and observation of this changing practice, is likely to be contributing towards its normalisation. In other words, through an active process of observation and benchmarking, *what is making sense for people to do* in response to extreme weather events is leading to the prioritisation of air-conditioning. The practice of air-conditioning is thus shifting from being 'unbelievable' (Table 6.5) to a 'need' required to make life 'bearable' (Table 6.6). While the changing material infrastructure of comfort practices is also instrumental to this process (see Chapter 5), householders' observations illustrate how the diffusion and penetration of an appliance such as an air-conditioner can change, in part, through active debate and comparisons about what is 'normal'.

Table 6.5: Benchmarking air-conditioning practices against other householders

People overdo it I think (RG4, 64).

Some people turn their air-conditioning units on and it's on all day whether they want it on or not. I know someone who has … his entire house air-conditioned. That is on twenty four hours a day, every day of the week, every day of the year! It's just full on! (RG4, 48)

My mates leave their air-conditioners on when they're not a home for six hours while they're at work and I think, well, why? So you can come to a nice, warm house when you get home? Why? It warms up in like five seconds anyway so I just don't see the point of it (RG4, 60).

WOMAN: She runs hers 24 hours a day.
MAN: Oh! It's unbelievable!
WOMAN: In the summertime she's got it going all the time and in the wintertime she's got it going all the time. As you walk around ...
MAN: ... you can hear them (RG4, 53).

If it's slightly warmer, you can hear the neighbour's air-conditioners going, and they go right into the night and you think, is that really necessary? It's quite comfortable in the evening and they've got their air-conditioner on! (RG1, 18)

Table 6.6: Adoption of air-conditioning practices in response to extreme hot days

For years we've struggled along without air-conditioning but finally we've been beaten into submission because I just can't stand it. I mean it's going to make life bearable (RG1, 14).

Only one day was 45 degrees: New Year's Day, 12 months ago. We had bushfires on the freeway and it was dreadful. We didn't have them then and that's what made us get them … but we really didn't want air-conditioning (RG4, 56)

WOMAN: What prompted us to put it in was about 2 years ago, in Brisbane, there was a day where it got to just under 42 degrees. I love the heat, but I tell you what, it was the most horrendous day.
MAN: 42 degrees and 85 per cent humidity.
WOMAN: It was shocking... people just didn't know what to do with themselves, and we went to the movies, because it was the only place we could find that's air-conditioned. But we decided, this is ridiculous, we need a bit of cooling. So we put in an air-conditioner (RG3, 29).

Unlike the visible nature of air-conditioned cooling, some householders had difficultly benchmarking their indoor cleanliness practices against others because they were hidden from view, or because they were worried that people would 'probably think it's too personal' to discuss them (RG4, 42). This was particularly so in regard to practices involving the removal of bodily wastes, namely bathing and toilet flushing and, to a lesser extent, laundering:

> Well, I don't have many people to compare to, apart from scungey children, or feral children. We overwash. … But other than that I wouldn't have a clue because I don't know what people do. I don't know what you do, so I can't relate to that (RG2, 27).

> Well actually I've never asked anyone else how often they bathe (RG4, 52).

> That's a social thing isn't it? You don't talk about it (RG2, 20, referring to toilet flushing).

> MAN: I don't think I have actually met people our age that shower every day, to be honest.
> WOMAN: I don't know, I've never asked them.
> INTERVIEWER: It's not something you talk about generally?
> WOMAN: Not really, no.
> MAN: Maybe you could sit at your bridge table and say, 'did you shower today?' [Laughter] (RG4, 48)

In this last quote, the idea of discussing personal cleanliness practices with others was considered strange and humorous. In some cases, householders' body language indicated they were uncomfortable discussing such topics with me. Indeed, such issues are rarely discussed in society. Media representation and information about how to save water in the home perpetuates this embarrassment by failing to discuss the actual 'doing' of cleanliness practices, such as how to bathe quickly and effectively, how often one needs to bathe, or how frequently we should wash clothes and linen (see, for example, Savewater 2009; SEW 2002). None of these issues was discussed or addressed during ACF's GreenHome workshops attended by me and RG1 participants.

In the small number of situations where practical information about appropriate ways to undertake practices was publicly available, householders identified this as being extremely influential. For example, one householder discussed how she had learned how to bathe using a very small amount of water through an instructional TV program:

> And there he was in his bathers, he had a little shower hat on, and he tipped the water on himself and then he used the soap to lather and then used the rest of it to rinse of. He said 'that's all you need!' And I thought, he's actually right! So I've been challenging myself under the shower. I know it sounds really strange but all you have to do is get wet, and then you just soap, and then you rinse it off (RG3, 33).

This woman was so impressed by this example that she wrote to her local paper a letter which was subsequently published, informing others on how to bathe using this method.

Similarly, some householders reported being very interested in the *Carbon Cops* television series (ABC 2007a), which provided them with demonstrations and practical information about household practices that reduce greenhouse gas emissions: 'That Carbon Cops program has sort of taught me what's normal' (RG2, 24). The importance of social comparisons and the lack of practical knowledge currently available to householders trying to modify their practices in less resource-consuming directions requires further attention. However, such issues are not completely ignored in other non-environmental arenas. For example, the commercial sector, where new comfort and cleanliness 'products' are constantly made and re-made, provides social benchmarks to householders in the form of advertisements, along with new forms of practical knowledge, that aim to deliberately shift householders' perceptions and understandings of 'normal' and acceptable practices. I discuss this process of deliberate reconfiguration in the following section.

Deliberate reconfigurations

Institutional and commercial interests have long been involved in deliberately reconfiguring everyday practices of comfort and cleanliness. Indeed, Shove (2003a, p. 89) argues:

> The recent history of cleanliness is, amongst other things, a history of the successful commercialization of an idea and the skilful development and positioning of products deemed essential for its achievement and so for moral welfare and normal life.

Some householders acknowledged that the deliberate reconfiguration of cleanliness practices was still occurring today:

> They [cleanliness marketing agencies] create these expectations. … It's not enough just to have your bench clean, you've got to have it anti-bacterial and anti-microbialised and god-knows-what else! And it's just like, that's the next bar that's getting raised now (RG1, 19).

Indeed, institutional rules and recommendations have been extremely influential in establishing the comfort and cleanliness practices we take for granted today (see Chapter 3). Theories, campaigns, and powerful commercial interests have sought to 'educate' the population about sanitarian beliefs and practices (Ashenburg 2007; Tomes 1998; Vinikas 1992). Similarly, institutional changes to the definition of acceptable thermal comfort standards for indoor environments (see, for example, ASHRAE 2004) have dramatically shaped current conceptions of comfort. More recently, new environmental rules and recommendations are being introduced, such as the *Cool Biz* and *Warm Biz* campaigns in

Japan, which seek to raise or lower office thermostats and normalise weather-sensitive business attire in replacement of the suit (Kestenbaum 2008; Moffett 2007). Such programs seek to deliberately institutionalise new understandings related to appropriate and inappropriate practices.

Interviews with householders suggest that deliberate 'environmental' rules and recommendations are successfully modifying the reproduction of some practices in households, although there are serious issues with such approaches. The example of the four-minute shower 'rule' promoted by governments and water and energy utilities in an attempt to encourage householders to 'save' water, and to a lesser extent, energy (Hobson 2006; Spearritt 2008), demonstrates these tensions. This four-minute 'norm' has been scripted into shower timers (Figure 6.1) provided free to households by governments and utilities. Some householders described how this rule had become incorporated into their regular showering routines through the shower timer: 'so we started using that [shower timer], and now it's become normal' (RG1, 18). In support of the success of this new recommendation, most householders described how their showering practices either conformed to, or deviated from, a four-minute time limit:

> I love long showers and I find it really hard to have four-minute showers. I don't always have four-minute showers, but I try (RG1, 1).

> I do luxuriate for two minutes, not four. Two (RG3, 29).

Figure 6.1: A four-minute shower timer

Source: RG1, 2, 22 May 2007

Householders expressed their showering time as either 'good' or 'bad' compared to this four-minute rule. Several reported spending 'far too long' showering (RG4, 56) or said that they were 'not very good with showers' (RG3, 34):

> Yeah, you're probably rule-abiding [referring to partner]. I'm not (RG2, 22).

> He's dreadful [referring to partner] but yeah I can get in and out in five minutes (RG4, 52).

However, despite wide acknowledgement of the four-minute rule, there was still great diversity in the time householders took to shower. Householders often explained these deviations as a result of their particular doings and sayings, such as their understandings of how soap works or how to clean the body (see Chapter 5). Such understandings often persisted despite acknowledgement of the four-minute rule, in part because the rule was not accompanied by any practical knowledge about *how* to shower in four minutes, or what were necessary and unnecessary things to do in the shower. This was complicated by the personal and private nature of bathing practices which stymied discussion with others about how they bathed, so instead many householders drew on faithful accounts of their bathing practices to determine how to incorporate this new rule into them. Consequently, while some felt a four-minute shower was: 'a bloody long time' (RG4, 41), others reported needing between five and seven minutes 'to quickly wash' (RG3, 35), and a further five or ten minutes when washing hair:

> Oh, five minutes for me if it's a normal shower, about 15 if we're talking hair or dying hair because with dying hair I tend to not stick my head in the sink, I just tend to go, 'oh, I'll have a shower', and wash it out. My husband, I think he's headed to the ten-minute mark when it comes to his hair (RG4, 60).

The lack of practical knowledge required to meet promoted recommendations such as the four-minute shower was heightened in other energy and water rules, such as water restrictions and targets, which did not usually identify or suggest alternative ways of undertaking existing indoor cleanliness practices. Instead, householders described how Australia's prolonged drought and compulsory water restrictions and made them more *aware* of their water consumption:

> Media information about water made me think about it's use and it's preciousness, whereas previously I'd think, 'It's just water!', but now I've got a different perception about how precious it is (RG1, 19).

> We are both naturally conservative. But I haven't myself been conservative in the areas of energy and water because I haven't thought about it until

> recent times. In recent years I've become very concerned about the world environmental situation — global warming and so on (RG3, 29).

> The water restrictions have definitely brought it front of mind. I don't think we'd be thinking about a tank if it hadn't been for that (RG2, 22).

In response to this increased awareness, householders reported making many efficiency changes and small practice modifications, such as washing full loads of laundry, turning off unnecessary appliances, taking shorter showers, and turning up air-conditioning thermostats in summer, which are consistent with the recommendations made by governments and utility providers (EA 2007a; Savewater 2009; SEW 2002; SV 2009). Householders were also encouraged to invest in new infrastructures and technologies, such as solar panels, grey-water systems, solar hot water systems, more efficient technologies and water tanks. Consequently, many householders who identified themselves as being environmentally minded were not questioning their existing practices, but rather seeking additional ways to make them more efficient through the purchase of new technologies and infrastructures. With their practices largely taken for granted and many 'big-ticket' items, such as solar PV panels, out of their price range, these householders 'don't know what more [they] can do' (RG1, 13).

> We're doing everything we can, but the bigger things cost too much money, so we're working towards those things (RG1, 18).

> In a sense there's not much more than we could do other than upgrading the washing machine (RG2, 27).

In contrast, Table 6.7 provides quotes from a number of householders who were beginning to question, or had already re-evaluated, the frequency of their sheet washing and showering practices in response to water conservation concerns, despite such changes being ignored in environmental recommendations. As discussed previously, householders were often reluctant to discuss these changes, fearing they would be ridiculed for not maintaining perceived common understandings of hygiene, body odour or presentability. Deliberate attempts to change or modify practices by environmental campaigners and demand managers *ignore* these underlying understandings, potentially further legitimising and entrenching existing practice configurations.

This discussion demonstrates how deliberate recommendations can both increase and decrease the resource consumption of comfort and cleanliness reproductions. Importantly, demand managers' primary focus on efficient routines and material infrastructures, rather

than the composition and reproduction of practices themselves, is potentially dangerous when we consider that other commercial interests, such as cleanliness and air-conditioning marketing agencies, explicitly recommend new or modified practices in order to sell particular products (Datamonitor 2008a, 2008b). Consequently, the resource savings achieved through government campaigns promoting actions such as four-minute showering or replacing showerheads may be annulled if householders start showering twice a day or more frequently due to increasing concern about smell, sweat, hygiene or presentability. Such issues deserve further attention in demand management rules and recommendations targeting the practices of comfort and cleanliness, or the impacts they create.

Table 6.7: Modifying showering and sheet washing routines in response to water conservation concerns

Do we really need to wash [our sheets] every week? It's just mindset isn't it? (RG3, 36, changed from washing sheets every week to every four weeks).
I'm just beginning to think [showering every day is] … not necessary. … It's a sense of dealing with people and hygiene but I'm just beginning to think about it (RG1, 10).
Like I wouldn't freak out now if … [my children] go a couple of days without a shower (RG1, 2).
But I can remember thinking when we were really desperate for water with this drought, and I think to myself, the roof is not going to fall in if I let the sheets go another week. And the roof didn't fall in, and it gave me a bit more spare time. … This is getting pretty personal, but unless you had some dreadful accident in bed, why do you need to wash your sheets every week? (RG3, 29).

Transforming reproductions

In this chapter, I have argued that practices can be faithfully reproduced, and actively and deliberately reconfigured in everyday life. I have argued that practices change neither randomly nor in large chunks, but rather in relation to their historical composition. Change is thus a social process whereby 'crises of routines' (Reckwitz 2002b) are created and resolved as practices are shifted in context, contested, debated and deliberately manipulated with reference to their origins. Such 'crises' do not necessarily involve conscious reflection or engagement. Rather, they result from subtle reconfigurations of practice components or the situations in which those components are reproduced. However, while practices are highly malleable, they are also resistant to change, often becoming deeply embedded in their original composition. Importantly, while commercial interests recommend specific know-how and necessary conditions for carrying out comfort and cleanliness practices, many environmental rules and recommendations do not. Consequently, the efficiency gains achieved as householders adopt new technologies and infrastructures, or modify their practices by shortening their showers, can be negated by deliberate and active shifts in what is considered normal and acceptable.

This chapter and the one before it have begun to outline the diversity, commonality and change within and between comfort and cleanliness practices in RGs 1–4. While much more attention could and should be paid to these concerns, we now have an empirical platform to inform the ways in which smart metering strategies intersect with the existing composition and transforming reproduction of these practices. Importantly, individualistic and rational-choice understandings of 'behaviour' central to the demand management approach (see Chapter 2) have so far been unhelpful in understanding what householders do and why they do it. How then, do smart metering demand management programs, which are premised on assumptions of rational action, intersect with the processes of reproduction discussed above, or alter the composition of practices discussed in the previous chapter? The analytical concepts introduced in Chapter 3, and our new understanding of comfort and cleanliness practices, provides us with a unique basis from which to evaluate these strategies' intersection and interaction with everyday life.

Chapter 7: Reconfiguring comfort and cleanliness practices through demand management programs

The previous two chapters analysed householders' existing and changing comfort and cleanliness practices drawing on the components and reproductions of everyday practices introduced in Chapter 3. Noticeably absent was evidence of householders acting in accordance with the dominant demand management assumptions of choice and change discussed in Chapter 2. While this might lead us to presume that smart metering demand management programs are completely ineffective, the results of trials summarised in appendices 1–3 indicate otherwise. This raises important questions about how and why demand management programs reconfigure everyday practices. This chapter addresses these concerns through an analysis of in-home display (IHD) consumption feedback and dynamic peak pricing (DPP). In particular, the chapter draws on interviews with 14 households from RGs 2 and 3 who received energy (gas and electricity) and water consumption feedback through an IHD. I also refer to interviews with 23 households participating in EnergyAustralia's DPP trial, 12 of which received IHD electricity consumption feedback (see Chapter 4 for further detail).

The chapter is divided into two sections. In the first half, I show how IHD feedback connected householders to their energy and water *consumption* whilst disconnecting them from their comfort and cleanliness *practices*. The device achieved this outcome in two ways. Firstly, enhanced visualisation of energy and water 'flows' through the household, and the provision of new acceptable and unacceptable consumption 'limits', encouraged householders to minimise 'waste', save energy and water, and make their practices more efficient, whilst largely ignoring the existing composition of comfort and cleanliness practices. Secondly, in treating householders as micro-resource managers, a series of translation problems emerged between the resource language of kilowatts, dollars and litres, and the day-to-day dynamics of everyday practices. This strategy therefore disguises and potentially legitimises taken for granted practices of comfort and cleanliness.

In the second half, I show how householders significantly modified, shifted or changed their comfort practices during a DPP event. However, rather than viewing this response as an outcome of the significant price increase during a DPP event, I argue that DPP became embodied as a new temporal 'rule', applying most particularly to comfort practices. This rule

was communicated through a series of notifications which engaged householders as co-managers of their practices during DPP events and generated new common understandings about 'appropriate' and 'inappropriate' *practices*, in addition to consumption. However, the DPP rule was interpreted in different ways by householders in the context of their existing comfort reproductions and the temporal and spatial ordering of their everyday lives. The findings suggest that DPP programs are capable of subtly reconfiguring the reproductions of comfort and other everyday practices by *inadvertently* targeting them.

I conclude by warning that both IHD and DPP programs place too much responsibility on householders without addressing the changing material, social and cultural landscape of comfort and cleanliness practices. Such strategies may inadvertently normalise and legitimise existing and changing practices by ignoring them — potentially negating the benefits of these programs if trends towards more resource-consuming practices continue. I therefore suggest that a new approach is required to bridge the divide between the resource logic of demand managers and the messy and mundane terrain of everyday life.

Reconfiguring everyday practices through IHD feedback

Visualising energy and water flows

Kaika (2005), Strang (2004) and Sofoulis (2005) have made significant contributions regarding the ways in which invisible flows of energy and water resources disconnect householders from their consumption and its impacts:

> The separation of domestic space from wider landscapes is concretised in the material culture that carries water invisibly to individualised homes. There is nothing remaining in this arrangement to indicate the relationship between the flow of piped water and external social, economic or environmental events. Homes are supplied, billed and sometimes metered individually, without reference to where the water has come from, and few people are sufficiently involved in the management of the landscape to see environmental degradation that results from the overuse of water resources. There is thus a crucial material and perceptual disconnection between domestic water use and its ecological consequences (Strang 2004, p. 197).

Within the household itself, Sofoulis (2005, p. 458) highlights how water technologies and infrastructures such as showers and washing machines are 'user-friendly' but 'saver-unfriendly' devices, 'designed for using and wasting water, not for conserving, reclaiming and reusing it'. While this is fundamentally a problem of relationships, with the spheres of

production and consumption firmly separated in policy and practice, disconnecting one from the other, various demand management strategies have attempted to overcome this by educating and informing domestic energy and water 'users'. In particular, policy makers, utility providers and energy and water campaigners have attempted to focus householders' efforts on saving water and energy by making visible the invisible flows of energy and water entering and exiting their homes.

The practice of 'water-gathering' (Head 2008; Figure 7.1), through which householders capture or re-capture water using water drums, containers and buckets before it goes down a drain or pipe, is one such visualisation tool which counteracts this disconnection. Householders from all RGs discussed how this practice offset the 'fantasy of endless supply' that has been 'baked' into domestic water infrastructures (Sofoulis 2005, p. 452):

> I save the water for the garden and even though it's the smallest machine, you'd be surprised. I get eight buckets full of watering cans of water out of that! (RG4, 59)

> That's frightening! You don't notice that it's going down the hole and you just don't see it (RG1, 11).

Figure 7.1: Water gathering practices inside the home

Source: From top left: RG1, 6, 9 May 2007; RG1, 7, 9 May 2007; RG1, 16, 4 September 2007; RG1, 13, 4 September 2007

In addition, demand managers have used a raft of visualisation techniques such as Victoria's 'black balloon' campaign (SV 2009), which highlights the invisible greenhouse gasses emitted from common household appliances.

IHDs are positioned in this context, where they act as a mediating device between the hidden units of energy and water ticking over on the meter, and the consumption of resources inside the household. The transparency of these flows conveyed through the IHD left some householders 'shocked [about] how much water we use in a day' (RG2, 21): 'The washing machine compared to the non-washing machine days is definitely confronting' (RG2, 27). This was particularly so for water, as householders could easily translate the resource management unit of 'litres' displayed on their IHD into a visual and easily identifiable amount, through analogies with buckets and bottles:

> When I see a photo of 140 litres in buckets and I think every person uses that, I think that's ridiculous. When I see 80, I think, how can I justify that? Forty — that's four big buckets of water every day! (RG3, 29).

Similarly, 'spikes', lights or sounds on the IHD alerted householders to the flow of energy in their home: 'It [the air-conditioner] will make it go berserk!' (RG2, 20). In a small number of cases, this enhanced visualisation encouraged householders to modify their practices, such as switching from hot to cold water in the laundry:

> I used to wash in hot water to kill germs and bacteria, which is silly because if you put it in the sun it does it all for you really. … I like clean clothes when I wash them. And I suppose growing up in the UK it's just instilled in me, *but I've changed that now since seeing the spikes* (RG3, 39, emphasis added).

While this householder's faithful reproduction of using hot water in the laundry is disrupted by IHD 'spikes', the practice of laundering is not questioned. Similarly, another householder had bought and installed several rainwater tanks which were connected to the laundry after seeing how much water this practice consumed. However, the actual doings and sayings of laundering were not called into question, only the method of achieving them. I elaborate on this below, arguing that heightened visualisation connected householders to their consumption, whilst leaving the energy and water associated with comfort and cleanliness *practices* largely hidden and taken for granted.

Visualising appropriate and inappropriate consumption levels

Traffic light feedback was provided to householders participating in the EcoPioneer pilot program (RG2), who were shown when they were consuming a low (green), medium (yellow) or high (red) amount of electricity (see Figure 7.2 and Chapter 4). Householders participating in the DPP trial (RG4) who were receiving feedback through an IHD also had electricity traffic light feedback, although in this case the green light correlated with the off-peak rate, medium with the 'shoulder' rate, and red with a DPP event. However, in both EcoPioneer and DPP trials the effect of the traffic lights was the same: it contained a normative benchmark for acceptable and unacceptable electricity consumption levels (see Table 7.1).

Figure 7.2: Green 'traffic lights' and consumption data displayed on an ecoMeter IHD

Source: RG2, 22, 24 August 2007

Table 7.1: Conveying consumption 'limits' through traffic light feedback

You can see what colour it is so you can tell whether you're doing right or wrong (RG2, 27).
The meter says, 'hey, look at me! You should cut back!' (RG4, 46).
It gives you positive feedback when it goes back to green. You think, 'oh well, yes, I've done the right thing' (RG2, 20).
It literally trains you to say 'hold on a second, that's going over the top', because you actually see how much it's using (RG4, 56).
Well, because of the rain that we've had, we've been using our dryer a lot more and all of a sudden we were finding if we had the dishwasher on and the dryer and you'd go out and just look at it [the IHD] and go 'okay, that's still all right but if the spa goes on, we're stuffed', so we turn something off. You know, like it does make you aware (RG4, 50).

Traffic light feedback was therefore an important visual stimulus encouraging householders to reduce, and in some cases increase, their consumption. This feedback conveyed a consumption limit, just as there are speed limits on the road:

> It's like the speedo on a car. Years ago, people would drive at whatever speed they wanted to. But now we understand that there's a limit. Unfortunately there are repercussions in terms of driving over the speed limit. I suppose in terms of power, in terms of the cost, it should be the same. It might not come as a fine, but it will come as a cost to you (RG2, 20).

In RG2, this 'cost' was a moral one, encouraging householders to feel either 'good' or 'bad' about their current consumption (see Table 7.1). In RG4, going over the 'limit' during a DPP event had both moral and financial repercussions. However, both RGs responded strongly to the presence of a red light, even though DPP householders were being charged significantly more money for their electricity consumption during a red period, whereas IHD householders were receiving a flat rate. Thus, IHD traffic lights had a scripting (Akrich 1992) and moralising (Jelsma 2006) role in specifying appropriate and inappropriate levels of consumption.

The presence of a yellow or red light was the most effective form of IHD feedback, encouraging householders to reduce their electricity consumption, albeit for a short time — the precise outcome desired by providers and deliverers of such schemes (see chapters 2 and 8). Some householders described how these lights disrupted and temporally suspended *all* household consumption by creating a feeling of urgency or danger:

> If it's four red, [my daughter] will have a panic attack! … We call that redlining. … if we see the thing redlining or on three yellows we see what we can do straight away to bring it back down to green (RG2, 20).

However, the traffic light rule could also be reversed, with the presence of a green or orange light being seen as approval for existing practices. For example, the following householder described how the traffic light feedback legitimised her existing practice of laundry drying: 'I was always worried about using the dryer so much, but I figure it doesn't make it scream red so it's OK' (RG2, 21).

In addition to this concern, the red light was only applied during specific periods of time, potentially legitimising and encouraging practices undertaken at other times of the day (creating load shifting). For example, traffic light feedback for RG2 was based on consumption *at a particular point in time*, as opposed to cumulative consumption over a day, week or month, potentially encouraging householders to spread their electricity-consuming practices

throughout the day in order to maintain a green or orange light. While this research did not identify whether or not this was occurring, the findings suggest that load-shifting occurred to a limited extent in RG4 households, which I discuss later in this chapter. From the perspective of electricity providers, particularly distributors, load shifting is a desired outcome, because it encourages efficient use of the electricity distribution system at all times of the day by smoothing out 'hot spots' of demand (Guy & Marvin 1996; Moss 2004). However, for behaviour change practitioners, such outcomes potentially negate and offset the energy (and water) savings that might be achieved. I return to these competing objectives in Chapter 8.

From an everyday practices perspective, traffic light feedback can be thought of as a new 'rule' targeting all electricity-consuming practices in the home during red periods, and potentially legitimising them during green periods. Orange lights are a 'grey zone', being interpreted as both appropriate and inappropriate consumption. However, unlike the four-minute showering rule, which specifically targeted the practice of showering (see Chapter 6), the traffic light rule was applied during specific temporal periods — i.e. when a household was using many electricity-consuming appliances (RG2) or during a DPP event (RG4) — and rarely targeted specific practices. Thus, while this rule contained new common understandings about acceptable (green) and unacceptable (red) levels of consumption, it was applied by householders to those practices they considered negotiable, wasteful or discretionary during specific time periods. This led to significant variation in the interpretation of IHD feedback, most of which was directed towards 'saving' energy and water consumption as I discuss below.

Managing, saving and minimising consumption

The heightened visualisation of energy and water flows and 'limits' encouraged householders to manage, save and minimise consumption associated with existing routines. Table 7.2 provides examples of householders using their IHDs to ensure other members weren't 'wasting' energy or water. Importantly, while the quotes provided in Table 7.2 show how householders eradicated unnecessary consumption and monitored the cost of it, their comfort and cleanliness practices are not in question. Rather, they are using their IHDs to 'train' themselves to switch off appliances when they are no longer being used, or to monitor the cost of undertaking particular practices. In this sense, IHDs were often implicated in processes of active reconfiguration, whereby 'excessive' householders were policed and controlled: 'You could tell, like in winter, when the kids have too many heaters on — "turn the heater off!"' (RG4, 63)

Table 7.2: IHDs as a household management tool

…or maybe I left the air-conditioning on or something like that and you looked at the display thinking, why is that so high at the moment? (RG4, 59)
It just trained me, virtually trained me to switch everything off. … Whatever was going on, I would go and check it (RG4, 48).
Sometimes I'll just glance past and have a look at what sort of rate we're on at a certain time and so forth and just to calculate how much, particularly in summer when the air-conditioning's on, how much we've used a quarter, … because I expect it to be about 100, 120, so I often look and think, we're at $80 this month so we're doing really well (RG4, 59).
It's good to sort of look at just to see how many cents you're using for an hour and so if you sort of say, 'OK, we've … got the dryer on for an hour and it's going to cost us X' (RG4, 50).

Householders therefore used their IHD feedback as a management tool to regulate particular household members, predominantly young children and teenagers (see Table 7.2). Other householders used their IHD as 'a bit of a game' (RG3, 29) to encourage and teach their fellow householders, particularly children, to undertake practices such as showering as quickly as possible. Householders were rewarded with positive feedback from the IHD and their fellow householders if they met a consumption 'target'.

In particular, householders were concerned with managing the 'waste' associated lighting:

> [My daughter's] an absolute maniac with turning off lights, to the point where I see her out here reading in the dark (RG2, 20).

> CHILD: When it's red you have to go around and turn off all the lights, then it goes green and you think, 'phew!'
> WOMAN: At first we'd pretend it was going to explode, didn't we? (RG2, 28)

Householders talked about lighting a great deal during the interviews, even though they were never directly asked about it (see Appendix 6). However, lighting is not the largest consumer of electricity in most Australian households, and householders could have been aware of this by checking their IHD feedback. Gram-Hanssen (2008) found a similar focus on lighting in her ethnographic study of routines, which she attributes to lighting's heightened visibility in the home, as well as its historical association with electricity usage. In support of this view, many householders discussed how ensuring lights were turned off was a faithful reproduction:

> By nature I think my father was always turning out lights, so I've inherited that (RG1, 7).

> I was brought up in an era where leaving a light on was such a no-no that I just turn them off. I'm a shocker for that (RG2, 27).

Householders' heightened interest in lighting can also be attributed to the significant attention lighting practices receive in energy-saving campaigns. Being a relatively easy and inexpensive practice to change (Shipworth 2000), conservative and efficient lighting practices are promoted by a range of Australian government organisations, energy companies and behaviour change campaigners as a fundamental principle of a 'green' lifestyle (ACF 2006; Hobson 2006; SV 2009). As a demonstration of their commitment to energy conservation, energy companies give energy-efficient light bulbs to householders, which many research participants had received. Mass environmental campaigns, such as 'Earth Hour' (WWF 2009), perpetuate the view that switching off lights is a major step in reducing greenhouse gas emissions and 'saving the planet'. Government policies also reflect this understanding through, for example, the banning of incandescent light globes by Australia's former federal environment minister (ABC 2007b). Consequently, lighting has become synonymous with new common understandings about 'wasteful' consumption, leading householders to use this practice as a benchmark for their environmental commitment: 'Our house uses next to nothing compared to other houses. They're always leaving lights on' (RG2, 20).

Householders also reported undertaking other energy and water-saving actions in response to their IHD feedback, which were consistent with government, utility and environment campaigns (ACF 2006; EA 2007b; Savewater 2009; SEW 2002; SV 2009). These included turning off appliances when not in use, turning off standby power, installing energy and water-efficient technologies, and washing full loads of laundry. A survey evaluation of EcoPioneer trial participants (RG2) conducted by SEW (Wetherall 2008, p. 7) reported similar actions undertaken by householders. These were:

- capturing and using water from the shower on the garden
- installing water efficient showerhead and toilet
- capturing grey water from the washing machine
- watering the garden less often
- reducing the temperature on ducted heating units
- turning off lights and turning off appliances at the wall
- installing compact fluorescent light globes.

Importantly, these changes refer to minimising, managing and saving consumption, rather

than reconfiguring everyday practices. Turning off appliances at the wall does not change the practices these appliances are implicated in (although it is arguably a new practice in its own right) just as installing a water-efficient showerhead does not transform the doings and sayings of showering. In light of this discussion, IHD feedback, which is interpreted in the context of these environmental rules and recommendations, might *reinforce* comfort and cleanliness practices as non-negotiable aspects of everyday life by inadvertently disguising the energy and water they consume, whilst at the same time highlighting energy and water flows.

Shove (1997, p. 271) has previously issued this warning, arguing that by making consumption 'transparent' the energy (and water) associated with everyday practices is disguised: 'when energy is in the spotlight, the services it provides are in the shadow; when services are highlighted, the energy dimensions fade'. In support of Shove's claim, several research participants expressed surprise when the interview concluded because it had targeted comfort and cleanliness practices, rather than the types of activities normally associated with 'wasteful' or 'discretionary' consumption, such as leaving the lights on and watering the garden: 'I thought you were going to ask us about our energy consumption!' (RG1, 12). Therefore, while these findings suggest that IHD feedback, particularly 'traffic lights', may be effective at engaging householders with their consumption, an outcome which will benefit demand managers in the short term, there is a risk that this strategy may *disengage* householders from their everyday practices, leaving them open to manipulation from the commercial sector, thereby potentially negating the benefit for demand managers in the medium to long term.

The translation between resource consumption data and everyday practices

In accordance with the assumption that householders lack adequate knowledge and information to make informed cost-benefit decisions about their consumption (see Chapter 2), householders were provided with data regarding the amount, price and greenhouse gas impact of their energy and water consumption through their IHD and, in RG2, through an additional website portal with further detail. Unfortunately, there was a fundamental disconnection between these data and the ways in which householders conducted their day-to-day practices: 'That's how I drive a car but it's not how I'd live at home. I look at monitors all day, I'm not going to come home and look at this one as well' (RG3, 41).

Nonetheless, many householders attempted to interpret and incorporate these consumption data into their comfort and cleanliness practices. However, during the translation process between the data and their everyday practices, a number of complications arose. Firstly,

some householders were unable to understand the consumption data, let alone link them to their practices, because they couldn't interpret the resource language used by the IHD:

> On the EcoMeter it says 2.7 tonnes per day. What is a tonne? ...Two tonnes? What is two tonnes? There's no description (RG2, 25).

> We need to be able to interpret and understand electricity use. ... It's googalldygook, and we're pretty intelligent, but it's still googalldygook (RG4, 45).

> It says you've used so many kilowattevers (RG4, 47).

> I didn't know what it meant, 4000 to 2000 watts …They're just figures really. It's only the colouring indication that gives you the sense that maybe we're over the top at the moment (RG2, 20).

Secondly, some householders did not trust the consumption feedback:

> It's giving funny readings and they're not right. … I really think there's a lot of teething problems with it (RG3, 38).

> We don't believe what it's telling us at the moment (RG2, 20).

This finding stands in contrast to the active reconfigurations discussed in Chapter 6, which highlighted how discussing practices with trusted friends and family members often led to practice change. In particular, there are two issues of trust to note here. The first relates to the provider of the information (i.e. influential peers versus a computer display provided by a utility company), and the second is the type of information provided (i.e. practical information about everyday practices versus resource management data). In both cases, householders place more trust in the people and information they are most familiar with. In focusing on unfamiliar information from the foreign and potentially untrustworthy realm of resource management, the information provided by IHDs may be rejected by householders before they have even attempted to relate it to their practices.

Thirdly, some householders misinterpreted the information provided through their IHD during the translation process between the data and the practices related to the data. For example, because appliances such as an electric kettle, toaster, hair dryer, oven or grill made the IHD

'scream red' (i.e. display a red light) or display a spike of consumption, householders assumed that these appliances consumed the most electricity in the home:

> MAN: The main thing was that jug. I can't believe how much power it pulled!
> WOMAN: 25 cents an hour!
> MAN: It was more than the air-conditioning! (RG4, 53)

However, this was not necessarily true, because householders did not use these appliances for extended periods of time.

Fourthly, some householders were unable to calculate the correct 'formulas' to weigh up the cost and benefits of using particular appliances:

> How do you do a formula? How do you work out the answer to that question? I understand that I could read what the gas reading is, but that doesn't answer my question about which is better for the planet... having the whole house going [on gas], or just having that nasty little [electric] heater thingy that's not that warm (RG2, 20).

This householder was not alone. Many others had difficulty linking their consumption data to their practices and answering specific questions about them. Interestingly, these householders suggested that they needed *more* data to compensate for this situation, an issue I return to later.

Finally, in a few cases, householders were able to make the connection between their energy or water consumption and specific practices:

> I have a look every morning after I make it out of the shower to see how much we use in the shower and that's how I know it's 30 litres for the two of us; 180 for the washing machine (RG2, 27).

However, linking consumption data to practices did not necessarily reconfigure them, particularly in relation to embedded arrangements of comfort and cleanliness as the last two quotes demonstrate. In the first quote, the practice of heating a room is not in question, and neither is the expectation of mechanically produced comfort. Rather, this householder was seeking the most *efficient* way of undertaking an existing heating practice. Similarly, in the second quote the householder had a clear understanding of how much water the shower and

laundry used, but this did not result in change.

Table 7.3 provides other examples demonstrating the non-negotiability of household practices in response to consumption feedback. In these examples, householders discuss how they felt unable to act on the information provided through their IHD because the practices it alerted them to were considered unchangeable aspects of everyday life. Thus, even when householders were able to link their IHD data to practices, many dismissed this information (see Table 7.3).

Table 7.3: Feedback awareness and non-negotiable practices

What can you do? You can't cook less (RG2, 20)
Well, I can't change the washing machine (RG2, 23)
I mean I pack it in as tight as I can! (RG2, 21, referring to washing machine).
I don't see the point because we're now aware of which appliances create red lights and *they're all things that you need to use anyway* so …it's not like you're going to say, 'I'm wasting, so let's do something about it' (RG2, 26, emphasis added).
It might be nice to know that the toaster is this and the kettle is this, but I don't know what I'm supposed to do about it — have cold tea? (RG2, 27)
I think with Ecovision [IHD], it's a great concept and idea for big families with massive power usage but with us, there's only two of us and you know, it really doesn't take much rocket science for me to work out that I've turned on the kettle because there's only me here (RG3, 41).

A notable exception to these findings relates to households living in the Currumbin EcoVillage (RG3) where, in two of the four households interviewed with an IHD, this device had become a resource management tool to assist them with assessing whether their demand was matching their supply of energy and water resources:

> When you move in here the emphasis is there and the information is shown to you and if you're in anyway inclined, you immediately go with it straight away and it becomes a sort of quest then. And with that screen you can check that many times a day. I quite often look at it five or six times a day to see how we're going or what we've got in the tank (RG3, 37)

In contrast, another RG3 household with an IHD did not believe resource monitoring was necessary:

> I don't think of it at all. As I said to you on the phone, we just ignore it. Because I don't need to look at it. ... we know how we're living. As I said we have plenty of water, we're heating it as cheap as we possibly can, we've

> paid initial money to buy solar panels, the house is nice and warm and cosy, and we don't need *that* [pointing to IHD] to tell us how wonderful our lives are, and that we're not actually using too much water [or] electricity (RG3, 40).

While the RG3 householders quoted above depict contrasting views, like other households with an IHD, neither of them indicated that their practices were changing as a result of feedback. While the first householder quoted was using an IHD to match supply and demand, the second already knew that he was not 'using too much'. Thus, neither considered it necessary to change their practices as a result of IHD feedback.

Disconnections within households

The disconnection between resource consumption data and everyday life was heightened when particular householders dominated the comfort or cleanliness practices for the entire household (see Chapter 6). In particular, while men and children in this study were reportedly more interested in monitoring the day-to-day consumption of the household than other members, women (and teenagers) were often disinterested in the feedback:

> I forget to look at the screen. I kind of leave it to [my partner] (RG2, 39, adult female).

> I'm not really a gadget person (RG2, 21, adult female).

> I don't know how to use it. It's got nothing to do with me (RG2, 26, adult female)

> I'm not really a numbers person (RG3, 34, adult female)

This is problematic given that women control and do more of the cleaning in Australian households (ABS 2009) and, as discussed in chapters 5 and 6, women and teenagers in this study were more sensitive to common understandings of presentability, body odour, hygiene and cosiness — a finding reported elsewhere (Gram-Hanssen 2007; Kaufmann 1998; Schwartz Cowan 1989). Therefore, while male and young householders could often see where practices could be modified or changed, these were sometimes considered non-negotiable by other householders. For example, the following female householder discussed how she found the cleanliness taunts of her partner 'funny':

> He has been known early on in the piece to ring me up from work and say,

> ‘have you got the dishwasher running?’, and not in an angry way, but in a puzzled way. ‘How can you possibly be washing again? You washed two days ago!’, or that sort of thing. That was sort of funny. It was very Big Brotherish (RG2, 26).

In the case above, this ‘Big Brother’ behaviour resulted in the female householder washing full instead of half loads of laundry. However, she did not cut down on the amount of washing that ‘needed’ to be done:

> Since the meter, and since … [my partner] has been coming home saying, ‘did you do the washing today?’, after he’s checked on the computer to see what water’s been wasted, I’ve become more conscious, and I now only wash when there’s a full load (RG2, 26).

In another example, a mother and her young children debated the practice of hair drying during the interview, which was one of the ‘culprit’ appliances that caused their IHD to display a red light, but was nonetheless considered a necessary practice by the mother:

SON:	No-one uses the hair dryer anymore.
DAUGHTER:	Mum forces me to.
INTERVIEWER:	Is that so you don’t get sick or something?
DAUGHTER:	No, it’s because she doesn’t like the way it looks if I don’t blow dry it.
MOTHER:	[Laughter] It takes about two seconds, I’m not going to stop because of that [referring to IHD] (RG2, 20).

These findings raise an important methodological concern regarding evaluations of IHD feedback, and indeed all demand management programs, which predominately employ survey methods (Challis 2004; NERA 2008a; Reidy *et al.* 2005; Wetherall 2008) that may inadvertently target those householders most interested in the program rather than those who dominate the everyday practices of the household. The group interview method employed in this research went part-way to alleviating this concern, highlighting a potential discrepancy between householders interested in analysing and managing the consumption of their household, and those who managed and/or dominated the comfort and cleanliness practices within it. Had I only interviewed those householders interested in the IHD, the householders that ‘don’t know anything at all’ about it (RG4, 51, adult female), would have been excluded, even though they often knew more about the day-to-day comfort and cleanliness practices of the household. This is an important consideration for future research

and a potential bias that should be acknowledged in existing evaluations of demand management programs.

Declining interest in IHD feedback

As a result of the irrelevance or difficulty in interpreting and applying consumption data to their everyday practices, many householders discussed how they no longer felt the need to use their IHDs regularly, if at all:

> I mean it's interesting, I do look at it sometimes but I'm not quite sure that it changes our behaviour to any great extent (RG4, 61).

> Once you get used to a new pattern it becomes the norm and you don't need to cross-reference as much. … It's a good check (RG4, 46).

> Well I … used it less, as you kind of got used to it. It was just an interesting thing just to see how much power you use (RG4, 63).

> Now we know how much we use so it's not necessary to look every single day (RG2, 25).

Other research has reported similar findings, referring to this phenomenon as the 'novelty effect' (Darby 2006). In support of this view, some householders reported that 'the novelty wears off after a while' (RG2, 24). While this phenomenon is predominantly interpreted as an indication that the IHD feedback and information provided needs to be improved (Wetherall 2008), this research suggests that disinterest occurs due to the disconnection between resource consumption data and everyday practices discussed above.

Consumption connections and practice disconnections

It is clear from this analysis that using consumption data to reconfigure everyday practices has serious limitations, despite achieving savings (see appendices 1–3). Not only are some householders simply unable to interpret and apply the language of 'kilowattevers' to their day-to-day practices but, even when they do, these data do little to reconfigure them. Unsurprisingly, householders tire of acting as micro-resource managers, which bears little relevance to their everyday lives. This was the case even though the householders interviewed were highly engaged with their IHDs, arguably more environmentally motivated than 'average' citizens, and genuinely interested in learning and interpreting the language of resource management. Thus, the scope and success of such programs may be limited in a nationally representative population.

Similarly, while enhanced visualisations of energy and water flows and new understandings of 'wasteful' consumption might act 'like a conscientious pinch on the arse from your mother' (RG3, 40), the focus is on *consumption* rather than *practices*. Shove (1997, p. 270) warns that 'these revealing processes in a sense constitute what counts as energy. And what counts is often what can be relatively easily counted'. By *not* counting or acknowledging the energy and water associated with comfort and cleanliness practices, these seemingly non-negotiable routines slip into the backdrop of everyday life as consumption moves to centre stage.

Evaluators of IHD programs, in reporting the success of IHD feedback in connecting householders with their consumption, fail to acknowledge these potentially dangerous disconnections. Instead, they suggest more 'bells and whistles' to heighten householders' perception of the invisible flows of energy and water passing through their homes (Wetherall 2008). Worryingly, householders may react negatively to these attempts to further connect them with their consumption whilst ignoring the realm of everyday life: 'If it started making noises I would smash it with a hammer. … and I'm serious about that, it'd be out the door' (RG3, 40). Thus, there is an urgent need to refocus attention on the reconfiguration of everyday practices, rather than the assumptions of individualised and rational consumption underpinning IHD programs.

Reconfiguring everyday practices through DPP

In this section I discuss the degree to which DPP reconfigured the practices of 23 households participating in EnergyAustralia's DPP trial (RG4). As outlined previously, DPP events were communicated to RG4 participants 24 hours in advance up to 12 times a year (Miller 2007). During a DPP event, which usually lasted for four hours, the price of electricity rose 20 or 40 times above the off-peak rate (Miller 2007). The high cost of the DPP event was offset at other times of the day, when households were subject to off-peak or shoulder rates. Twelve RG4 households also had an IHD which notified them of an upcoming DPP event through a red light and beeping sound. Events were most commonly called on very hot or cold days. Therefore, the aim of the DPP trial was to encourage householders to either shift or shed their consumption during a peak period. EnergyAustralia considers their DPP trial successful, yielding real peak demand reductions of 36 per cent in summer and 30 per cent in winter (Collins 2009)[18].

[18] Figures quoted refer to DPP 'high' and 'medium' groups both with and without an IHD (see Chapter 4 for further clarification of these groups). Overall peak demand reductions were 23–25 per cent across all temperatures (Collins 2009).

Diversity, temporality and commonality

While all RG4 householders modified their electricity-consuming practices before, during and after a DPP event (with the exception of one household experiencing notification faults), there was significant variation in what householders did in response to these events. Some of the reported practice modifications included: cooking outside peak times; cooking with gas or BBQs instead of electricity; preparing cold meals instead of hot ones; not using the oven; turning off the pool pump; switching off all lights and/or entertainment equipment; switching off all standby power; turning off fridges and freezers; turning off electric hot water units; not undertaking cleaning practices, such as ironing, laundering, vacuuming and dishwashing; turning off or down air-conditioners and heaters; switching off mains power at the meter; and leaving the house.

While a similar response was reported by households from RG2 when their IHD displayed a red light, the types of practice modifications reported by RG4 householders were much more extensive. However, not all RG4 householders responded to a DPP event in the same way. Rather, householders drew on their existing doings and sayings to identify appropriate responses. Nor were all practices suddenly considered unnecessary. Most practices, particularly cleanliness practices, were simply shifted to other times of day:

> I'm prepared to work within the system. Instead of ironing of an afternoon I'll just iron of a morning. It's not much of a hassle, especially when you're retired. You can fit it in around other things (RG4, 53).

> We try and do as much as we can on the light rates (RG4, 56).

> When it [the IHD] goes down to one green light, that's generally a really low time and I generally do a lot of my washing at night because I'm a night owl (RG4, 60).

Thus, in most cases, existing practices were maintained, but rather the time of day in which they were undertaken was shifted. A notable exception was comfort practices, which were significantly modified during a DPP event and often not shifted to other times.

Diverse comfort arrangements across time and space

Table 7.4 provides a range of quotes which illustrate the diverse comfort arrangements employed by householders in response to a DPP event. While comfort practices are clearly in question, householders discuss a diverse range of responses to the DPP signal, from simply not using their air-conditioner or heater through to pre-warming or pre-cooling their

homes. The quotes demonstrate how householders drew on their practical knowledge to identify other ways of heating or cooling their bodies and homes, such as using a fan, opening a window, changing their clothing or going to the beach (see Table 7.4). Interestingly, some didn't feel the need to make any adjustments to their bodies or homes apart from turning the air-conditioner off, highlighting the malleability of comfort reported in Chapter 5.

Table 7.4: Diverse comfort arrangements in response to DPP events

If we were going through a warm period and that was also when a peak period was occurring, we would turn it off. And when the period came to an end we would then turn the air-conditioning on (RG4, 48).
I'd have to make a judgement on that because I've got to live at the end of the day and I'd do it [turn the air-conditioner on] with reluctance but I would try and avoid the peak because I imagine that the reason for telling people is that they have the expectation that they're trying to reduce demand at that time and as a result of that, if I can cut back and get a benefit from it, that's what I'd do (RG4, 49).
I think we're more conscious of how much it is, where before you go, 'oh I'm feeling a bit sticky, I'll whack it on'. Now we're sort of going, 'feeling a little bit sticky'... Well, I put the fan on, but even the fan isn't the first thing we look at … we'll open the doors and then we'll walk outside or something like that, like it's not an automatic straight to the air-conditioner which before it was (RG4, 50).
I think one time it was just too hot and the peak pricing was on and we took off to the beach (RG4, 60).
If it's too cold I just put more clothes on. … Well the hot days I just wear a pair of shorts (RG4, 65).
If it's cooler weather I'd punch the air-conditioner up high till such time as just before the peak period's going to apply, and then I cut it back to about 19 or 20 just to circulate (RG4, 56)
When an event's called we basically go out for the four hour period. [Laughter] We switch everything off and we go out. … We go to someone's house or we would go out for dinner (RG4, 58)
Look if it gets really, really, really hot, we're about to use it, and then the red light comes on [so we don't use it] (RG4, 45).
Yeah, I think there was one instance where I felt it would be good to put the air-conditioner on, but we were on a peak period and I stuck that out I think (RG4, 49).
It wouldn't matter how hot it got, I don't think we'd turn it on in a peak (RG4, 56)
We wouldn't even have it on. We wouldn't even *contemplate* having it on (RG4, 59).

The quotes in Table 7.4 demonstrate not only the use of alternative comfort strategies in response to DPP events, but also the shifting of comfort practices in both time and space. While some householders pre-cooled or pre-warmed their house, others used the DPP event as an excuse for a family outing or a chance to visit a friend. This was also evident in regard to cooking practices, with some householders pre-cooking a meal, and others shifting their meal outside to the BBQ or further away to a local restaurant. The ability of householders to

move their practices to other places and times depended on their mobility, working arrangements and financial situations. In a wider implementation of this strategy, less mobile members of society might be unable to leave their homes or afford similar services (i.e. cooling or meal preparation). This issue deserves further investigation in future research.

However, householders' ability to shift practices in time and space wasn't of great concern to those interviewed because, during most DPP events, comfort practices were considered either malleable or discretionary. While some householders talked about how they had to 'survive' or 'bide out' these DPP events (Table 7.4) most householders did not consider them to be a significant burden or source of discomfort:

> You can always go without …I can't ever recall being uncomfortable (RG4, 48).

> INTERVIEWER: Were you uncomfortable?
> MAN: No. … It wasn't happening every day.
> INTERVIEWER: So it wasn't a big inconvenience for you?
> MAN: No, it hasn't been. (RG4, 51)

> I have to say the four hours … is not too much of a burden. In the summer, I don't think it's a burden at all (RG4, 47).

In contrast, heating practices were considered less discretionary than their cooling counterparts, and more householders reported being unwilling or unable to change these:

> In the winter, because it was on at night, from 4:30 to 8:30 [pm], I think I'd have to put the heater on then ... just because of us (RG4, 47).

> They can forget about the winter… I'm not going to get cold (RG41).

Several householders also reported being in a situation where the air-conditioning was necessary, although this was considered rare:

> I remember one time last year, it was at a really bad time, it was really hot and I'd just come home from work because unfortunately when I get home from work the peak hour starts … and it was just stinking hot that day. … I remember saying to my husband, I said 'I don't care how much money it costs, put the bloody air conditioner on!' It was just *so hot*. My little boy was

> screaming. … I think it was the only time that we've ever, you know, used a big appliance while the peak pricing was on (RG4, 60).

A number of householders reported that DPP events hadn't affected their heating or cooling practices very much, but most still felt it had made them more 'aware' of their comfort:

> I don't think you should let your own personal comfort go, if you're trying to achieve something like that. So what I'm trying to say there is that [the peak pricing] wouldn't influence me one way or the other, but at the same time I'd be aware of it, up here [pointing to head] (RG4, 62).

> MAN: We have done [turned the air-conditioner off]. But if it's real stinking hot we don't. We leave it on.
>
> WOMAN: Well, it makes you think, doesn't it love? It makes you think about the heating and cooling, whereas before you might have gone and thrown the air-conditioner on, but you sort of think, well you don't need it (RG4, 53).

> But then sometimes it's excessively hot and you say, well I'm going to use it. … But it also makes you aware that there are peak times, whereas I was never aware before, that there were different times when the power went up (RG4, 55).

Thus, while DPP events did not always result in householders modifying their comfort practices, it did place them in a contestable space, albeit for a short time period. Most householders considered their cooling practices, and to a lesser extent heating practices, discretionary in response to a DPP event. These findings stand in contrast to those reported in the previous section, where householders who were receiving IHD feedback largely took their comfort, and indeed all other household practices, for granted.

Understanding the DPP response

The wide diversity of practice changes reported by RG4 householders could be interpreted in a number of ways. Following the dominant demand management paradigm, we would assume that householders weighed up the benefits of their practices against the high cost of electricity during DPP events and modified their demand accordingly. There is some evidence to support this argument:

> WOMAN: When it went to peak periods we were extra careful with the

use of electricity. Sometimes it was from two to six [pm], so we often didn't have dinner. …

MAN: That was $2 an hour!

WOMAN: Yes, so we often had dinner after. Or I would prepare something, so I could just pop it in on the gas part. ... It just takes a bit of nous to get yourself organised (RG4, 52).

> We just switch the freezers off because we found that when it goes back to lower rates then the freezer actually keeps going to catch up. It's still nothing compared to what they charge you when the peak period is on. The peak period is ten times what the off-peak rates are! (RG4, 56)

However, the findings also suggest that viewing householders as 'rational' consumers who weigh up the costs and benefits of their consumption is problematic for several reasons. Firstly, householders rarely identified saving money as a motivator of the practice modifications reported, yet they often cut back *all* of their electricity consumption during a DPP event. Secondly, householders often did not shift their consumption to off-peak times of the day, which would give them the same benefit at a lower cost. Rather, RG4 householders reported conserving a significant amount of electricity as well as shifting it — a finding consistent with the results of the wider EnergyAustralia DPP trial (NERA 2008b). Thirdly, householders rarely identified themselves as being 'environmental' or 'green', questioning the assumption that individual attitudes or opinions might be responsible for this response. A practice-based analysis of these data provides alternative explanations.

Reconfigurations resulting from a new rule

The significant DPP response reported by RG4 householders can be understood by conceptualising the peak pricing signal as a new 'rule' targeting comfort, and all electricity-consuming practices, during a DPP event. In this context, the DPP rule takes on the role of '*sanctioning* of modes of social conduct' (Giddens 1984, p. 4). Although the rule does not explicitly ask householders to cut back their heating or air-conditioning usage, it is applied during hot or cold periods when comfort practices are likely to dominate household electricity consumption. Many RG4 householders were aware of the link between weather, DPP events and their comfort practices: 'it's mostly if the weather is very hot or very cold, so it obviously refers to the air-conditioning and heating' (RG4, 55).

However, as with IHDs, EnergyAustralia did not suggest particular practices householders should target during DPP events or how to change them. Consequently, householders were

left to interpret this rule within the context of their existing practices, as the following quote illustrates:

> The big stuff, yeah like we don't do all the washing, we don't put on the air-conditioner, but obviously we don't turn the fridges or freezers off or, you know, the television we keep going, the computer generally keeps going as I've said. … We just wait it out (RG4, 60).

Therefore, householders incorporated the DPP rule into their everyday practices in different ways, through their interpretation and discursive formulation of it (Giddens 1984) within the context of existing doing and sayings. The indirect and non-explicit nature of this rule begins to account for the diversity of responses reported earlier in this section.

Triggering the DPP rule

The DPP rule was communicated to householders in various ways, such as through a red light and sound alert on their IHD, SMS sent to multiple phones, phone messages, and email. In most cases, householders received multiple notifications, which heightened the sense of urgency or importance they attributed to an approaching DPP event. Examples of the seriousness associated with an impending DPP event are provided in Table 7.5, where householders refer to it as a 'deadly virus', 'power surge', 'failure', 'break' or 'blackout'. The sense of importance attributed to these events resulted in some householders turning everything off (at the main meter switch) or leaving the house altogether. Noticeably lacking are references to the price increase as a motivator for these changes. In the quotes selected in Table 7.5, the notification creates a sense of obligation and urgency to respond.

In addition to the communication householders received from their utility, householders also communicated with each other, adding to the intensity of the situation:

> Oh, well the kids would get them too. Then everyone would leave messages everywhere! (RG4, 63).

Several households used the notification to prepare for a self-enforced blackout, which they used as a game or form of entertainment:

> MAN: We use it as a bit of fun. … 'Okay, it's a red light – candles everybody!' … You know the TV's off and that sort of thing.
> WOMAN: We're probably taking it to the extreme but we've made a bit of fun out of it (RG4, 50).

Table 7.5: Notification of a DPP event

Oh gosh, everything goes off. Two mobile phones, a message on the answering machine, this thing [referring to the IHD], as soon as the time actually hits, it glows up red and it just starts beeping at you and it won't stop beeping until you press the button. … Yeah, it just goes, everything just goes off. Like we get a fair bit of notice (RG4, 60).
I don't know if you have ever heard it, but it sounds very…deadly: 'there's a deadly virus coming in, you must not use your power!' That's how it comes across the first few visits: … 'Now listen carefully, I will only repeat this once', or something like that (RG4, 48).
They sent us an email and they send me a text message on the mobile phone to tell me 'the peak period is going to be or high priced period is going to be between two and four, or two and six'. So we go around and turn off all the power points and we don't use anything (RG4, 56).
Yeah, and that's one of the reasons why we have changed a lot of our things. As soon as that red light comes on, [my partner] gets her SMS message. It comes through on my phone as well but I use the work phone, not my private one. We change our dinner pattern. We have candles in our bedroom (RG4, 50).
When the power surge goes on I do turn that off (RG4, 47).
No, when there are power failures we wouldn't use it. … And we try not to use it unless it really is cold (RG4, 48).
Yeah, there was another time where we had a power blackout and we just said, 'let's just go to the beach' (RG4, 60).

These findings suggest that the communication methods used by EnergyAustralia resulted in householders drawing on their practical knowledge to help address the resource management issue of peak demand. This did not mean householders had an expert knowledge of peak demand. On the contrary, many were unable to articulate the purpose of the trial or explain what peak demand is when asked, even though a plain language explanation had been provided by EnergyAustralia at the beginning of the trial. Thus, understanding the resource management issue at hand was less important to householders than being engaged with a problem (and potentially having fun with it). This is an important distinction to make, as policy makers and behaviour change experts often assume that householders need to be better educated in order to assist with resource management problems. However, this research suggests that householders who are more informed through consumption feedback delivered through an IHD are *less* likely to modify their practices than those who are engaged as co-managers of their everyday practices through, for example, DPP events.

In further support of this argument, some RG4 householders reported having a heightened perception that they were monitored by EnergyAustralia during a DPP event:

> That comes into your mind, particularly when you've had that phone call, 'oh wait a minute, they're trying to measure this now, or just to see what the rate of consumption is and they've given us the message now' — and quite

> obviously when they give it to you they must be measuring — that's the day they measure it for sure, so I don't think it would change me that much, but I've got an awareness of it now. Now that I've got into the habit of doing what I do now I don't think that would leave me (RG4, 62).

> It's like someone looking at you all the time. It's like Big Brother watching you… and then it becomes normal. It becomes habit (RG4, 46).

As these quotes indicate, the perception of being watched or monitored encouraged the reconfiguration of existing practices. While some researchers might call this the Hawthorne Effect — an experimental effect which makes people more likely to respond because they understand they are part of a trial (whether they are so or not) — we could also interpret this communication as a form of engagement between EnergyAustralia and their customers. In other words, the perception of being watched may have heightened householders' willingness to respond.

In further support of this finding, EnergyAustralia's 'information-only' group, who received notification of a DPP event without changed tariff conditions, reduced their consumption by 13 per cent during summer DPP events (Collins 2009). While EnergyAustralia found this response more variable than participants on higher tariff charges, and while international trials indicate that this response may diminish over time (CRA 2005), these results suggest that notification plays a significant role in the DPP response. Furthermore, given that the purpose of the trial was to empower householders to reduce or shift their *consumption* with the right *price signals*, as opposed to modifying their *practices* with the right *notification*, reconfiguring demand management programs with the explicit aim of engaging householders as co-managers of their comfort (and other) practices may solicit even greater results.

New common understandings conveyed through the DPP rule

Like the IHD traffic lights, the DPP rule generated new common understandings about appropriate and inappropriate consumption. In some instances these new understandings challenged others, such as the socially sanctioned practice of providing 'cosiness' to guests (Wilhite *et al.* 1996a). For example, one householder described how, instead of putting extra heating or cooling on for guests during a DPP event, they would 'tell them about it' and ask them to adjust their personal comfort in other ways (RG4, 45). In contrast, another householder talked about how they 'had to' maintain heating for their guests during one DPP event where they had pre-arranged a dinner party (RG4, 44). However, this householder also said that this situation didn't bother them: 'That was all right. That's fair criticism. In other words, if the peak load is on and you want to use the power, you pay for

it' (RG4, 44). Therefore, this householder understood and accepted the new rule that consuming electricity during a DPP event was undesirable, and was prepared to pay the price of disregarding it to maintain the common understanding of cosiness.

Similar findings have been reported by Hackett & Lutzenhiser (1991) in their research on changing householder practices resulting from a switch from master metering to individual metering in a Californian apartment block. Through quantitative meter readings and qualitative interviews, these researchers found a significant and immediate drop in consumption resulting from the change to unit-metering. This drop was virtually universal, persistent over time, and highly specific to the air-conditioner. These authors found little evidence regarding the calculation of energy costs and benefits one might expect from a strictly economic model of consumption. Instead, they argue that the price signal generated a new form of social responsibility concerning residents' energy use which gave consumption an 'obligatory' quality (Hackett & Lutzenhiser 1991, p. 459). Residents identified air-conditioning as a luxury and visible appliance which they were now responsible for managing in an appropriate manner within their new role as metered consumers of power. These authors conclude that the new metered pricing structure acted 'as a socially instituted "allocated rule"' applied to discretionary or 'luxury' practices such as air-conditioned comfort (Hackett & Lutzenhiser 1991, p. 460).

Similarly, the consumption of air-conditioning, along with other forms of energy consumption, was still considered a luxury by most householders involved in this research (see Chapter 5). The new DPP rule, along with its communication, *problematised* practices involving air-conditioning and heating appliances and encouraged householders to identify alternatives. Viewed in this way, DPP targeted comfort practices not because it encouraged householders to weigh up the benefit of their air-conditioning against the cost of running it, but because the DPP rule led to new common understandings about appropriate and inappropriate consumption *and* practices, referring in particular to the negotiable and discretionary practice of air-conditioned cooling, albeit during specific time periods. This strategy therefore goes some way to rectifying the disconnection between consumption and everyday practices reported in relation to IHD feedback.

Sustaining the DPP response

There was some concern from householders that the response to DPP events could not be sustained, and that a larger roll-out of DPP would disadvantage certain households for this reason. For example, the following householder discussed how DPP was far too 'anxiety provoking':

> If the price differentiation was reduced, you would still be price conscious but without the panic effect. … It's an extraordinary difference and of course you run around like a blue-arsed-fly trying to make sure that nothing is on. ... I don't think it should be as anxiety provoking when the peak pricing period is coming on. …I think you would get tired of having to be so obsessional about turning everything off during that peak pricing period (RG4, 61).

This householder raises important issues about the responsibility and burden placed on households who are asked to respond to DPP signals. Like IHDs, DPP falls under Sofoulis' (2005) criticism of strategies which blame householders for resource problems and saddle them with all the responsibility for fixing them. While DPP might enhance the communication lines between utilities and householders, this is still predominantly a one-way system, with the utility sending a notification to householders. Furthermore, DPP does little to assist with the reconfiguration of existing practices or counteract the ongoing marketing and advertising of more energy-consuming and 'peaky' methods of achieving comfort and other household practices.

In light of these concerns, householders were worried that the high peak price may adversely affect particular segments of the population, such as the elderly or sick, particularly on cold days:

> What we're saying is it puts a lot of pressure on people that shouldn't bend to pressure. It puts pressure on older people … like my mum's 91 and she'd be the one who would just likely turn everything off and let herself get cold. … It's not such a problem with cooling, but it is for heating (RG4, 45)

> I wouldn't exclude anybody. But maybe some people should be excluded on sort of age grounds, like the elderly probably would say this is too much to worry about or whatever (RG4, 59).

However, the elderly householders interviewed for this research, along with householders caring for sick family members, did not share this concern. Indeed, some elderly householders reported being more able to respond to DPP events than families because they had more time and flexibility to shift their practices to other times of the day. They were also used to 'doing without' during their lifetimes, and therefore had a wide base of practical knowledge to draw on regarding alternative practices. In one exception, a sick elderly woman with dementia who was being home-cared was completely unable to respond to the DPP events. However, her family were happy to pay the cost of her participation in the trial

(through her continued consumption during DPP events). Thus, while protections need to be in place for certain households, there is also a danger that some segments of society could be too easily dismissed from DPP strategies because of common assumptions about their 'needs' and their ability to change them.

The answer, it seems, lies somewhere in between 'protecting' householders and expecting them to shoulder all the responsibility. If it is assumed that householders can do without mechanical cooling while houses are built to prioritise this form of comfort, then householders are likely to respond with anger and resentment like the first householder quoted above. In contrast, if it is assumed that householders can't live without air-conditioning on very hot days, then DPP strategies are likely to be dismissed altogether (see, for example, Murphy 2009). However, if *comfort*, rather than air-conditioning, is viewed as an 'essential service' (McCann 2006) then the methods of achieving it, and indeed the very definition of what comfort is, are open for debate, negotiation and reconfiguration. Importantly, such programs should engage householders in identifying and undertaking alternative comfort practices *as well as* provide support for alternative material reconfigurations of comfort (and other practices), new social understandings and alternative forms of practical knowledge to assist with change.

Bridging the divide between resource management and everyday practices

The demand management programs discussed in this chapter provide little support for the claim that householders act in accordance with the assumptions embedded in the dominant demand management paradigm. In contrast, I have shown how the assumptions of consumption, choice and change that these programs are premised on may be seriously limiting opportunities for reconfiguring comfort and cleanliness practices. I have been most critical of IHD feedback, which attempts to engage householders as micro-resource managers and assist them in visualising and 'saving' energy and water consumption. I have shown how, by seeking to engage householders with their *consumption*, IHDs may inadvertently disengage householders from their everyday *practices*. I have argued that, rather than focusing on improving education and information about resource consumption and its impacts, there needs to be more engagement with, and recognition of, the dynamic and changing composition of everyday practices.

In contrast, DPP inadvertently engages householders with their comfort (and many other) practices during DPP events, even though householders involved in this research had a poor understanding of the resource management issues associated with peak demand, and were not primarily interested in saving money. In making sense of these findings, I showed how

DPP could be interpreted as a practice 'rule' resulting in new common understandings about appropriate and inappropriate practices during DPP events. Furthermore, I suggested that the multiple communication methods used to notify householders of a DPP event contributed greatly to this engagement, by involving householders in an apparent 'crisis' in conjunction with their utility, thereby engaging them as co-managers of their comfort practices.

However, overlooked in both these strategies is an acknowledgement of the malleability of everyday practices. The demand management strategies discussed in this chapter make the dangerous assumption that individuals' resource savings can be maintained amidst the changing composition of 'normal' practice. However, as other studies have clearly shown (Akmal & Riwoe 2005; Slob & Verbeek 2006; Wilkenfeld 2007), efficiency benefits can all too easily be negated as practices change. This oversight throws into question the ability to sustain the types of consumption reductions recorded and proposed in smart metering demand management trials and analyses (see appendices 1–3). If, for example, housing infrastructures continue to prioritise air-conditioning and this appliance becomes a universal 'necessary' household technology in the practice of cooling, the types of 'savings' achieved by these programs (and smart metering in general) could be negated. Similarly, the issue of peak demand could evaporate if houses are completely climate controlled, although this would create increased greenhouse gas emissions due to the energy required to maintain a constant temperature all year. This point is particularly relevant in the context of IHD feedback, which, by inadvertently ignoring practices and focusing instead on efficiency gains and the minimisation of 'waste', may be justifying and further entrenching current conventions, tacit understandings and notions of normality. If not coordinated with other strategies that question the constant resource escalation of more intensive ways of life, their benefit is likely to be negligible, if not negated.

At a more fundamental level, these strategies highlight an underlying problem with the dominant provider–consumer relationship, which prioritises a one-way stream of education, information and engagement focused on the individual consumer. Not only is there a concern that householders will rebel against this responsibility, as other studies have shown (Strang 2004) but, even when householders are genuinely engaged with IHD feedback and DPP events, as the majority of householders in this research were, there are serious limitations in what they can achieve, much of which extends beyond their individual control. Thus, what is required is not a more intensive and strategic targeting of individuals' practices with improved 'alarm functions' and better benchmarking information (Wetherall 2008) but rather strategies which engage both providers and consumers of power and water in practice reconfigurations.

This may be easier said than done. As identified in Chapter 2, the dominant demand management paradigm is characterised by a self-reinforcing rationale which positions demand managers as providers of resources and householders as consumers of them. How then, can be break this cycle? In order to address this question, we first need to understand more about how smart metering stakeholders' shape and limit opportunities for practice change. To achieve this goal, it is useful to consider the views, assumptions and practices of these stakeholders. We are yet to comprehend how they understand householders' comfort and cleanliness practices, how they understand 'consumers', what opportunities they see for practice change, and how they see their role within the transforming context of everyday life. In the following chapter, I draw on interviews with industry stakeholders to address these issues.

Chapter 8: The provider–consumer relationship: a smart metering stakeholder perspective

Having established how household practices change and persist in response to smart metering demand management strategies, this chapter considers how smart metering stakeholders structure and limit opportunities for practice change. Stakeholders interviewed were from relevant organisations, businesses and utilities involved in the delivery of the trials underway in RGs 2–4 (see Chapter 4 and Appendix 10). In addition, stakeholder interviewees represented a range of other smart metering demand management trials with a 'behavioural' component taking place around Australia before or during 2008. Several housing stakeholders were also interviewed to understand the role of housing infrastructure in shaping changing comfort expectations in Australian households. This chapter draws on these interviews to discuss how the provider–consumer relationship shapes what people do and why they do it. Three interrelated questions are addressed. Firstly, how do industry stakeholders understand comfort and cleanliness practices? Secondly, why do these stakeholders predominately overlook everyday practices in their demand management programs? And thirdly, how do demand managers' conceptualisations of consumers potentially shape what householders do? The chapter builds on the self-reinforcing rationale of demand management introduced in Chapter 2, focusing particularly on the responsibilities and roles assigned within the provider–consumer relationship.

The chapter is divided into two sections. Firstly, I show how the neo-liberal policy paradigm permeating the energy and water sectors is leading to deeply entrenched provider–consumer roles which shift and sideline blame and responsibility for the changing composition of everyday life, despite the stakeholders interviewed acknowledging the complex ways in which everyday practices are changing. I argue that policies and interventions are required that reorient these objectives towards the mutual management of everyday life. However, in order for this to occur, the narrow and contradictory range of conceptualisations stakeholders hold about their consumers must also be revised. In the second half of the chapter, I show how these conceptualisations have led to the problematic view that consumers could not, would not and/or should not be asked to change their everyday practices, thereby limiting opportunities for practice reconfiguration. However, subtle reconfigurations in the provider–consumer relationship, through demand management programs such as DPP, are challenging these assumptions and leading stakeholders to engage in further research. In

light of this analysis, I conclude that bridging the divide between resource management and everyday life requires, first and foremost, a new relationship that breaks down the pervasive and problematic division between providers and consumers.

Change and responsibility

Demand managers and other smart metering stakeholders were concerned about the increasing resource escalation of residential comfort practices, despite being predominantly unable to account for this change in demand management policy and practice. In contrast, indoor cleanliness practices, which are currently in a resource growth hiatus (ABS 2006a), were considered non-negotiable by the small number of water demand managers and policy makers interviewed. In this section, I argue that these oversights are characteristic of the provider–consumer relationship, and have been strengthened due to the neo-liberal policy paradigm[19] characterising the energy and water sectors. In particular, neo-liberalism has entrenched the roles and responsibilities of providers and consumers through two avenues. Firstly, the neo-liberal treatment of energy and water resources (Bakker 2005) in Australia has encouraged utilities to *accelerate* and *normalise* resource-intensive comfort, and to a lesser extent, cleanliness practices, by prioritising the commercialisation of energy and water and with it, the pursuit of profit. Secondly, the production–consumption divide, which is further entrenched through neo-liberal policies such as privatisation, disaggregates blame and responsibility for the impacts of more resource-intensive comfort and cleanliness practices. Demand managers, in their role as 'providers', don't believe it's their role to target or address changing practices. Consequently, within this neo-liberal paradigm of resource management, there is no central authority, authorities or group of individuals responsible for change. Rather, utilities, governments and consumers become *individually* responsible for their own resource impacts and problems, leaving the composition of everyday life free to change. I address these two issues below.

Malleable and changing comfort practices

Table 8.1 provides a series of quotes from demand managers in the electricity sector discussing the complex ways in which the material composition of comfort practices are changing in Australian households. These quotes confirm the findings presented in Chapter 5, highlighting the limited opportunity for alternative cooling practices because air-

[19] Neo-liberalism is a broad term used to encompass the privatisation, commercialisation and/or commodification of goods and services (Bakker 2005; Irwin 2007; Peck 2004). In the context of the energy and water sectors, the term is used to encapsulate a form of 'market environmentalism', which 'offers hope of a virtuous fusion of economic growth, efficiency, and environmental conservation' (Bakker 2005, p. 543). Proponents of neo-liberalism in the resource sector assert that environmental goods will be better protected and more efficiently used if treated as economic goods participating in a market (Bakker 2005).

conditioning is literally 'built in' to the new 'McMansion' format[20], and because the increasing affordability of this new appliance encourages retrofitting into existing houses. The quotes also point to the normalisation of air-conditioning and its shift in status to a 'necessary' appliance, rather than a contested luxury. These stakeholders refer to changing comfort practices as more householders benchmark themselves against the 'Joneses next door' (Table 8.1). Stakeholders argue that this is not an individual decision-making process — 'people have no choice' but to install air-conditioning — they 'are having to put *commercial air-cons* on their roofs' (Table 8.1).

In other examples, demand managers discussed how it was not only comfort practices, but the changing composition of everyday life that was leading to escalating energy usage and peak demand. The demand manager quoted below refers to the taken for granted ownership of multiple appliances in his household, the changing composition of household size (Linacre 2007b), the emergence of new 'creature comforts', and changing 'fashions' and infrastructures transforming practices such as lighting:

> We have a quarter of the population now living alone. That is the highest percentage it has ever been. Each one of us wants to have our own creature comforts, including air-conditioning, as well as, how many computers have you got at home? How many TVs? … How often do you switch everything off at the power point? So we have a lot of things at home that we take for granted that are just on all the time. I mean in my own household, where there are only three of us in the house, we have three cars, we have four TVs, we have multiples of everything and each one of them is usually connected to the power point. So unless I go around and specifically switch everything off, nobody will. So it's a lifestyle issue. The other thing is that it's a fashion issue as well. How many downlights have you got in your home? I know of some houses that have got 500 down lights. Each one of those is 50 watts. So you've got very inefficient lighting because of fashion, and you've got lifestyle changes that would be very difficult for us to change (consultant, 25).

[20] 'McMansion' is a colloquial term which was used repeatedly by industry stakeholders during interviews. Stakeholders used the term to refer to the increasing number of large homogenised dwellings, usually located in suburban fringes, which are characterised by poor thermal design and the prioritisation of air-conditioning. As such, McMansions contribute disproportionately to residential peak demand. The term contains references to the American fast-food chain *McDonalds*, which is characterised by its homogenous and expansionist approach. Used in conjunction with the word 'Mansion', stakeholders are referring to the increasing Americanisation, standardisation, and growth in size of Australian suburban housing.

Table 8.1: The changing material composition of comfort practices

People go: 'aw gees it's hot, let's go and buy an air-conditioner, they're pretty cheap at the moment', and install it (electricity distributor, 32).
The second effect is that I think the expectation of people now is that it's no longer becoming a luxury, and I'm sure you're finding this as well, it's more becoming an expectation. So if you look out at western Sydney in particular, which is not our supply area but it's more symptomatic of the kind of attitudes that we're seeing, it's just an expectation that you'll have the McMansion, you'll have no eaves on the house, and then the way that you'll deal with the thermal problems of the house is just to whack in a centrally controlled air-conditioning system, and OK you wear the capital cost but they've built it, the house builders have walked away, they've made their sale, and they don't have to live with the operating costs and the customers that are buying don't really understand the cost of the air-conditioner. So there's that kind of McMansion effect where the consumerist society here has kind of gone well, this is what we want, this is what we need, this is what comfort is about, this is the standard for the Joneses next door and we are … seeing a big backfill in terms of air-conditioning penetration (electricity retailer & distributor, 24).
Most of the residential area has air-conditioning and so-called 'McMansions'. There's also a large number of new housing estates that have ducted air-conditioning, they're all three or four bedroom houses, poorly designed, so in those areas, residential loads are driving congestion problems at the low-voltage part of the network (electricity retailer & distributor, 18).
But people in these developments are having to put *commercial air-cons* on their roofs! Not domestic. It's these *huge*, big things! Because they've got no eaves! … So they belt out the air-conditioner until they get what they want (electricity distributor, 4).
I have to say that Australian houses are the most uncomfortable cold and hot houses I've ever lived in, anywhere in the world. They're bloody terrible. They're disgusting places to live. I mean I've lived in places where you can put a bucket of water outside and it would freeze solid, but be completely warm inside, and we'd have to open the window to cool down. Whereas in my house in South Australia, if it's six degrees outside it's six degrees inside. There's nothing you can do about it (electricity distributors, 5).
If you look at new suburbia anywhere, in the north-western corridor in Sydney, anywhere in the outer suburbs of Melbourne, even in some of the country towns in new estates, you're getting huge houses, no eaves, built on bare blocks, so people have no choice but to air-condition because they're moving into, essentially, a box. …You wouldn't build a house now without air-conditioning, whether it be reverse-cycle air-conditioners or evaporative coolers if you're in an area that will allow you to use that. Is smart metering going to change that? I'm not so sure. Because I think customers, or homeowners, are going to want to be comfortable if they're living in their big brick box with no eaves and no trees. They're going to be looking at some other way to make their house comfortable (electricity retailer & distributor, 21)

Similarly, other stakeholders identified how changing common understandings of presentability (particularly fashion) and cosiness were reconfiguring comfort practices:

> It's a Country Road society — they want to look like they've stepped out of a catalogue in a 'light knit', even if it's bloody zero outside (energy retailer, 1).

> As a society we want to improve our lot. We want to be more comfortable and we want our friends to think we're terrific … and so there's undoubtedly a connection there with energy (consultant, 2).

A number of stakeholders also discussed the complex and highly malleable ways in which

people established their idea of a 'comfortable' environment. For example, the following demand manager discussed discrepancies in common understandings of comfort between the states of Victoria and SA:

> For me, one of the most interesting things to consider is the difference between the perception of individuals and groups of people in different states and different countries. It's quite amazing. … We have massive air-conditioners that we don't actually need very much, because it doesn't actually get all that hot. Only on a handful of days of the year. But everybody jams these massive air-conditioners into their houses and they don't design them properly. Whereas in Victoria it's different. Everyone has spanking great big heating systems — central heating systems … but they don't have the same fixation on cooling as South Australia… but we've basically got the same climate. I mean, it's not like Saudi Arabia! (electricity distributor, 5).

As evidence of the social fascination with heating in Victoria and cooling in SA, this stakeholder cited the example of a business trip he took between the two states on a day with the same outside ambient temperature. In Victoria the heating was on, and in SA the air-conditioning was on. In another example, this demand manager discussed how householders heated their homes higher in winter than the temperatures they would tolerate in summer and visa versa:

> People cool their houses in summer lower than the temperature they heat them in winter. If their house was 21 degrees in the winter, they'd complain. If the house is 24 degrees in summer they complain… They'll try and get it down to 18 in summer and up to 27 in the winter — 28! (electricity distributor, 5)

Such understandings led this stakeholder and his colleagues to believe that comfort expectations were predominantly psychological, rather than physiological.

These quotes indicate that industry stakeholders recognise the complex, malleable, diverse and transformative nature of everyday practices. Furthermore, stakeholders clearly highlight the *non*-individual and *ir*rational characteristics of comfort practices. Thus they confirm, rather than contradict, the analysis presented in chapters 5–7. Why then are everyday practices generally ignored in demand management programs? Why is the unit of analysis and change the individual, when these examples clearly demonstrate that other technological, social, cultural and institutional factors are at play? An analysis of the growing

neo-liberal characterisation of energy and water management provides useful answers to these questions.

Diverging responsibilities for comfort and cleanliness

Neo-liberal contradictions

While neo-liberalism is not responsible for the beginning of the production–consumption divide[21], it is further entrenching the division between providers and consumers of energy and water with problematic consequences for the management of peak electricity demand, climate change impacts and water shortages. Neo-liberalism in the Australian energy and water sectors has been characterised by three interrelated but differently applied processes of privatisation, commercialisation and commodification (Bakker 2005). While both sectors are continually commercialising their respective resources, the energy sector has progressed further down the pathway of handing over management from the public to the private sector. Another key difference between the two sectors is that, while energy services are still not fully commodified, being provided to customers at a price which protects them from the ups and downs of market exchange (Willett 2007), neo-liberal attempts to rescript water as an economic good have been rejected by consumers, whose 'meanings and values of water do not easily succumb to messages of economic reductionism' (Bakker 2005, p. 557).

Neo-liberal principles have led to the introduction of electricity smart metering to reduce peak demand and drive energy efficiency (NERA 2008b). Ironically, the progressive deregulation, privatisation[22] and vertical disintegration of electricity businesses (Willett 2007) severely limits opportunities for achieving the aims of smart metering, and for stabilising or reducing the resource escalation of comfort practices. Indeed, it may encourage this escalation to continue (Strengers 2008a). At the root of this problem is the unbundling of the four functions of the electricity system into geographic monopolies for transmission and distribution, and competing generation and retail businesses (EFA 2006). The ability and willingness of electricity utilities to stabilise or curb more energy-consuming comfort practices is set within this complex and transforming regulatory context driven primarily by the imperative to sell and deliver more power (Willett 2007).

[21] Kaika (2005) documents how the production–consumption began with the 'Promethean Project' of modernity in the late 19th to the first three quarters of the 20th centuries. Her book describes how large-scale urban sanitation and infrastructure projects formed part of a 'historical geographical process that started with industrialization and urbanization and aimed at taming and controlling nature through technology, human labor, and capital investment' (Kaika 2005, p. 4). The result of this era of modernity was the establishment and entrenchment of the division between the state as the provider of resources, which are 'largely hidden, opaque, invisible; disappearing underground, locked into pipes, cables, conduits, tubes, passages, and electronic waves' (Kaika 2005, p. 28), and the household as the consumer of them.

[22] Victoria and SA are fully privatised. Queensland has privatised its retail sector. All states are predicted to fully privatise within this decade or the next (Willett 2007).

For example, when retailers are split from their distributor counterparts they have very little financial incentive in passing on the cost of a 'network peak' (i.e. periods of peak distribution often caused by residential air-conditioning load) to their customers via variable tariffs:

> For the retail business, the blunt reality is that there isn't a lot in it for them. … It's not all that clear that it's actually profitable for them to have time of use tariffs (electricity retailer and distributor, 24).

In regard to comfort practices, this means that retailers have little interest in slowing the diffusion of air-conditioning into households because they are sheltered from network peaks. Compounding this issue is that 'some people in the electricity system actually like peaks because it creates crises and peak prices to make them lots of money' (consultant, 2). In particular, generators and retailers stand to gain from peak demand:

> Origin, AGL, Tru Energy and International Power — the main four retailers of Victoria — all are generators as well as retailers and all have peaking plant. This means that they have an interest in keeping wholesale prices high — not low — which means that the curtailment of load is not in their interests, apart for 'green' reasons (consultant, 25).

Therefore, retailers have a financial incentive in actively *promoting* peak-consuming appliances such as air-conditioners and heaters, and many currently do (see, for example, Origin 2009). This is exacerbated by the fact that retailers make money by selling power: 'It makes no business sense for the retailer to drive energy efficiency' (electricity retailer and distributor, 14).

Conversely, distributors have a financial interest in slowing peak air-conditioner usage due to the 'hot spots' (Guy & Marvin 1996) it creates in their network (i.e. intense periods of demand):

> If [our company] can reduce the peak and defer capital that's pure profit for the business. So the incentive there is to make money, fundamentally (electricity retailer and distributor, 24).

However, distributors have the least ability to influence householders because they have no direct relationship with them. DLC, and other 'invisible' demand management techniques which involve very little interaction with customers, are often the only viable option for

distributors on a large scale. Importantly, DLC is not only attractive to distributors because it ensures concrete peak reductions, but because it allows them to manage hot spots in their network whilst potentially increasing usage in cold spots (Guy & Marvin 1996) — a strategy referred to as 'load shifting':

> We're in the business of supplying and selling energy and anything that helps customers reduce their energy damages our revenue. We're already in enough strife for not having enough revenue and our problem is that our revenue is driven by energy but our *costs* are driven by peak demand. So our business is primarily interested in driving customers to reduce peak demand without reducing energy (electricity retailer and distributor, 14).

Thus, distributors also have an interest in maintaining and escalating the energy consumption associated with comfort practices, although they seek to shift these practices to other times of the day by promoting cooling and heating before peak times.

Ultimately, this issue extends beyond the electricity industry to governments themselves, who currently receive significant revenue from the burning and selling of coal:

> In Queensland, a large part of our economic income for the state comes from burning and selling coal. A quarter of the coal mined is burned to create energy. Now the government gets a lot of revenue from electricity utilities in the first instance, and a lot of revenue via levies and charges from coal mining and sales. Again, it is not in their interests to drive this down (electricity retailer and distributor, 14).

Consequently, there is no commercial imperative to slow the resource escalation of comfort practices in the electricity sector at present.

The issues raised above have been paid surprisingly little attention in MCE's smart metering cost-benefit analysis (MCE 2008a, 2008b; NERA 2008b). While KPMG's (2007) retailer impact report does raise concerns about the willingness of retailers to pass on network peak prices to their customers, they offer no firm solutions. Similarly, NERA (2008b, p. 53) simply advises that the diverging interests of retailers and distributors should be 'borne in mind' when reviewing their analysis. Interestingly, EnergyAustralia has recently proposed an alternative smart metering dynamic tariff which may rectify this issue. The pricing tariff, known as the dynamic peak rebate (DPR), goes 'around' retailers by providing householders with a financial rebate for cutting back their consumption during peak times. This 'carrot'

approach is similar to DPP, except that householders are rewarded for consumption reductions during DPP events, rather than penalised for not responding. However, this pricing structure still leaves important issues, such as retailers' interest in promoting 'peaky' forms of comfort, unaddressed.

Table 8.2: Stakeholder concerns about smart metering

It's like any other infrastructure. Just by virtue of putting a telecommunications network in there doesn't mean people communicate more effectively. You have to educate them, you have to sell the concept, and you have to promote the usage of it (electricity retailer & distributor, 24).
We don't think smart meters will add a lot. Because at the end of the day the smart meter is providing half-hourly synchronised data. It's simply a data cruncher (energy retailer, 1).
There's a presumption that the installation of a smart meter, on its own, will change customer behaviour. The smart meter in itself is just a data-logger. You actually have to do something else with it. All it is, is a platform for doing other things. It's an enabler. So if you just put a box in your house, it's not magic! You have to do other things (electricity distributor, 5).
We seem to be living in a climate, a political climate right now, where the smart meter is the silver bullet. But to what? I mean, it doesn't do any of the things that we actually want it to do. … And some people seem to think it's going to mean that on peak demand days they're not going to use as much, but why wouldn't they? (electricity distributor, 4).
The trouble with technology is that people can get hooked on the technology as a sort of silver bullet. …Smart metering on its own will do nothing. … [The government's] said, here's the technology. Now what are the costs and benefits of this technology? Rather than saying, what are we trying to achieve? Now it's really about peak demand, carbon and energy conservation, and what are the best ways of achieving that, and in that context, what are the costs and benefits of smart metering? (electricity distributor, 26).

This issue is particularly pertinent given that the mandate for smart metering only refers to the technology, rather than the demand management programs or services it facilitates (MCE 2008b). Therefore, the outcomes this new device is expected to achieve depend almost entirely on the various stakeholders within the electricity sector, who, as the discussion above clearly highlights, may not share the MCE's objectives of reducing peak demand and greenhouse gas emissions. Industry stakeholders interviewed also shared this concern, describing the smart meter as a 'chunk of electronics' which has been misrepresented as a 'silver bullet' (Table 8.2). Worryingly, it would be possible to meet the MCE's objective of reducing peak demand by encouraging householders to use their air-conditioners more often, albeit less during 'critical peaks' (NERA 2008b). However, this situation would accelerate, promote and normalise air-conditioned comfort practices, and thus undermine another MCE objective to promote energy efficiency and greenhouse benefits (NERA 2008b).

In contrast, while Australia's water sector is commercialised, shortages have reduced the primary incentive to sell more water: 'Well I think we go out of our way to sell less water. So we're actually trying to sell less of our product' (water retailer, 22). Nonetheless, Australian

water utilities, which act as private companies but are government-owned, are still seeking larger supply systems to rectify this issue, with demand management measures such as water restrictions viewed as temporary hindrances to growth (England 2009; Spearritt 2008). For example, Victoria's water minister recently announced that the state's desalination plant and north-south pipeline will run at full capacity in its early years, irrespective of rainfall, in order to attract private financiers (Ker 2009). If former supply levels can be restored or increased through new projects, such as energy-intensive pipelines, wastewater treatment plants and desalination (Spearritt 2008; VictGov 2007), water businesses may return to promoting the continued use of their product, and with it, new and more resource-consuming cleanliness practices.

Disaggregation of blame and responsibility

In addition to skewing priorities towards profit, the neo-liberal policy paradigm further disaggregates blame and responsibility for comfort and cleanliness practices between providers and consumers of power and water. In the quest for economic efficiency, resource management shifts from being an integrated to a compartmentalised process, within which no-one is willing to take responsibility for change, unless it directly and adversely affects their interests (Strengers 2008a). In this section, I elaborate on this argument by discussing the disaggregation of blame and responsibility for changing comfort expectations between the energy and building sectors, the government, and consumers.

Despite identifying the built environment as *directly contributing to* escalating peak demand, very few energy demand managers were liaising with the housing industry or the government on this issue. First and foremost, demand managers saw themselves as producers and providers of electricity. Consequently, the changing material composition of comfort practices was positioned as the government's role and responsibility:

> Whether a utility has a place to lobby the planning standards on houses I'm not sure, but where the utility I think can be effective is in educating the policy makers as to the impact of the huge penetration of appliances and air-conditioners that we're getting in (electricity retailer and distributor, 21).

However, demand managers were predominantly opposed to further regulation. Some blamed the building industry and the government but believed they were powerless to do anything about it because they had been separated from other electricity businesses:

> The standard of the built environment is rubbish. In fact it's getting worse. One of the problems with the privatisation of the electricity supply industries

> is it's disaggregated the industry and that means that it's more difficult to coordinate. … We have no leverage (electricity distributor, 5)

In particular, this demand manager criticised the types of 'space-aged' houses designed by architects and the ignorance of building professionals:

> The problem with architects, when they build an energy-efficient house, they don't just build a basic house, they take it as an opportunity to build some super space-aged premium product that looks like it's just dropped from, you know, the USS Enterprise. Whereas it's quite possible to build an energy-efficient house with mud straw and grass. … And it's not really an architect issue because most of the houses that are built are built by mass builders. And they're dumb, as far as energy efficiency is concerned. … So if we're going to address energy efficiency as a community, we need to educate our building professionals, because we get left with the problem they've created, and we've been asked to fix it (electricity distributor, 5).

In response to increasing industry pressure to produce more energy and water-efficient houses, the Housing Industry Association (HIA), which is also opposed to further government regulation, has established a voluntary GreenSmart educational training program for builders (HIA 2009). However, minimising peak demand is not an aim of the program, nor is this program a high priority for over-stretched builders. As one housing stakeholder indicated, the wide shortage of qualified builders due to the cessation of government apprenticeship programs several years ago has resulted in education being 'the *absolutely last thing* that's on [builders'] minds' (housing stakeholder, 27). Furthermore, this stakeholder argued that builders were there to provide, not challenge, what consumers want:

> The building sector actually responds to market demand. People today, even first homebuyers want everything up front… So therefore, the housing market is extremely competitive. Because if you don't offer, you know, the big entertainment room, or, you know, big open areas, it makes it look grander and larger, then you're actually potentially missing out on substantial sales (housing stakeholder, 27).

This view led some stakeholders to blame consumers for the escalating resource intensity of comfort practices:

> At the end of the day the consumer builds their house, they pay for it, they make the choices, and they make every wrong choice there is to make. They will take the curtains over the double glazing. They will take the tiles over the eaves, they'll take the, you know, the fancy door handle over, you know. So that's what we're dealing with (energy retailer, 1).

> We've talked to builders about why they build those houses and they say because that's what the people are demanding (electricity distributor, 4).

However, consumers, like the stakeholders discussed above, are often reluctant to accept this blame and responsibility, because their role in the provider–consumer relationship is to consume rather than manage or maintain resources. Further entrenching this relationship are the legal obligations energy providers have to meet consumer demand: '…our core business is still to provide capacity. Our licence conditions require us, we have an obligation to supply, full stop' (electricity retailer and distributor, 24). As this stakeholder indicates, the electricity industry's primary responsibility is to supply capacity, rather than to influence or challenge what people use that supply for. Positioned in this way, consumers logically blame utilities when this supply is not forthcoming:

> But think of it like this… we don't hold the petrol stations accountable for the fact that our cars use too much fuel, do we? But we hold the electricity industry accountable for the fact that we use to much energy…. We get the blame. We had a heat wave a couple of years ago…we had the most horrendous blackouts, they were hideous. The issue was mainly infill in suburbs, where people had knocked down old houses and put in a new one. Builders hadn't informed [our company] of new houses. Unless you have someone employed walking down streets all year, you're never going to know. And you're going to get blamed for letting the system run down. You haven't. The system was actually in very good nick. What happened was there was all these extra bits in it that nobody had told us about, that we had to service, but we couldn't (electricity distributor, 4).

Some stakeholders commented that consumers expected better service since their electricity businesses were privatised, which had further separated and entrenched the roles of providers and consumers. Comments from a website forum on ETSA Utilities' DLC program in a new Adelaide suburb support this view (Bildstien 2007). Positioned as a profitable, privatised service provider, ETSA Utilities faces criticism for not meeting the air-conditioning 'needs' of its customers. Comments shown in Table 8.3 reflect some consumers' belief that

ETSA Utilities should unquestionably meet demand and stop 'lining their own pockets'. There is an expectation from these forum contributors that utilities should invest in unlimited electricity infrastructure, because they are making money out of it.

Table 8.3: Blame from Adelaide Now forum contributors

What is wrong with this picture? Customers are demanding more of a product so what does the producer do? It asks them to buy less so that they can keep up with the demand. Any other industry would build more production facilities to meet the demand. I've never seen an industry like this. Don't tell us to use less, meet our demand, or should we all revert to 1950's lifestyles where we sweat to death in houses with a radio for entertainment and send the electricity companies broke (Bildstien 2007, comment 23).
why are people having a crack at mawson lakes? Isn't ETSA providing a service? why can't they meet demands? they are selling a product and charging large amounts of money for it. seems to me they can't meet demand... news for ETSA – it's hot in adelaide in summer. people need air conditioners. stop carrying on and meet the needs... (Bildstien 2007, comment 66)
Its Hotter in the Northern Suburbs therefore air conditioners are a necessity. No one wants to come home after work to a hot house. And as far as I am concerned no one should live in third world style like in vietnam where they cut off power over certain hours. Perhaps the electricity providers should stop lining their own pockets and reinvest more money into a better quality of service to it's paying customers (Bildstien 2007, comment 47).
These people have built these houses after approval, so if they want a big air/cond so be it, they are paying for it, noone is giving it to them. So to etsa and other utilities, pull your finger out, you've made enough money from us, so start supplying what we are paying for (Bildstien 2007, comment 35)

This example helps explain why demand managers, in their role as providers, did not believe it was their job to challenge existing practices or ways of life, but rather to support and maintain them, albeit more efficiently. Table 8.4 provides a range of stakeholder quotes illustrating this view. In particular, the italicised text refers to the 'rights' of consumers to 'get what they want' and maintain the 'Australian way of life'. Indoor cleanliness restrictions were rejected by water policy makers because they would 'impact on people's lives too much' (Table 8.4). Thus, existing practices and expectations are assumed to be beyond the influence or responsibility of the provider. As a result, comfort and cleanliness practices are reinforced as non-negotiable aspects of everyday life.

In sum, because utilities (and builders) are positioned as providers, consumers expect them to provide and utilities (and builders) aim to provide. The end result is that responsibility and blame are shifted between providers and consumers. While the government is also blamed, there is extreme resistance to their further intervention in market-based systems. Consequently, there is no central actor or actors willing or able to take responsibility for the changing dynamics of everyday practices. Strang (2004, p. 249) warns that this can lead to the 'Tragedy of the Uncommon' where, in the UK, the privatisation of the water industry and central government control have resulted in responsibility for water no longer being held 'in

common' — breaking down collective action and social 'common ground'. Strang (2004, p. 197) argues that existing systems of provision and the relationships they facilitate are forming a dangerous 'material and perceptual disconnection' between the domestic and managerial fields of water consumption. The result is unwillingness by domestic water users to respond to moral appeals to curb their usage, and further entrenchment of existing water practices.

Table 8.4: Achieving energy and water savings without challenging lifestyles and expectations

The way people are getting comfort at the moment, is, without them really understanding it, causing the electricity system to haemorrhage under certain circumstances and so if you can find a way that the technologies we have for energy supply can be less traumatised by the way people use energy, *but if people can get what they want, then that's a good thing* (consultant, 2, emphasis added).
You can't ask an affluent society to shiver in the dark. They're not going to turn off their basic comfort and put on an extra jumper. … What we're grappling with is increasing comfort standards being delivered in a really dumb way. So what we're trying to say is *you can have all the comfort you like*, but you also need to take a leap in understanding of technological solutions to achieve it in a smart way so it's sustainable (energy retailer, 1).
My starting point is that *I believe it is possible to have the Australian way of life*, with about one third of the energy consumption. … People think that the service that people want is energy. They don't. What they want is what energy delivers: comfort, convenience. … *So I can't do things that are seriously going to compromise people's comfort or convenience*, except maybe a little bit of a trade-off every now and again. … The question is, do we as an electricity utility have the means or the right to set standards for customers' comfort levels*? I don't think we have the right* (electricity retailer & distributor, 14, emphasis added).
If people can afford it, why should we say they can't have it? … I think it's unfair when there are tools to allow people to be comfortable… and a temperature that can get down to about 5 degrees to 0 at night in winter – 45 in summer. … *I don't think we've got the right to say you can't have it. I think we have to find ways to change the environment we live in* (electricity distributor, 4, emphasis added).
It's a matter of meeting those standards in a sustainable manner. I mean I very strongly believe that, you know I watch Star Wars movies, and I believe that's where we'll be, but somehow we've got to be delivering all of that, whether that's hovering through space, or bloody, levitating, I don't know what the bloody hell it is, but it's all incredibly energy intensive, and we'll do that with the technology that has no environmental impact… or very little. So that's the challenge for humanity, and that's what we're facing (energy retailer, 1, emphasis added).
You've got that balance of trying to meet some targets so you're actually getting your water savings, *but still not impacting too much on people's quality of life* (water retailer, 22, emphasis added).
We've got no plans for water restrictions inside the home because A, it's two difficult, and B, it impacts on people's lives far too much (government department, 30).
The customer should have the right to be able to go and buy what they want, when they want to a certain extent. … And we, as utility, need to be customer focused and work within that at the same time as looking at our own network. So customers should be able to have an air-conditioner if they want to, but the advice would be to have it almost like a licence – the customer can't own an air-conditioner unless they meet these particular requirements. Maybe that would be an insulated house and various other efficiency requirements (electricity distributor, 32, emphasis added).
People love gadgets, *we just have to promote gadgets that do a better job*, for people and the environment (consultant, 19, emphasis added).

In contrast, this and other research (Allon & Sofoulis 2006; Head 2008; Randolph & Troy 2008; Sofoulis 2005), suggests that the social '*terra nullius*' described by Strang may not yet characterise the Australian energy and water industries. Some consumers are willing to change and adapt their water practices, despite the 'fantasy of endless supply' embodied in the publicly owned infrastructural legacies of the build and supply era (Sofoulis 2005, p. 452). Similarly, this research and other smart metering evaluations (Knamiller & Sharp 2008; NERA 2008a) suggest that householders are willing to adapt their comfort practices during peak times when asked by a publicly owned utility[23]. There is also considerable climate change concern in Australia, and a strong desire to do something about it at the household level (DECCa 2007; Dexter *et al.* 2002). Why else, then, do demand managers continue to take comfort or cleanliness practices for granted in their programs, even when they are explicitly concerned with reducing the energy or water associated with them?

Conceptualising 'consumers'

In order to further understand why demand managers don't address or acknowledge everyday practices in their programs, and why they won't ask consumers to change them, it is useful to return to the ways in which demand managers conceptualise their consumers. I have argued previously that the dominant framing of householders as rational consumers of *resources* (see Chapter 2) rather than carriers of social practices (see Chapter 3) leads to a range of common demand management strategies. In this section, I elaborate on the ways in which the stakeholders interviewed for this research understood their consumers as self-interested, dumb and disinterested, irrational, unpredictable, and/or disadvantaged. I show how the inadequacies and contradictions inherent in these conceptualisations emerge out of the provider–consumer relationship and the limited concepts and methodologies underpinning the dominant demand management rationale. Unintentional shifts in this relationship through DPP are contradicting and confusing these dominant conceptualisations, leading some stakeholders to conclude that consumers are ultimately misunderstood. However, further research being conducted to understand consumers is carried out using the same inadequate methods, resulting in a continual cycle of misinterpretation. I conclude by arguing that the provider–consumer relationship must be reconfigured in order to shift focus from consumers to everyday practices.

The self-interested consumer

Many industry stakeholders understood consumers as being entirely self-interested and therefore unwilling to change their everyday lives in any way:

[23] To date, all Australian DPP trials have been carried out in NSW (NERA 2008a), where the industry is still publicly owned and distributors are not yet split from their retail counterparts (EFA 2006).

> We're talking about a massively corrupt and immoral society and I mean they don't give a shit about their comfort levels…. I guess that's what drives me to be involved in a technology area (energy retailer, 1)

> Most people respond with their pocket unless they're really into conservation (smart metering manufacturer, 10).

> They're not going to switch off on the third of fourth day [of a heat wave] when you actually need them to because they're going to say: 'bugger it, it's hot!' (electricity distributor, 4)

This conceptualisation stems from the demand management assumption of rational choice introduced in Chapter 2, whereby 'consumers' are thought to weigh up the costs and benefits of their consumption and make decisions that prioritise their personal interests (Jackson 2005). Although most demand managers referred to consumers as being somehow separate from themselves, a minority referred to their own families as self-interested, and based their understanding of consumers on the non-negotiable lifestyle of their own household:

> I turn my air-conditioner on around October and turn it off in March. … If I was forced to go onto a [air-conditioning] cycling regime, I'd just double the size of my plant, I'd just spend $900 instead of $700 and I'd be guaranteed to still have a duty cycle that cools me. So people in time will work out a way around it (electricity retailer and distributor, 11).

This conceptualisation generally resulted in strategies designed to monitor, manage or circumvent the consumer even though, as the stakeholder quoted above indicates, eventually consumers 'will work out a way around it'. Such strategies were not seen as permanent solutions but as the best ones currently available. In the examples shown in Table 8.5, stakeholders were overseeing, supervising or bypassing the selfish consumer by 'making sure the customer's doing what they ought to be doing', policing 'discretionary' practices, or controlling the 'invisible infrastructure'.

However, circumventing the consumer through strategies such as DLC was also problematic, because the self-interested consumer doesn't 'like being told what to do' or having 'Big Brother' controlling their air-conditioner (electricity retailer and distributor, 24). This view encouraged some demand managers to favour variable pricing strategies, which offered the self-interested consumer choices about the costs and benefits of their practices:

It's about responsibilities. My point of view is that, if you put an efficient pricing signal out there, there's customers willing to pay that price. It's really about making sure that they undertake an evaluation based on the right price signal. And if they want to use their air-conditioner on those hot days, and they're willing the pay that high price then so be it. That view gets me in all sorts of trouble with my engineering friends because their view is that, it's all about achieving a certain demand reduction. *But it's a democratic right of customers*, like any market, whether it's electricity or water, or petrol refilling, if you're willing to pay the higher price, then you should be able to do so, because it's efficient for that to happen. … *So it's really about providing customers with what they want*, at the right price signal (electricity retailer and distributor, 18, emphasis added).

Table 8.5: Responding to the self-interested consumer

The audit mechanism is the most important thing. Having the meter there to make sure the customer's doing what they ought to be doing (electricity retailer & distributor, 11).
It's about limiting discretionary water use and that, fortunately or unfortunately, tends to be watering gardens, which is residential rather than commercial. … It's about being able to police it, and you can't police indoor water use (government department, 30).
Control of the invisible infrastructure on the grid is going to be the only ones that utilities are going to have an immediate win with. … and the consumer is not involved or affected in any way. It's the only way that utilities are going to be able to *directly* do anything. The reason I make that statement is that every time I sit down in the open forums, there is always the consumer representative who stands up and says, 'the government should go and invest hundreds of millions of dollars in wasted generation capacity so that I can turn my air-conditioning on whenever I want to. How dare the Government not invest in these huge great inefficient plants and waste my taxes paying for these types of things!' And the utilities all stand up and say, 'these things are used for less than one per cent of the time, 20 hours per year, they are incredibly wasteful!' … The consumer people will not listen. They just do not care. … So they've got to actually do a *lot* of educational stuff (smart metering manufacturer, 17).

The emphasis added to the quote above highlights how pricing signals do not challenge the conceptualisation of consumers as inherently selfish, but rather uphold and indeed *perpetuate* this understanding by giving them 'what they want'. Pricing strategies are therefore focused on providing consumers with rewards and incentives:

In terms of economics, the whole idea about tariff reform or improving the pricing on this is to empower customers to give them the opportunity to save money. … It's very much based on incentives. We're not forcing customers to do anything. It's their choice. If they agree to participate then we pay them those bonuses. And if they change their behaviour then they could potentially mitigate any bill impacts. It's not really Big Brother … forcing customers to do

> something — it's about incentivising customers to do something (electricity retailer and distributor, 18).

Similarly stakeholders discussed how the self-interested consumer was motivated to change when they understood how efficiency savings would benefit them. For example, if they were shown how they could save money, and received feedback relating to this through an IHD or pricing program, it was assumed that they would change their behaviour:

> We had customers making purchasing decisions based on the information that was coming from us, and the information they were receiving through their in-house display. When they started to realise the true cost of the second fridge and freezer in the shed which may have a six-pack or a frozen chook in it and that' it, they started to think about, well, do I actually need that? Can I switch it off? Can I replace appliances? (electricity retailer and distributor, 21)

> The cost saving in our focus group work has demonstrated to be the single most effective driver in terms of behavioural change. What's in it for me? Now again that might shift in the next 12–18 months as cultural mores shift in terms of the whole greenhouse issue and there might be a more altruistic response in terms of their behaviour, but when we started the trial 12–14 months ago, although people had aspirations to be green, when the rubber hit the road in terms of their comfort, it's not there (electricity retailer and distributor, 24)

This conceptualisation assumed that consumers acted rationally when provided with information and feedback:

> The idea would be that people don't know how much water they use, when they use it, where they use it, and smart meters would enable them to figure that out or gain that knowledge and so it would hopefully lead to them saying, well, we can cut our consumption by doing XYZ, and changing their behaviour accordingly (government department, 30).

> I liken this thing to a speedo on a car. People on the first day when they're learning are very clinical. Longer term I think it's a useful reckoner. They may not relate to it in the same way they do early on but we're hoping that they'll

> keep an eye on the display and say, OK I'm going too fast or I'm not. … But keeping people engaged is going to be a challenge (IHD manufacturer, 16).

I have argued previously that this rational mindset overlooks the realm of everyday practices. However, this discussion also highlights how these rational understandings of action emerge out of, and fit within, the conceptualisation of consumers as self-interested. Importantly, this understanding is a product of the provider–consumer relationship and the commercialisation of energy resources discussed previously, as the following demand manager acknowledges:

> We've now created a market for electricity, so if I ask you to reduce your load for some reason, if it was the old days when you didn't have the market, then I could say, as an obligation to the community we ask you to switch something off to protect our equipment. But now that we're in a market, if I'm going to ask you as an end-user to change your lifestyle, or to inconvenience you or just ask you to do something, then I should be prepared to do it in a market situation. So we work within that commercial philosophy — that if I'm going to ask you to switch something off or switch over to a generator, then you should expect to be paid, and that payment should be within a reasonable value of what you want or what the market value is (consultant, 25).

In conclusion, the provider–consumer relationship, which is entrenched through neo-liberal market principles, prioritises and *encourages* consumers to act in a self-interested manner. This does not mean that householders are *intrinsically* selfish, but rather that this relationship may encourage them to maximise their own self-interest. In refocusing our attention onto the *relationship*, rather than the consumer, we are able to see how certain conceptualisations and actions may emerge out of it.

The dumb and disinterested consumer

Industry stakeholders described how consumers were ignorant of, as well as disinterested in, issues of climate change, peak demand and water shortages. Consumers didn't understand, or misunderstood, the issues associated with resource management or the problems that their consumption created. Furthermore they couldn't or wouldn't understand these issues even if demand managers tried to explain it to them:

> So this stuff is very complicated and very interconnected, and the story of selling it to people is difficult because you can't get people to sit down long

> enough to listen to the story. And everyone thinks they understand this stuff so they're not willing to listen anyway (electricity retailer and distributor, 14).

The logical demand management response to dumb and disinterested consumers is to educate them. This education took a number of forms, such as information campaigns, feedback and advertising. As the examples shown in Table 8.6 demonstrate, education was not about 'big stick' approaches, but rather about finding ways for householders to keep their 'Country Road catalogue lifestyle, and feel good about the fact that [they] are doing it smarter' (energy retailer, 1). Educating consumers was viewed as the only option available to demand managers because their role is to provide, rather than challenge, lifestyles and expectations.

Table 8.6: Educating dumb and disinterested consumers

Well, yes, I believe it is an education campaign, and some people will take it on board and others won't, but it's about providing ideas in response to consumers to say, you know, this is what you can do. In one example, there was the *Your Home* magazine produced through the consortium. Now, it had incorporated some environmental elements, a few but not a lot. You know, something like that, a publication like that, getting out to people who were actually building or designing their first home. … Because they want to become more informed, a lot of them are wanting to do the right thing. But it needs to be an education campaign and a voluntary uptake [as opposed to more regulation] (housing stakeholder, 27).
And we're tyring do an education campaign to start empowering the community to understand these issues, to say, if you are interested in issues such as sustainability, climate change, the environment, even if you aren't, even if you're a sceptic, no one can believe for a minute that we can maintain the comfort levels that we want with the same psyche, we're going to have to become a bit smarter. Here are some tools for, so that you can keep your Country Road catalogue lifestyle, and feel good about the fact that you are doing it smarter. Now I think that's what we're trying to foster….It's very hard to know whether it will take off or not. It's really tipping point stuff. It may or may not (energy retailer, 1).
It's really to see if this technology, if awareness and real-time technology like this will help customers to modify their own behaviour. So it's not the big stick approach. It's just showing them their own consumption patterns and allowing them to make the decision to modify their behaviour. So I'm hoping it's a bit more empowering than other methods… because you're not telling them what to do. You're just showing them what they are doing. What they do with that information is up to them (water retailer, 8).

However, the dumb and disinterested view of consumers also encouraged stakeholders to dismiss the use of information feedback provided through an IHD because it 'won't mean anything' or because consumers 'will lose interest fairly quickly' (electricity retailer and distributor, 14):

> It's not going to work for individuals. They just don't have the skills or knowledge that's necessary and I don't believe we can train them to do it. What we need is a much simpler approach. Not simplistic, but simpler (electricity retailer and distributor, 14).

Similarly, other stakeholders discussed how certain concepts were 'too complex…to give out to customers' (energy retailer, 20). Consequently, stakeholders used simple propositions to get consumers to respond to pricing signals:

> It makes sense to them. Their heuristic, they just think, 'oh yeah, it just gets constrained for very short periods of time, it's like the M4 [freeway], … I'll get off and go somewhere else'. … When you provide that idea or that analogy to customers, *surprisingly* they get it. *We thought that might be too sophisticated for them* but they're kind of familiar with it with telephones and other sorts of things so it's not a difficult concept in their mental model. They can deal with that in terms of their comfort levels and make some decisions as to where they're going to save money (electricity retailer and distributor, 24, emphasis added).

In another example, a stakeholder explained how the 13 per cent consumption reduction during summer DPP events from an 'information-only' group was the result of customer confusion:

> I think they have got the idea that the system is congested, prices are expensive, so I should use less. It doesn't really matter that they pay the same, that's not the key piece of information in the mental model; it's that prices are more expensive out there, so I should use less. Perhaps they have simple mental models and don't understand that they are not paying those high prices that are 'out there', but nevertheless, it's the *idea* of the price, not the price itself that matters (electricity retailer and distributor, 24).

Likewise, some stakeholders argued that consumers were unable to make intelligent decisions about their consumption in response to a DPP event, and therefore had to be told what to do:

> We said to customers very early on, this isn't about you being inconvenienced. This isn't about you not cooking, not heating, not cooling, not washing. It's just about you thinking about how you can make better use of the time of use pricing structure to do exactly the same activities, maybe just a little later in the day. And they responded very well. Again, it was in the education. *It would have been absolutely pointless for us to say 'here's your times of day, now you go off and work out what you're going to do', because we were very conscious of the fact that we didn't want these customers to*

> *suffer in any way.* Because, when you get home from work, you want to be comfortable in your home, not sitting there watching the clock waiting for seven o'clock to roll around so you can turn the light on (electricity retailer and distributor, 21, emphasis added).

This quote suggests that consumers would 'suffer' if left to their own devices in deciding how to respond to a DPP event. Consequently, this DPP program encouraged consumers to load-shift their air-conditioner usage to other times of the day: 'the beauty of the air-conditioner is that it's big, people see it, and it's discretionary' (electricity retailer and distributor, 24). Despite these recommendations, participants of this DPP program modified their practices in a wide variety of unexpected ways involving relatively *little* load shifting:

> [Customers were] doing a whole raft of different things which we didn't expect to see, so turning computers off, turning their lights out. We've had customers that will just turn all their power off at the main switchboard and just go completely zero. … What we have found … was the reduction was predominantly conservation on the day of the event. There wasn't actually any shifting, which was a surprise to us. *The reason we were encouraging shifting was because we thought that was a more sellable proposition* (electricity retailer and distributor, 24, emphasis added).

However, even when consumers were responding to DPP events like in the program discussed above, there was a presumption that this response would not last, or that householders would lose interest, as the following demand manager indicates:

> I expected a mass exodus but it just goes to show that you can't use your own pre-conceived notions about customer behaviour. Probably best to leave it to a pricing trial. My view is that over the next six months there will be more people that will drop out, because we've hit customers with almost 12 DPP events and they're getting sick of it (electricity retailer and distributor, 18).

A review of Australian DPP trials contradicts this view, indicating that response, participation and satisfaction rates in DPP trials have remained high (NERA 2008a). For example, an evaluation of EnergyAustralia's Strategic Pricing trial, which involved various combinations of DPP, TOU and IHD feedback, found that 84 per cent of their residential customers' expectations were either met or exceeded (Collins 2009). Similarly, demand managers interviewed who conducted previous trials, indicated that the enthusiasm and response from consumers continued through to their completion:

> Even in the last months when a critical peak was called, these people were still responding and still achieving the same sorts of reductions. … Overwhelmingly customers said they wanted to continue for another six months (electricity retailer and distributor, 21).

There are three main explanations for the discrepancies reported above. Firstly, stakeholders assume that consumers require more education of resource management systems and their personal consumption to rectify their assumed ignorance. In contrast, the previous three chapters have highlighted the practical knowledge householders already possess in regard to their comfort and cleanliness practices, and where this is lacking. Thus, there is a mismatch between the provision of consumption information and practical information about how to 'do' a practice. Secondly, chapters 5 and 6 highlighted the non-individual nature of comfort and cleanliness practices, referring to the 'information' scripted into material infrastructures, as well as institutional rules and social common understandings. The impact of consumption information is extremely limited in this context, as discussed in Chapter 7 with reference to IHD feedback.

Thirdly, in Chapter 7 I suggested that the subtle reconfiguration of householders' relationship with their electricity provider during DPP events engaged them as co-managers of their comfort and other household practices. This provides an explanation for the strong response reported in DPP trials. However, DPP also may be limited by the dominant provider–consumer relationship, which *encourages* consumers to act in a dumb and disinterested manner, by delegating responsibility for energy and water management to the providers of these resources, and embedding this responsibility into the material infrastructures of energy and water-consuming practices (Kaika 2005; Sofoulis 2005; Van Vliet *et al.* 2005). Thus, householders may also be disengaged from the impacts of their comfort and cleanliness practices where they are positioned as 'consumers'.

The responsible or 'irrational' consumer

Some industry stakeholders believed that there was a shift occurring in Australian society which was making consumers more interested in 'doing their bit' for the environment. Often stakeholders held this view simultaneously with their conceptualisation of householders as selfish and/or disinterested. For example, the demand manager below, who was previously quoted discussing Australia's 'massively corrupt and immoral society', believed that segments of the population were changing:

> When I took on [this] project, the switch hadn't occurred, and in October last year there was this tipping point, and all of a sudden it happened, and there was this massive change… all of a sudden the environment is back on the agenda, climate change is back on the agenda and it was just like a rash, it was just instant (energy retailer, 1).

Similarly, other stakeholders talked about a global 'buckle tightening' that was occurring in response to environmental concerns, and householders' desire to be 'part of the solution':

> It's very unpopular to tighten the buckle. But globally you have got people voluntarily tightening their own buckle. They're taking on carbon offsets for their flights. People are starting to move to do the right thing. Why do people do anything? Why do people buy more expensive cars? These are sort of another thing that are non-financial and I think that's one of the huge challenges that society faces is that it's not always coming down to the financial imperative on all these things. We're talking about environmental; we're talking about social responsibility (IHD manufacturer, 16).

> I went out in the field and talked to people. I probably talked to a couple of hundred people in their households, and just letting them tell me about what they think we should be doing in all of this. And when I went out there what I was expecting is that people want to save money, that's a lot of people. But there are the waste watchers, who want to reduce their energy consumption because they see it as being wasteful to use more than necessary, plenty of them were older people, but not all of them. There were people who had a green bent, so they're biased towards reducing energy consumption for the climate change effect. They were the three things that I had programmed into my head as what I was expecting to find. I found all three of these things and I found a quite unexpected one as well, which is that *people wanted to be part of the solution and weren't being asked*. And that was the big difference (electricity retailer and distributor, 14, emphasis added).

This 'switch' was prompting some stakeholders to 'sell' their demand management programs to consumers on environmental grounds:

> …and we thought, when we were doing the branding, well what do we say to the community? What's the sales proposition here? And in the first instance we thought, well it won't be the environment, it's going to be hip pocket. Now,

> we're saying we're probably on safe grounds to go with an environmental sales proposition. That's really cool. That's amazing! (energy retailer, 1)

However, stakeholders thought of these environmentally minded consumers as a small segment of the wider population: 'I think, really, like with a lot of these programs, you're already preaching to the converted' (water retailer, 8). Consequently, demand managers undertaking trials with representative samples of their consumers were wary to accept the possibility that they were behaving 'responsibly' or altruistically. However, in DPP programs, where the relationship was reconfigured during DPP events, stakeholders discussed how the 'common good factor' stimulated consumers to respond:

> I've spoken with customers and got this sense that they feel obligated to do it. Now I really wonder what's driving that. Is it this view that if I sort of reduce my consumption, then your contributing to this common good factor, which essentially minimises the risk of blackout? So it's a bit like in the water industry where you've got in some situations, voluntary restraint where the water utility advertises or puts the message out: 'please conserve water'. And you find that there is a community response and people do cut back. If you're out washing your car and the neighbours give you a bad look it sort of reinforces that attitude. And I wonder, I'm just speculating, that this sort of common good aspect, may be a feature in this response, which doesn't fit well with the theory of an economically rational consumer that I have in my mind (electricity retailer and distributor, 18),

As shown above and below, this stakeholder had trouble understanding, accepting and incorporating this 'common good' response into his understanding of rational consumer behaviour:

> But so far it's been almost irrational, if you assume that customers value their air-conditioning use the most on extreme hot summer days (electricity retailer and distributor, 18).

Similar 'irrational' responses were reported by other stakeholders conducting DPP trials, although in the example below it was described as a form of empowerment:

> To me that is one of the strongest indications that we empowered these people. We gave them all this knowledge and they actually made …

> intelligent decisions that actually highlighted that they were doing the right thing (smart metering manufacturer, 17).

As in the previous conceptualisation of consumers, these seemingly irrational responses can be understood as a reconfiguration of the provider–consumer relationship during DPP events, thereby engaging householders as co-managers of their practices.

The unpredictable consumer

The examples above outline diverse and contradictory conceptualisations of consumers. Are they rational or irrational? Are they self-interested or altruistic? Are they stupid or intelligent? Will they respond or won't they? Such seeming discrepancies led many industry stakeholders to prioritise programs that bypassed consumers' unpredictable and erratic tendencies:

> If you know that you can halve the load of air-conditioners then you can drive your energy system. Whereas if you are relying on people to respond when half of them are not even at home, there's a whole lot of uncertainty there in the way you run the system (consultant, 2).

Stakeholders discussed how the malleability of comfort practices was particularly problematic for the reliable management of demand:

> Our experience is that, yeah there is a physiological side to it, definitely …. but it's the psychology of it that's really important, and we know that that moves around so much it's not funny. Because, it depends on women, it depends on time of the month, exercise, time of the day… all sorts of things. And I have to say that women control the air-conditioner. We actually have an example of it in our trial where we spoke to the man and recruited them onto the trial and he didn't include the wife into the process and she fought all the way against it, and when our guys came to fit the equipment she …really didn't like it (electricity distributor, 5).

Consequently, this demand management team was designing a DLC program which attempted to bypass the variability of comfort:

> So we had to work out a regime that allowed us to switch without them feeling a change to their comfort levels. And that's just not a reality change it's a perception change. So therefore, the swear word of the whole project is

> ‘temperature’. We never discuss temperature with people. Because if you get people to think about temperature they’re immediately hot or their cold. So we talk about comfort levels (electricity distributor, 4).

Using this approach of engaging with consumers as little as possible, this DLC program received very few comfort complaints during the trial. DLC, therefore, is a strategy designed to explicitly bypass unreliable householders, with very little impact on their everyday lives:

> You wouldn’t know it was there. It would just be working in the background and it wouldn’t have any impact on a person’s lifestyle whatsoever (consultant, 25).

> The whole key to DLC is back of mind. The idea is that people forget it’s even there (electricity distributor, 4).

Bypassing consumers was seen as particularly attractive for stakeholders with serious peak demand problems because, as discussed earlier, the utility is the one blamed (and potentially financially penalised) for failing to meet consumers’ erratic demand. With the focus on ‘providing’ at all costs, stakeholders place householders and their erratic tendencies within a resource-based paradigm, seeking to control, regulate and manage their wayward demand to ensure unwavering supply. However, such strategies are problematic precisely because householders’ everyday practices shift and change. The current focus on never-ending provision also gives rise to a never-ending stream of more resource-intensive practices which can only be ‘managed’. Thus, in attempting to override the unpredictability of everyday life, stakeholders may indeed be perpetuating it.

The disadvantaged consumer

Electricity industry stakeholders discussed how householders can be disadvantaged by both existing ‘ability-to-pay’ and new ‘willingness-to-pay’ pricing regimes (Bakker 2005). Similar views have been expressed in regard to variable water tariffs (AAP 2008), but these were not discussed by water industry stakeholders interviewed. Some electricity industry stakeholders expressed concern at the equity issues posed by new variable pricing regimes, such as TOU and DPP tariffs, particularly those affecting low-income earners, the unemployed, stay-at-home parents, students, the elderly, and the sick, who are most likely to be at home during peak periods, and the least able to afford peak pricing:

> Smart meters will allow retailers to charge a high price when it’s expensive for them, and pass that onto the people who use the power. And who are the people who are going to use the power on a hot summer afternoon? Not the

> rich people because they're all going to be at work and someone else is paying for the air-conditioning… I can imagine an elderly person who gets a smart meter and gets a whacking great bill, sitting there on a hot summer's day, too frightened to run the air-conditioner because it will cost too much (consultant, 2).
>
> Unfortunately if you have low-income customers, for example, living in a public housing with an inefficient air-conditioner, they've children and it can be difficult for these customers to sacrifice their comfort levels. Their bills will be very high, as a consequence. From an economic point of view they're paying the right marginal price, but from a social welfare point of view, it's an absolute disaster (electricity retailer and distributor, 18).

However, most stakeholders did not reject new pricing programs as a result of these concerns. On the contrary, they believed there were methods of protecting disadvantaged consumers: 'But there's ways and means in which you can produce and provide direct subsidies to meet those needs' (electricity retailer and distributor, 18). Furthermore, some demand managers argued that a much larger pool of disadvantaged customers, arguably also low-income, were currently paying for the air-conditioning use of a privileged few, in particular, those able to afford and live in new McMansions:

> Customers are paying for the peak right now, make no mistake … it's just smeared in. They don't have an opportunity to avoid it. It's inescapable. By providing this tariff structure we can give them a price discount … for 99.9 per cent of the time (electricity retailer and distributor, 24).
>
> So there is this massive cross-subsidy effect of the order of $100 million for [my company] alone per year, between those that contribute to the problem, and those that do not. … So it's within that framework and that perspective that I thought of DPP, because it's a way in which you can get rid of this cross-subsidy, by making sure that customers that contribute to demand on hot days pay for it. But it's not the concept of equity that most people have. It's an economic concept of equity (electricity retailer and distributor, 18).

While the cross-subsidy from non-air-conditioned households to air-conditioned households is estimated at $300–500 million per annum (Wilkenfeld 2004), the concept of 'economic' equity discussed above, which is characteristic of the neo-liberal commodification of resources (Bakker 2005), is not without contradictions or complications. Those moving into thermally

inefficient McMansions have been 'sold' a particular type of thermal comfort, namely one designed around air-conditioning. Changing the economic context for the provision of that service leaves these people in the inequitable position of having to suffer in a hot house, while those in less thermally inefficient houses reap the benefits of their foresight, luck, or both:

> It all depends on the built environment. If you've got a lot of thermal mass in your building, and a lot of insulation, and you can shade it, then that's a fairly good strategy. But if you live in a 400 square metre Henley dog box you'll never pre-cool it because it won't hold the heat (electricity distributor, 5).

Such concerns have led to recommended 'consumer protections' for new variable pricing regimes in the electricity sector, such as those proposed by the Consumer Action Law Centre (CALC), including the ability for consumers to shift between tariff products easily to ensure they are not financially worse off, and the voluntary uptake of demand management programs. These particular recommendations seriously restrict opportunities to reconfigure, on a large scale, the relationship between providers and consumers. International research quoted by one stakeholder suggests that the voluntary uptake of new retail electricity products (specifically DPP/TOU tariffs), as proposed by the CALC and endorsed by the MCE (2008b), would only involve 5–7 per cent of the customer base (government department, 31). Ironically, those customers that *don't* have an air-conditioner or *don't* contribute to peak demand stand to benefit the most from all smart metering pricing programs and vice versa, potentially compromising the aims and outcomes of new pricing regimes and undermining moves towards new relationship configurations.

These equity issues are complex and concerning, requiring further attention than can be devoted here. Ultimately, the status quo of flat electricity tariffs, as well new tariff structures such as TOU and DPP, overlook one of the most pressing equity issues, which is the continued oversight of changing comfort and cleanliness practices and, in particular, their path-dependent material composition. This issue is most pressing in the energy sector, where climate change and worsening peak demand may lead to unavoidable electricity price increases and/or peak demand blackouts that severely disadvantage those people living in 'Henley dog boxes' (electricity distributor, 5). Thus, in seeking to achieve social equity, it is arguably *in*equitable (and certainly unhelpful) to begin with the assumption that the composition of existing practices, and the development of new ones, constitute non-negotiable needs and wants that should be protected.

The misunderstood consumer

Emerging out of these often contradictory conceptualisations of consumers was recognition from industry stakeholders that consumers are ultimately misunderstood, or at least more complex than previously thought. In particular, demand managers acknowledged that their assumptions of rational action and consumer behaviour were inadequate. For example, the following demand manager reflected on the trials and programs he had run, which had challenged his former consumer assumptions:

> So, many utility managers think people will not let you control anything other than their hot water system. Rubbish. They will let us control everything. That's what I've found from experience. People are asking me, can you turn my TVs on and off at certain times so I can stop my kids from watching them? Yes I can, but we won't do that. People will let you do all sorts of stuff. Many utility managers think that people don't like TOU tariffs. Rubbish. We've had over 90 per cent satisfaction rate in every trial we've done that's had TOU tariffs. In fact the voluntary take-up we had was so high. We had a 38 per cent acceptance rate when we mailed out. You're all the time battling against the unjustified opinions of senior managers. Every senior manager has a firm view about what customers will and won't do and I've spent three years unlearning most of that firm view and relearning what they will in fact let you do by asking them and testing them (electricity retailer and distributor, 14).

However, as this stakeholder indicates, dominant understandings of consumer behaviour were so entrenched in this electricity business that he had to 'battle' against his more senior colleagues even after he had 'relearned' what he could do with consumers. The programs this demand manager intended to run had become so controversial that he was relocated away from the area of demand management. Thus, not only is there variation between the conceptualisations of consumers that demand managers hold, but also within different management levels of electricity (and water) businesses. This example indicates how difficult it is to adopt alternative understandings of consumers, even when trials clearly indicate that current conceptualisations are inadequate.

A number of other industry stakeholders believed that there was a lack of data available about how consumers would respond to demand management strategies:

> The thing we're missing in the market is data. We have no data. We have no understanding of behavioural patterns of use. We have broad brushstroke

> views about what people do and what they don't do, and what they relate to and what they don't, and when you're talking about a mass market like energy, a retailer buckets its million customers and pretty much treats them the same (energy retailer, 1).

Consequently several stakeholders were delivering a diversity of strategies based on a combination of consumer conceptualisations discussed above in order to discover which one(s) worked:

> [The company] wasn't set up as a home automation company per se; it was really set up to use smart technology to empower end users to change their behaviours. If [the display] feedback and the screen didn't empower behaviour change then the automation was there as a back-up (IHD manufacturer, 16).

> A lot of people are signing up to DPP as well as DLC. It's effectively a way of cross-selling. Well we're going to make it more expensive for you on these days but hey, by the way, sign up for this and we'll help you reduce your load on those hot days and it's not going to cost you much and you're going to save money (electricity distributor, 32).

Other demand managers, particularly those involved in DPP, believed that further research was required to account for the unexpected and seemingly unexplainable response they were witnessing:

> This is something we want to explore because we've found that when we tell people they go and make a reasonable amount of difference, so even if we tell them on a mediocre temperature day that we're going to run a peak pricing trial day, they go and reduce as much load as they possibly can. And it's not necessarily a hot day, and we don't necessarily need to do it, but because we've let them know that it's the peak, they reduce their electricity. It would be interesting to see if it's really the price, or if it's just the notification (electricity distributor, 32).

While there was a growing recognition from demand managers that current models and assumptions of consumer behaviour were inadequate, evaluations of smart metering demand management programs (see Chapter 2) were reinforcing the same assumptions these

programs are based on. This self-perpetuating process may limit possibilities for new approaches, and create new problems with existing ones:

> The economic[ally] rational and technologically rational people that are driving all of this have an untested assumption that everyone else is economically and technologically rational too. … If they're not then there could be a whole lot of unforseen consequences and quite diverse consequences. … And so we may be creating a social justice problem. We may be creating an incentive for people to use more energy. And if we're not aware of the possibilities and if we're not recognising that we need to acknowledge the possibilities and have strategies to respond to those things or studies about whether or not they'll happen and to what extent they may or may not happen … we'll solve one problem and create half a dozen others (consultant, 2).

However, in response to concerns such as this, several demand managers acknowledged that more attention needed to be devoted to understanding *everyday practices*, as opposed to consumer behaviour. In particular, one stakeholder wished to find out the answers to the following questions concerning air-conditioner usage:

> How are people using their air-conditioners? What other things do they use in their house? Who controls the air-conditioning and how do they use it? Are they moving to the American model where they have it on all the time or are they just switching it on when they're hot? (electricity distributor, 4).

However, even in this case, research was desired so that this demand manager could better predict and respond to current and future comfort practices, and therefore demand, rather than attempt to change comfort practices. Indeed, none of the utilities interviewed questioned their role as providers of electricity resources, and all shared a deeply entrenched faith in the individualistic and rational choice understandings of consumer behaviour framing current demand management strategies. Noticeably lacking was a theory of ongoing adaptation of change that could be employed in their programs, even though I have previously argued that the same demand managers had a strong understanding of changing comfort practices. While these utility providers acknowledged that their existing understandings of consumers were inadequate, they predominantly sought to rectify any inconsistencies or discrepancies through the same insufficient methodologies underpinning the dominant demand management rationale.

Understanding consumers: contradictions and tensions

I have argued above that the dominant provider–consumer relationship *encourages* consumers to act in a self-interested manner. To assist them with this process, consumers are treated as individual resource managers, who weigh up their kilowatts and kilolitres against the cost of consuming them. When householders do not respond to this information, but rather act in accordance with their everyday lives and prioritise their own self-interest as they are encouraged to do as 'consumers', they are presumed to be dumb and disinterested. With taken for granted everyday practices largely ignored, changes to their composition and reproduction lead to seemingly unpredictable and erratic consumer 'behaviour'. However, when householders are engaged with their practices as co-managers of them, rather than consumers of the aggregate resources, they make significant 'irrational' changes which stakeholders can't explain using dominant demand management assumptions. However, such strategies give rise to a range of equity concerns which either prioritise the needs and wants of consumers, or the notion of economic equity, whilst ignoring the equity issues associated with the rapidly changing composition of comfort and cleanliness practices. In acknowledging that these conceptualisations of consumers are inadequate, stakeholders seek to understand their consumers using the same assumptions embedded in the dominant demand management paradigm.

How then, are we to understand 'consumers'? Are they calculated and self-interested, or dumb, ignorant and in need of education? Are they responsible or unpredictable? Are they disadvantaged or simply misunderstood? In reality, consumers can be conceptualised in all these ways. What these juxtapositions point towards is the need to recognise the ways in which particular relationship configurations and framings of demand prioritise specific forms of engagement with, and disconnection from, comfort and cleanliness practices.

Reconfiguring the provider–consumer relationship

In this chapter, I have shown how the provider–consumer relationship structures and limits opportunities for change. Within the market-based neo-liberal ideologies characterising the energy and water sectors in Australia, this relationship has become deeply entrenched. In particular, it has given rise to: the prioritisation of what consumers want, when they want it; the disaggregation of blame and responsibility for the problems that arise from this provision; the taken for granted status of comfort and cleanliness practices; and misunderstandings regarding the ways in which people use energy and water resources in their everyday lives. I have shown how the provider–consumer relationship also creates self-perpetuating conceptualisations of consumers which are counterproductive to the engagement of householders with their comfort and cleanliness practices, and may entrench or escalate the

resource intensity of these practices. As such, my analysis builds on the claims of Chappells *et al.* (2004, p. 148), who argue that consumption is:

> a dynamic process shaped by relations between consumers, producers and intermediaries. It is the interface between these groups that defines a particular consumption 'space' and how different consumers act within that space.

Furthermore, I have argued that subtle shifts in this relationship through, for example, DPP programs, can enlist householders as co-managers of their everyday practices. Demand managers interviewed acknowledged this change, but were unable to account for it within the consumer conceptualisations discussed above. Noticeably lacking is a theory or way of accounting for, and responding to, changing demand within the dominant demand management paradigm. In conclusion, it will be difficult to encourage demand managers and other stakeholders to assist in the reconfiguration of everyday practices within the dominant demand management paradigm. Rather, what is required is a new paradigm which reconfigures the relationship between resource providers and consumers and refocuses attention on the changing dynamics of everyday life. In the following chapter, I identify this new paradigm and outline the potential role of smart metering in facilitating a transition towards it.

Chapter 9: The co-management of everyday practices paradigm

Throughout this thesis, the mismatch between the programs and data from the sphere of resource management, and the day-to-day practices of householders, has become increasingly apparent. In this chapter, I return to the primary aim of this thesis — namely, to consider how we might bridge the divide between resource management and everyday life and what role smart metering might play in this 'bridge-building' process. Drawing on literature on the co-management of systems of provision (Chappells & Shove 2004; Shove & Chappells 2001), along with the analyses presented in the previous four chapters, this chapter proposes a new resource management paradigm which I term the *co-management of everyday practices.* This paradigm is a collaborative and participatory approach that breaks down the production–consumption divide and, more specifically, the provider–consumer relationship, by shifting focus from the central management of *resources* to the co-management of day-to-day *practices*. However, simply identifying a new paradigm is unlikely to instigate required change given the pervasive and self-reinforcing nature of existing energy and water regimes and, in particular, the continuing application of dominant demand management assumptions (see chapters 2 and 8). What is required is a corresponding understanding of *how* a paradigm shift might occur. In this chapter I begin addressing this concern by exploring the role of smart metering as a potential catalyst or constraint for transition towards this alternative paradigm.

I begin by outlining the term co-management and its conventional application in the resource sector, where it is used to refer to the co-operative management of energy and water resources and systems of provision. I distinguish between this standard application of the term and my application to *everyday practices*. I elaborate on this hybrid concept and its potential role as a resource management paradigm, distinguishing between the rationales of demand management and the co-management of everyday practices. In clarifying the role and purpose of this proposed paradigm, I discuss its concepts, methodologies, relationships and roles, and the types of strategies that might emerge from it. I then turn my attention to how a transition towards this new paradigm might be achieved through smart metering. I conclude that this device represents a useful platform for future change. However, I warn that further analyses are urgently required to identify alternative bridge-building pathways between resource management and everyday life.

What is co-management?

In contrast to centrally controlled provision and maintenance of energy and water resources characterising dominant resource management policy and practice, *co*-management refers to mutual responsibility for the supply and demand of resources between providers and consumers. The term emerged relatively recently in the natural resources sector, where it is often referred to as a participatory, collaborative, joint, multiparty or round-table management approach (Berkes & Preston 1991; Borrini-Feyerabend *et al.* 2007; Carlsson & Berkes 2005). Borrini-Feyerabend *et al.* (2007, p. 1) describe co-management as:

> a situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources.

However, while co-management is usually applied and studied in reference to developing countries (Carlsson & Berkes 2005), it is rarely considered in association with the established resource management sectors of modern western nations. A notable exception comes from a small but growing group of researchers (Chappells & Shove 2004; Chappells *et al.* 2004; Medd & Chappells 2007; Shove & Chappells 2001; Van Vliet *et al.* 2005), who argue that reconfiguring systems of provision to include elements of collective management breaks down the production–consumption divide. Van Vliet *et al* (2005) argue that a 'co-provider' relationship arises from co-management, whereby new technological and institutional configurations enable consumers to generate services, such as energy and water provision, on their own. Chappells and Shove (2004, p. 139) discuss the outcomes of this relationship configuration in their study of micro-grids in a UK sustainable housing scheme:

> the households involved have developed a distinctive approach to demand management, arranging a variety of routines around the availability of resources that most of us take for granted. … In these situations the distinction between provider and consumer collapses, opening up new opportunities for the coordination of demand and supply and for the 'real-time' management of resources and resource-consuming activities.

These authors argue that everyday practices can be adapted by reorientating systems of provision towards the mutual control and responsibility of resources between providers and consumers. My analysis of faithful reproductions resulting from householders' past experiences with alternative water supply infrastructures supports this claim (see Chapter 6). Similarly, other studies have shown that owners of solar photovoltaic energy systems (ATA

2007), or people with prior and current connections to localised water supply systems (Head 2008; Sofoulis *et al.* 2005; Sofoulis & Williams 2008), are more likely to engage in less resource-intensive practices.

However, the concept of co-management has predominantly centred on resources or systems of provision rather than everyday practices. In the examples provided by Chappells and Shove (2004), practices change *because* the management structure (and/or physical composition) of systems of provision change, not because everyday practices are themselves the focus of co-management. While systems of energy and water provision are undoubtedly integral to the existing composition of everyday life, applying the concept of co-management to everyday practices gives rise to a wider range of potential policies, strategies and opportunities for change.

The co-management of everyday practices

I conceptualise the co-management of everyday practices as a new paradigm with the potential to bridge the current segregation between the realms of resource management and everyday life. Whereas demand management presumes rationality, demands certainty, is risk averse, and avoids challenging the practices of its 'consumers', everyday life is messy, often irrational, lacks certainty, carries risk, and contains constantly shifting and changing practices (Strengers 2008b). As I have argued throughout this thesis, demand managers have attempted to fit householders into the rationale of demand management, largely overlooking their everyday practices. At a practical level, this has resulted in demand management strategies physically entering the realm of domestic life, while providing householders with tools and information from the realm of resource management (see Chapter 7). Householders misunderstand, misinterpret, ignore and/or lose interest in this resource management information, which bears little relevance to the ways in which they carry out activities such as laundering, showering, heating, cooling, house cleaning and toilet flushing. In contrast, co-managing everyday practices involves recognising and utilising householders' skills in the reproduction of everyday practices, and facilitating the reconfiguration of practice components (see Chapter 3) to encourage less resource-intensive activities.

More specifically, I propose that the co-management of everyday practices paradigm involves processes of:

- **engagement** — engaging people as active participants in societies and social networks with shared (but shifting) components of practices (including understandings about appropriate practices) and supporting active reconfigurations;

- **encouraging and discouraging recruitment** into less-resource intensive practices and out of resource-intensive practices;
- **utilising practice skills and competencies** — recognising, respecting, mobilising and rewarding householders' skills, expertise and adaptiveness as managers of everyday practices;
- **instigating or supporting crises of routine** — within and between households; and
- **modifying practice components** — material infrastructures, practical knowledge, common understandings, rules and recommendations.

Thus, just as co-management involves the mutual negotiation, definition and responsibility of natural resources, the co-management of *everyday practices* involves the collaborative negotiation and management of what people do and why they do it. While householders are already engaged in multiple forms of everyday practice management, through negotiation, debate, rejection and continual maintenance of different comfort and cleanliness configurations (see chapters 6 and 7), these capacities and skills have not yet been acknowledged by demand managers (see Chapter 8). What is missing is co-operation between the carriers and reproducers of everyday practices, and the facilitators of resource consumption and demand. However, this does not mean that stakeholders need to assist householders with maintaining a constant or heightened level of conscious awareness about everything they do and why they do it. Rather, through the reorganisation of practice components and householders' reproduction of them, new forms of expectation and normality may emerge that appear just as mundane and inconsequential as the ones we take for granted now.

In Chapter 2, I outlined the concepts, methodologies, and relationships and roles underpinning the self-reinforcing demand management rationale. I return to these characteristics below in order to distinguish between this dominant rationale and the co-management of everyday practices. In addition, I outline the strategies and approaches potentially enabled by this new paradigm. A summary of the distinctions between these two paradigms is provided in Table 9.1.

Table 9.1: Distinctions between the demand management and co-management of everyday practices paradigms

Characteristics	***Demand management paradigm***	***Co-management of everyday practices paradigm***
Concept of choice	Choice is an individual, autonomous and calculated process based on one's preferences, attitudes, opinions and beliefs.	Choice emerges out of the composition of dynamic and malleable practices with reference to practical knowledge, common understandings, rules and material infrastructures.
Concept of change	Change is a linear process premised on technological and economic efficiency, and the removal of behavioural 'barriers'.	Change takes place through processes of practice reproduction which is shaped by the complex and changing configuration of practice components (practical knowledge, common understandings, rules and material infrastructures), and those who 'carry' them.
Methodologies	Concerned with understanding how and why *people* change within the conceptual context outlined above. Focused on targeting consumers and their consumption. Identifies the best sources of technological and economic expertise in managing a resource problem or constraint and prioritises the most cost-effective solution. Targets behavioural barriers in isolation from social and technical contexts.	Concerned with understanding how and why *practices* change based on the conceptual context outlined above. Focused on reconfiguring practice components through which new forms of reproduction emerge. Aims to attract (or detract) new practice recruits and/or instigate crises of routine. Recognises and prioritises the expertise and skills of the carriers of everyday practices (i.e. householders).
Relationships and roles	Provider–consumer relationship dominates. Role of the provider is to provide centralised and unwavering supply of energy and water resources and to educate, inform and encourage the consumer to curb their demand in the face of resource constraints. Role of the consumer is to pay a fair price for the resources they consume and to use those resources efficiently during periods of resource constraint.	Relationship of co-management dominates, whereby carriers and facilitators or everyday practices are mutually and collectively responsible for their composition and enactment in everyday life. Flexible and interchangeable roles emerge across multiple scales. Householders co-manage practices within the context of the household, through their interactions with others (active reconfiguration), and with reference to their relationship with utilities, governments and material infrastructures.
Strategies and approaches	Narrow range of possible strategies primarily involving pricing regimes, consumption feedback, resource education and information, and efficient or controlled technologies and devices.	A suite of approaches emerge across multiple scales (household, community, jurisdiction, state, country etc.) which reconfigure practice components (rules, material infrastructures, practical knowledge, common understandings) in ways designed to instigate new and less resource-intensive processes of reproduction

Concepts

Unlike the dominant demand management rationale, which is premised on assumptions of choice and change originating from the field of economics (see Chapter 2), co-managing everyday practices is underpinned by conceptualisations of the composition and reproduction of everyday practices (see Chapter 3), which have primarily emerged from the disciplines of

sociology and philosophy. In particular, day-to-day practices can be conceptualised as a co-ordinated entity of interrelated components encompassing material infrastructures, practical knowledge, common understandings, and rules and recommendations, which are established, sustained and transformed through regular performances. Change is understood not as an individual, autonomous, calculated or 'rational' phenomenon, but as the outcome of various configurations of practice components that attract, detract and retain practice 'carriers' who, through their everyday performances of practices, create, reject and sustain particular notions of normality. Choice is not viewed as an individual and calculated decision-making process based on current 'needs', attitudes, opinions and beliefs, but as an outcome of the current and historical composition of a practice or conglomeration of practices.

A focus on everyday practices breaks down the conceptual split between the spheres of production and consumption, where people's practices are deemed separate from the methods and objects used to enable them, such as technologies, infrastructures and resources. In contrast, an everyday practices approach conceptualises these material infrastructures as *part of the practice itself.* Similarly, regulations, restrictions, standards and codes pertaining to how resources are provided and used are conceptualised as part of what makes a practice possible and sensible.

Methodologies

From this conceptual grounding, I propose a methodology that is primarily concerned with how everyday practices are established and reconfigured. This is distinct from the methodology underpinning the demand management rationale, which is focused on targeting and stimulating individuals to shift and/or shed their demand, or removing behavioural barriers to more sustainable patterns of consumption. Therefore, a crucial methodological starting point for the design and evaluation of policies and strategies within this new paradigm is to consider *how* and *why* practices change, and how demand managers and other stakeholders can and do facilitate further change. The aim is not to devise a list of prescriptive practices that should be recommended or enforced, but rather to identify opportunities for assisting with the reconfiguration of practice components, and for supporting the carriers of practices in new reproductions of them. Further opportunities exist to think about enabling recruitment into less resource-intensive practices by encouraging and supporting active reconfiguration within and between households, peer groups and social networks (see Chapter 6).

For example, this research has evaluated the effectiveness of several smart metering demand management programs in reconfiguring the everyday practices of comfort and

cleanliness. This stands in contrast to the dominant demand management rationale, which is concerned with evaluating the 'costs' and 'benefits' associated with implementing smart metering within the separate spheres of production and consumption (see Chapter 2). Some demand management strategies enabled by this new technology are likely to be discarded or ignored by the dominant paradigm, as surveys and focus groups prioritise consumers' 'wants' and 'needs' rather than positioning their everyday practices as part of the problem and solution. In order to dissolve this divide, a co-management of everyday practices paradigm gives rise to a series of methodological questions intended to inform the development of demand management and/or behaviour change programs, such as:

- What strategies do experts in everyday practices (i.e. householders) already have for co-managing their day-to-day activities?
- How do practices change through interaction between different carriers of everyday practices (i.e. how are they actively reconfigured) and how can these processes be enabled or supported?
- How does the historical and persistent backdrop of householders' faithful reproductions enable and limit opportunities for new practice configurations?
- How can practice components be reconfigured to support practice change?
- How do domestic technologies 'carry' everyday practices and in turn be reappropriated by practice carriers (i.e. householders)?
- How can 'everyday crises of routine' (Reckwitz 2002b, p. 255) be enabled and supported?

In addition, the co-management of everyday practices gives rise to methodological questions at the broader level of policy development and infrastructure provision. These include:

- How do infrastructures, systems of provision, technologies, rules and recommendations reconfigure everyday practices?
- How do government programs and projects intended to reduce consumption reconfigure everyday practices?
- How are commercial interests deliberately reconfiguring practices (i.e. through the advertising of air-conditioners) and are these aligned with policy interests (i.e. reducing peak demand and climate change)?
- How do energy and water reforms and regulations (such as disaggregation and privatisation of the electricity sector) shape everyday practices?
- How do other policy interventions, such as restrictions, targets and new pricing arrangements, contribute to what people do and why they do it?

Such questions represent a useful starting point for devising strategies, approaches and policies aimed at co-managing everyday practices and ultimately reducing resource consumption.

Relationships and roles

Reconfiguring the relationship between providers and consumers of power and water is central to co-managing everyday practices. In this context, the co-management relationship does not refer solely to the collective management of resources or infrastructures, but to the co-management of the dynamic composition and reproduction of what people do and why they do it. In the context of existing resource problems, the object becomes one of collectively reconfiguring practices in less resource-consuming directions, rather than engaging consumers with their consumption, making consumption more efficient, or providing more resources to meet new forms of demand.

Consumers are repositioned as the carriers of everyday practices, who are knowledgeable reproducers of everyday life (Giddens 1984). Providers, on the other hand, are active and deliberate facilitators of practice configurations and are able to implement wide-ranging decisions and regulations regarding systems of provision, building codes, appliance standards, targets and new pricing regimes that shift the composition of practices. Importantly, the roles of carriers and facilitators are interchangeable: facilitators are also carriers of everyday practices, and carriers are able to facilitate their own co-management strategies by, for example, installing their own energy or water supply system, or designing a thermally efficient house which will engage them in adaptive comfort strategies (such as opening/closing windows, blinds, doors, breezeways etc.). Equally important, co-management does not require householders to retain a constant level of awareness about their practices. In shifting practice components in ways outlined below, it is possible for new forms of reproduction to emerge that become normal and routine patterns of everyday life.

Strategies and approaches

Unlike the dominant demand management rationale, which prioritises a limited range of methods involving efficient pricing, new and more efficient technologies, and improved consumption feedback and education, the co-management of everyday practices paradigm gives rise to a range of potential strategies across various scales which span beyond the traditional scope of the resource sector. Such strategies include reconfiguring the material infrastructure, rules or common understandings associated with less resource-intensive practices, or facilitating the exchange of practical knowledge about how to undertake them. In elaborating on what these strategies might involve, I do not wish to produce a narrow list of recommendations that fit within the co-management of everyday practices paradigm. This

would be neither possible nor desirable and would limit the potential application of this approach. Rather, the strategies I discuss below are used to help conceptualise this new paradigm and to exemplify the ways it is already being successfully employed, and could be further employed. Thus, my aim here is to shift away from paternalistic recommendations of one strategy over another, to suggest a new way of working with people and things (including resources) in order to collectively manage the changing composition of everyday life.

In outlining what this paradigm encompasses, as well as what it doesn't, I wish to return to the smart metering demand management strategies of IHD feedback and DPP (see Chapter 7). While IHDs arguably attempt to engage householders as co-managers of their energy and water *consumption*, achieving a 5–15 per cent resource reduction in most cases through information feedback alone (NERA 2008b), this approach does little to reconfigure comfort or cleanliness practices. In contrast, I have argued that DPP engages householders as co-managers of their comfort *practices*, and many other energy-consuming practices, during DPP events, albeit tentatively, indirectly and apologetically. It does so through notification signals which ask householders to assist with a problem in order to avoid a financial penalty. Importantly, this strategy does not prescribe or forbid practices, but encourages householders to utilise their everyday skills, practical knowledge and available material infrastructures with reference to this new temporally specific 'rule'. Thus, we can see how co-management can extend beyond the reconfiguration of systems of provision proposed by Chappells and Shove (2004).

In thinking about what other strategies this new paradigm might enable, it is useful to reiterate that the transformation of practices invariably takes place during their reproduction (Giddens 1991). That is, it is through our routinised everyday performances of practices that we continually make and remake visions of normality (Shove 2003b). While practices are not individual phenomena, they are carried out by individuals. Therefore, the aim of co-managing everyday practices is to change *what makes sense for someone to do*, by reconfiguring the composition of practices. This is a fundamental shift from the dominant demand management paradigm, which aims to engage householders with their energy and water *consumption* through personalised cost and benefit information or by appealing to, and seeking to change, their morals, beliefs, attitudes and opinions. The Currumbin EcoVillage's housing infrastructure (RG3) illustrates this distinction. This unique development engaged residents in adaptive comfort practices, not by seeking to motivate or educate them, but by reconfiguring the material composition of comfort practices through an air-conditioning ban (explicit rule) and a requirement to incorporate passive solar design features into the housing envelope (changed material infrastructure) (see Chapter 5). Therefore, what *makes sense* for Currumbin EcoVillage householders to do in response to hot weather involves engaging in

adaptive comfort strategies, such as opening up a series of strategically placed windows or shading part of the house.

Similarly, the government-led Japanese *CoolBiz* (and *WarmBiz*) campaign has slowed the convergence towards ASHRAE thermal comfort standards in Japanese commercial buildings by engaging building occupants in the co-management of their comfort. The campaign encourages workers to wear climatically appropriate business attire while raising the temperature in their offices to around 28 degrees — seven degrees warmer than a typical USA office building (Kestenbaum 2008). Importantly, this strategy encourages workers to develop their own ways of adapting to the natural environment in response to a collective change (i.e. an increase in temperature). In the context of co-managing everyday practices, the CoolBiz campaign can be conceptualised as a new practice rule that reconfigures, to a limited extent, the material composition of a practice by making a universal adjustment to a climate-controlled office environment. Furthermore, the campaign has encouraged new common understandings about acceptable levels of coolth and appropriate business attire. An 'over-indulgence' of air-conditioning is reframed as a shameful act, 'the equivalent of unnecessary trips in a gas-guzzling automobile' (Moffett 2007). This understanding overrides common understandings of presentability, such as the professionalism associated with wearing a conventional suit. New forms of practical knowledge and material infrastructures have emerged in response to the new rule, such as CoolBiz haircuts, CoolBiz suits and 'global warming underwear' (Kestenbaum 2008). Thus, this program has led to the redefinition of appropriate comfort (and to what makes sense for people to do in the office) and facilitated new ways of achieving it.

Another potential avenue for co-managing everyday practices involves focusing on the technological intermediaries shaping everyday practices, such as taps, showers, appliances, pipes and supply systems (Chappells 2003; Sofoulis 2005). While large-scale centralised systems, such as dams and desalination plants, represent path-dependent legacies that will be difficult to change, there are opportunities to focus on other scales of material infrastructure and the regulations and standards that facilitate them. For example, the co-management of everyday practices might involve the development of appliance, building and sanitation (for grey-water systems and water tanks) standards and incentive schemes that are aimed explicitly at facilitating co-management. It might also involve the identification of local supply systems (and other material infrastructures) instigated and co-managed by local communities (Chappells & Shove 2004).

However, there is a danger that the co-management of everyday practices could be interpreted as the divulging of responsibility (and blame) back to the individual. For example,

it is possible for demand managers to *target* practices without actually engaging householders as co-managers of them through, for example, water restrictions that forbid specific outdoor practices. More worryingly, practice rules and restrictions can be imposed while maintaining and expanding the Big Water (Sofoulis 2005), Big Electricity and Big House systems central to the provider–consumer relationship. This would not be a form of co-management, but rather a new form of paternalistic control whereby a utility or government places explicit demands on people and their practices. Sofoulis (2005, p. 456) has previously expressed concern about this approach:

> Although Big Water's infrastructure was created to supply drinking water to meet demands for cleanliness, flushing toilets, and green suburbs, in a 'water crisis', domestic users are suddenly saddled with blame for this situation. They are castigated for being enthralled by the fantasy of endless supply embodied in the water faucet; criticised for lacking detailed knowledge of water used in different household processes (not that this information is easily available), and expected to make sacrifices in the amenity of their yards — quintessential icons of Australian suburbia — as their cherished gardens die.

Sofoulis (2005) reminds us that a transition towards a co-management approach requires, first and foremost, a reconsideration of the production–consumption divide embedded in large-scale systems of provision and a recognition of the ways in which technological intermediaries shape and script particular practices.

This does not mean that central energy and water supply systems and the 97 per cent of existing housing stock (Dalton *et al.* 2007) should be dismantled. We must look to other forms of co-managing everyday practices within existing systems of provision. Chappells' (2003) PhD thesis makes an important contribution in this regard, focusing on the institutional intermediaries in the construction of demand rather than those operating at the extremes of the supply chain. Chappells (2003, p. 180) draws attention to intermediaries such as regional distribution managers, who 'have retained their role as gatekeepers of electricity and water grids' despite their instrumental role in the co-construction of everyday life. She argues that regulators could intervene to foster collaborative demand management policies such as partnerships between housing developers and utilities. Similarly, intermediaries can play a role in facilitating the co-management of everyday practices through, for example, DPP, which provides opportunities for change that do not require the wholesale rejection of large-scale systems.

However, the analysis presented in Chapter 8 suggests that breaking away from the self-reinforcing rationale of demand management is likely to be extremely difficult. Entrenched through neo-liberal principles which further reinforce the production–consumption divide, particularly the distributor–retailer–consumer chain, reconfiguring this system involves change across institutional, political, social and cultural scales which have become pervasive and powerful aspects of modern capitalist societies. As I have argued previously in regards to DPP (see Chapter 7), isolated pockets of co-management are unlikely to achieve the necessary change required, and may be stymied by further changes in the composition of comfort, such as the trend towards mechanised heating and cooling (EES 2006). What is required is a transition towards co-managing everyday practices as an alternative to the dominant demand management paradigm. Considering how such a change might occur is beyond the scope of this thesis; indeed, this would be a large research project in and of itself. However, it is useful to consider how smart metering, as a discrete platform technology, might facilitate this paradigm shift. In the following section I discuss how smart metering might catalyse, or constrain, a transition to the co-management of everyday practices.

Smart metering: catalyst or constraint for transition

As I have shown throughout this thesis, smart metering, while developed in isolated trials, primarily in response to the pressures of peak demand, drought and climate change, is adopting a broadly symbiotic relationship with the dominant demand management paradigm. The smart metering programs reviewed in Chapter 2 and investigated in RGs 2–4 predominantly maintain the status quo by seeking to inform, educate and empower individual consumers. As such, smart metering reinforces the production–consumption divide and may actually serve to further entrench it by utilising demand management techniques that exert more control over consumers through, for example, widespread DLC. However, the smart meter, as a semi-permanent infrastructure that will become a fixture of most Australian households for 20 years or more, may also provide a unique platform from which niche applications and trials of practice-based co-management could take shape.

In teasing out these potential opportunities and limitations, Marvin *et al.* (1999) identify a number of different technical development pathways (TDPs) or relationship configurations arising from smart metering. One of these TDPs involves ‘user-led’ strategies, whereby information flows and programming capabilities are oriented towards the consumer. In this pathway, householders have more control over the types of services they receive, and can use their smart meter as a tool to assist them with partially disconnecting from mainstream systems of service provision, similar to the ways in which the EcoVision IHD (EcoVision 2007) assisted householders living in the Currumbin EcoVillage to manage their on-site

energy and water generation (see Chapter 7). The user-led pathway has strong synergies with Van Vliet *et al.*'s (2005) 'co-provider' relationship, whereby new technological and institutional opportunities enable consumers to generate services, such as energy and water provision, on their own. These relationship conceptualisations, while focused on the provision of resources, fit within the co-management of everyday practices paradigm, whereby householders are collectively involved in reconfiguring their practices in response to the availability of supply. The smart meter gives rise to these possibilities, as it has already done in innovative programs such as Solar Cities, whereby communities are involved in the collective deployment of solar PVs (Campbell & Macfarlane 2006; Ergon 2006; Origin 2006a, 2006b).

Given the expected wide-scale diffusion and availability of the smart meter, the user-led TDP could be readily adopted by energy and water stakeholders. However, most smart metering demand management programs, such as TOU tariffs, DLC, IHDs and DPP, are currently consistent with the objectives and assumptions of the dominant demand management rationale. These approaches predominantly fall under Marvin *et al.*'s (1999, p.117) 'producer-led' TDP, which focuses on new 'cutting-edge' systems, through which producers extend their control 'beyond the meter' and into the household to offer value-added services (such as IHDs), collect new information about consumers, and offer targeted service packages (such as TOU or DPP). In producer-led trials of smart meters, utilities are 'most interested in developing applications which will allow them to have more centralised control over their customers' consumption' (Marvin *et al.* 1999, p. 119). Of particular concern is DLC, which is characteristic of a third 'gatekeeper' TDP (Marvin *et al.* 1999), whereby more sophisticated forms of home automation result in increased control over resource provision and consumption. Thus, most smart metering demand management strategies are designed to *further entrench* the production–consumption divide, rather than bridge it. If these smart metering trials begin to stabilise, the dominant demand management rationale and provider–consumer relationship is likely to persist.

While DPP (and potentially DPR) is perhaps a notable exception which promises opportunity for co-managing everyday practices, this strategy has not been developed for this reason. Rather, DPP has been introduced to defer investment in capital-intensive electricity infrastructure required to meet peak demand and maintain comfort expectations. As argued in Chapter 8, there is no strong incentive from any electricity business to fundamentally reconfigure comfort practices in less resource-intensive directions. Therefore, a transition resulting from DPP is unlikely. This would require recognition of the limits to growth and resource use, as well as better understanding and acknowledgement of householders' skills and competencies in managing their day-to-day practices — a required shift which runs

counter to the progressive neo-liberalisation of energy and water resources discussed in Chapter 8.

Consequently, the smart meter, in and of itself, is unlikely to result in a transition from the dominant paradigm to the co-management of everyday practices. However, it is possible that this platform technology could be implicated in a groundswell of niche innovations loosely based on the user-led TDP, which could potentially enable the co-management of everyday practices. Potential applications of this device might involve disconnection from mainstream energy and water systems or adaptive water targets communicated to households through an IHD. This opportunity is heightened by the open-ended scope of this technology and its large-scale application. As new thinking emerges, smart metering may be a useful tool for feeding successful niche innovations upwards to potentially destabilise the dominant paradigm. As such, change is more likely to occur as climate change, peak demand and drought pose more immediate economic, environmental and social challenges.

Future transition pathways

While I have argued above that smart metering provides a potential platform from which transition might take place, it is unlikely to be the necessary catalyst for change. This is not only because smart metering is expected to further entrench existing energy and water regimes in its current application, but because a transition to the co-management of everyday practices paradigm necessitates extending beyond the resource sectors to consider the complex configuration of everyday practices such as comfort and cleanliness. For example, changing understandings of comfort practices and the associated technologies and housing infrastructures required to support new energy-intensive forms of heating and cooling will inform the degree to which the existing paradigm can be shifted in the energy sector. Similarly, understandings of water 'needs' and expectations and the 'rights' of consumers will continue to shape how water is provided and which relationship configurations are possible. Considering how a wide-scale transition might occur therefore necessitates understanding changes in everyday practices across local, national and global scales. These complexities represent an important area for future research which extends beyond the scope of this study.

Other researchers have already begun the process of identifying where leverage points for change might exist, utilising promising approaches such as socio-technical transitions theory (Brown & Keath 2008; Geels & Schot 2007; Keath & Brown 2009; Rip & Kemp 1998). In considering how a transition to the co-management of everyday practices might be achieved, future studies could adopt the multi-scale approach used by these researchers to identify where mutual landscape pressures (such as climate change, drought, peak demand, global

cultural understandings about expectations for particular resources and practices, and pervasive theories and standards) affect multiple regimes (energy, building, cleaning and appliance) that inform the composition of particular sets of practices (such as comfort and cleanliness). Similarly, this theory provides a useful starting point for thinking about how niche or micro-level smart metering programs utilising a co-management of everyday practices approach might destabilise the existing paradigm and lead to change.

Towards a new paradigm

There is a clear imperative to move away from paternalistic strategies which seek to monitor, manage and protect consumers from the malleability of comfort and cleanliness practices towards those which reconfigure their composition and reproduction in less resource-intensive directions. Building on the co-management of systems of provision (Chappells 2003; Chappells & Shove 2004; Shove & Chappells 2001; Van Vliet 2006), I have proposed a new paradigm in this chapter, which is focused on co-managing *everyday practices* rather than managing, maintaining and providing energy and water *resources*. This paradigm represents an important new contribution that provides demand management stakeholders and policy-makers with a new way of working with practices, the people who participate in them, and the technologies and infrastructures that make those practices a possible and sensible thing to do. Importantly, co-managing everyday practices could encompass a range of strategies and approaches. My suggestion is not to abolish or ban particular practices, but to reconfigure the ways in which everyday practices are facilitated, and to debate and contest normal everyday life rather than taking it for granted as we do now. While this may not result in the rejection or modification of existing comfort and cleanliness practices, it may open them up for negotiation, as the following policy maker suggests:

> I think they will [change their cleanliness practices]. If you change the paradigm for them they will come up with solutions. We don't have to think of everything. We don't have to be paternalistic in this. We've got to get away from paternalism and working out every answer. We've got to empower (government department, 29).

However, as I argued in Chapter 8, the persistence of the dominant demand management rationale limits opportunities for transitioning towards the paradigm proposed in this chapter. In particular, energy and water regimes are highly resistant to change. The path-dependent nature of the water sector discussed by the stakeholder quoted below necessitates the identification of leverage points where destabilisation might occur:

> There's a need to fundamentally change the base assumptions within water product delivery in terms of how to improve the service and until that happens, we probably won't be any different. But once it does happen the change will only happen gradually. … It takes a long time to actually have fundamental change because it's a long term industry but also you have to start, because if you don't start you've lost time, and you've lost time for a long time (government department, 29).

I have suggested that smart metering is unlikely to provide the necessary catalyst for a transition towards this new paradigm, but nonetheless represents an important platform from which niche innovations involving the co-management of everyday practices can feed up to the regime level, thereby helping to facilitate broader change and potentially destabilise the dominant paradigm. I have also argued that future research must look beyond smart metering, and indeed beyond the energy and water sectors, to identify alternative transition pathways that take into account the different dimensions of practices and how they inform the types of service provision expectations and relationships the co-management of everyday practices seeks to change. In the following and final chapter, I review the contributions this empirical study has made to our understanding of comfort and cleanliness practices, the role of demand management strategies in reconfiguring these practices, and the potential to bridge the divide between resource management and everyday life through the alternative resource management paradigm proposed in this chapter.

Chapter 10: Research conclusions: contributions, limitations and future directions

I began this thesis by suggesting that residential demand management strategies are characterised by a problematic divide between the spheres of production, where resources are generated, captured and delivered to households, and consumption, where resources are consumed for day-to-day practices. I showed how this split results in inadequate strategies that either target individuals' consumption or bypass individuals though technological efficiencies, thereby ignoring the ways in which everyday practices are composed and changing. My aim was to develop an approach that bridges this divide using the empirical hook of smart metering and comfort and cleanliness practices. To achieve this aim, I focused this study on understanding how comfort and cleanliness practices are currently composed and changing in Australian households, how smart metering strategies are reconfiguring (and further entrenching) these practices, and what role smart metering stakeholders play in shaping and limiting opportunities for practice change through their relationship with householders. Throughout this inquiry, I uncovered serious limitations in the ability of smart metering demand management programs to reconfigure everyday practices in less resource-intensive directions. In response, I proposed a new resource management paradigm designed to engage both providers and consumers of power and water in the co-management of everyday practices.

In this final chapter, three tasks remain. Firstly, I outline the conceptual, methodological and empirical contributions this research has made in addressing the research aim. I focus on key findings and practical insights that could be adopted by demand managers and other relevant practitioners, and I highlight this material in summary boxes. Secondly, I identify the interdisciplinary and real-world implications of these contributions, and thirdly, I discuss the study's limitations and future research directions. I conclude on a cautionary note, reiterating the tensions that remain in facilitating a transition towards the co-management of everyday practices paradigm proposed in this thesis, and mapping some essential first steps towards this goal.

Key contributions

This thesis was concerned with bridging the divide between resource management and everyday life, using the empirical hook of smart metering demand management programs and the practices of comfort and cleanliness. In brief, this thesis builds on previous critiques of dominant demand management approaches (Chappells 2003; Chappells & Shove 2004;

Medd & Chappells 2007; Sofoulis 2005; Southerton *et al.* 2004b; Wilhite *et al.* 2000) and, in particular, applies this critique to the emerging area of smart metering. It adds to the contributions of previous research regarding the importance of everyday practices in structuring demand for energy and water resources (Gronow & Warde 2001; Shove 2003a; Sofoulis *et al.* 2005; Southerton *et al.* 2004b; Wilhite *et al.* 2000) and the ways in which the relationship between providers and consumers of power and water enables and limits opportunities for managing demand (Chappells 2003; Guy *et al.* 2001; Kaika 2005; Southerton *et al.* 2004a; Strang 2004; Van Vliet *et al.* 2005). However, most importantly, this research adds to the contributions of a small group of researchers who have suggested that co-managing systems of provision may give rise to new service relationships that better account for the changing dynamics of everyday life (Chappells 2003; Marvin & Medd 2004; Shove & Chappells 2001; Van Vliet *et al.* 2005). My primary contribution is to bring together this co-management relationship with my practice-based analysis of household consumption and change to develop a new resource management paradigm termed the *co-management of everyday practices.* In the sub-sections below, I elaborate on the contributions this thesis makes at a conceptual, methodological and empirical level.

Reconceptualising demand as everyday practices: conceptual and methodological contributions

I began this thesis by reconceptualising the production–consumption divide and the dominant demand management paradigm within the context of everyday practices. My contribution in this preliminary stage involved demonstrating the significant and problematic gaps in our knowledge that arise from the dominant understanding of demand, and the self-reinforcing concepts, methodologies, and roles that underpin it. While other social researchers have offered similar critiques (Chappells 2003; Chappells & Shove 2004; Guy & Shove 2000; Wilhite *et al.* 2000), my review identified a series of hitherto unexplored (and unidentified) gaps in our knowledge about how smart metering programs potentially shape (and ignore) aspects of demand. The questions that I raised in that chapter, which are relevant to both national and international demand managers and policy-makers, deserve urgent investigation in future studies and reviews of smart metering.

In response to the limitations of the demand management paradigm, I reconceptualised demand for energy and water as a by-product of the composition and reproduction of everyday practices (Chapter 3). In addition, I discussed what was known and unknown about comfort and cleanliness practices in an Australian context, identifying previously unanswered questions which were used to inform the empirical inquiry. My conceptual framework positioned everyday practices as a series of interrelated and highly dynamic components encompassing material infrastructures, such as technologies, resources and systems of

provision; ‘rules’ and recommendations, such as advertising, regulations and restrictions; practical knowledge of what makes sense for someone to do; and common social understandings about what is right and proper to do. I argued that these loosely bound components form ‘practice entities’ which are established, sustained, and transformed through their performance and reproduction in everyday life.

This practice-based framework is both practical and pragmatic, making it a useful tool for other social researchers, demand managers and behaviour change practitioners wishing to understand, analyse, study, and potentially reconfigure everyday practices in order to bridge the production–consumption divide. As such, this thesis contributes to Shove and others’ (Gram-Hanssen 2008; Hand & Shove 2007; Shove 2003a; Shove & Pantzar 2005; Warde 2005) work by providing a useful ‘translation’ of complex social theories into tangible and easily replicable real-world examples and concepts. Furthermore, my multi-method approach to studying everyday practices provides processes, methods and potential pitfalls that could be easily reproduced (or avoided) in similar studies (and future demand management trials) seeking to reconfigure or analyse everyday practices (see Chapter 4). My contribution to the potential application of practice theory is essential for the normalisation of its use in policy, demand management and behaviour change contexts, and in beginning to disrupt the dominant assumptions consistently underpinning understandings of individuals and their behaviour.

The composition and transformation of comfort and cleanliness

In chapters 5 and 6, I presented new findings regarding how comfort and cleanliness practices are currently composed and transforming in Australian households. Chapter 5 presented a unique analysis of the practice similarities and differences found in RG households by identifying how diversity and commonality emerge out of the composition of practices, rather than through individual attitudes, opinions, values or beliefs. Chapter 6 contributed to our understanding of how practice emerge, persist and change. My analysis in both chapters shifts away from unhelpful dichotomies such as ‘technical’ or ‘behavioural’ change which dominate similar studies. Although intended to provide ‘baseline’ information for understanding how smart metering demand management strategies reconfigure these practices (Chapter 7), this analysis is significant in its own right, identifying mechanisms of change and persistence that extend beyond the models of individual agency, rational choice and technological diffusion normally assumed and adopted by demand managers. As I argued, misrepresenting or overlooking this complexity can lead to potentially detrimental and counterproductive outcomes for demand managers. Those chapters present significant new knowledge regarding our understanding of comfort and cleanliness practices in Australian households, and how they change, which could immediately inform demand

management programs such as Target 155[24] (VictGov 2009a), IHD roll-outs, DPP programs or household behaviour change programs. Key findings from those chapters that may be of immediate use to demand managers and policy-makers are identified in Table 10.1.

Table 10.1: Key findings: understanding comfort and cleanliness practices

Comfort and cleanliness practices are incredibly diverse, yet characterised by a significant degree of commonality. Rather than explaining these differences through individual motives and beliefs, this diversity can be accounted for by understanding the composition of these practices within and between households.
Many comfort and cleanliness practices are highly negotiable and contestable.
The desire to create a warm (or cool) and cosy environment for guests may override environmental considerations relating to heating (and potentially cooling) homes, event though no-one's comfort may be improved by this practice. This issue deserves further attention from those seeking to minimise the impact of rising comfort expectations.
Common understandings of smell, sweat, hygiene and presentability are pervasive across all cleanliness practices. Women and teenagers may be more sensitive to these understandings, thereby dominating these practices within the household.
Comfort and cleanliness practices are faithfully reproduced from householders' childhood and life experiences; actively reproduced through negotiations and debates with friends, family members, fellow householders, and other influential peers; and deliberately reconfigured through rules and recommendations made by governments, institutions and commercial interests.
One household member may dominate the practices of the entire household and, in the case of comfort, this can be a non-human member (such as a household pet).
Householders' experiences with material infrastructure dramatically shape what they do and why they do it. The history of a practice is thus instrumental to its current composition.
Householders who have experienced severe water or energy shortages or have used alternative (household managed) supply systems may be more likely to develop long-lasting low-resource-consuming comfort and cleanliness practices as a result of these experiences.

Reconfiguring comfort and cleanliness practices through smart metering demand management strategies

The individualistic and resource management focus of the IHD and DPP demand management programs discussed in Chapter 7 stood in stark contrast to the dynamic composition of comfort and cleanliness practices addressed in the preceding chapters. The divide between the realms of resource management and everyday life came to the fore, as did the problems emerging from this segregation. Although many evaluations of smart metering demand management trials have been undertaken both in Australia and internationally (see appendices 1–3), none have considered the impact of these programs on household practices. Thus, this analysis represents a significant new contribution which

[24] Target 155 is a Victorian Government initiative aimed at maintaining household water consumption at or below 155 litres per person per day.

raises a series of previously unexplored issues that should be of immediate concern to smart metering demand managers and policy-makers world-wide.

In particular, I showed how IHD feedback, while enhancing visualisations of energy and water flows through the household, ignores the practices this consumption is implicated in, leaving householders to 'save' energy and water or reduce 'waste' associated with existing practices, rather than assisting householders with practice reconfigurations. Furthermore, I argued that IHD feedback seeks to frame householders as micro-resource managers, providing them with data that were often misinterpreted, misunderstood or rejected by householders because they bear little relevance to their everyday lives and practices of comfort and cleanliness. While energy and water savings were achieved, I warn that the consumption focus of IHDs may further legitimise and normalise practices of comfort and cleanliness already taken for granted and leave them open to further manipulation from commercial interests. These findings suggest that the current focus on connecting householders to their *consumption* may be insufficient to achieve change. Rather, what is required is a corresponding connection to *practices*. These findings are significant and have potential implications for the design of IHDs and consumption feedback programs.

In contrast, I found that DPP engaged householders as co-managers of their comfort practices, and indeed all other electricity-consuming household practices, during a defined temporal period. The notification of an oncoming DPP event acted as a 'crisis' signal which householders felt obliged to respond to. I argued that, rather than being thought of as a rational response to the higher price of electricity, DPP can be conceptualised as a new rule which engages householders in the co-management of their practices and, through this, the resource management issue of peak demand. In particular, this new rule targets comfort practices by being implemented on particularly hot or cold days. However, while DPP clearly demonstrates the malleability of comfort, I warn that this strategy places too much responsibility on individuals without considering the material configurations 'hardwired' into comfort practices. These are significant findings that challenge demand managers' assumptions regarding the effectiveness of price signals. My analysis of DPP provides new impetus to reshape the types of programs enabled through smart metering by refocusing attention on communication, engagement and notification, which are normally considered secondary to price signals. Table 10.2 summarises key findings that emerge from my analysis of IHDs and DPP.

Table 10.2: Key findings: changing comfort and cleanliness practices through IHD and DPP programs

IHD feedback

IHD feedback is largely ineffective at changing or modifying comfort and cleanliness practices in less energy or water-intensive directions, and may be inadvertently justifying and legitimising existing configurations of these practices by focusing solely on consumption. Consequently, energy and water savings achieved through IHD feedback may be negated in the future as new products, understandings, practical knowledge and rules pertaining to everyday practices emerge or are deliberately introduced.

Householders with IHD feedback respond by attempting to avoid 'waste', increase efficiency, and 'save' energy and water. This response is consistent with the recommendations made through their IHD, other environmental campaigns and demand management programs. While this approach may encourage householders to co-manage their *consumption*, it continues to overlook everyday practices and how they are changing.

IHD 'traffic light' feedback contains new common understandings regarding appropriate and inappropriate consumption which is used to challenge and justify some comfort and cleanliness practices.

Householders respond to traffic light feedback by 'shifting' their consumption to other times of the day, or by avoiding 'waste'. Comfort and cleanliness practices are rarely called into question.

IHD frames householders as micro-resource managers, which bears little relevance to their everyday lives. Consequently, householders lose interest in this device, and the savings it can achieve are limited.

There may be a gender and age divide between those householders interested in IHD feedback (men and children) and those householders who dominate comfort and cleanliness practices (teenagers and women). This potential divide is likely to bias existing evaluations towards those respondents most interested in IHD feedback but not necessarily undertaking or dominating the most energy and water-intensive practices in the home (i.e. comfort and cleanliness).

DPP

There is little evidence to suggest that householders weigh up the costs and benefits of consuming electricity during a DPP event. Rather, DPP can be conceptualised as a new practice 'rule' targeting all electricity-consuming practices during a specific period of time. This rule applies particularly to comfort practices due to the extreme weather conditions normally experienced during DPP events.

DPP engages householders as co-managers of their practices during a DPP event. Engagement takes place through a series of notifications and interactions between the utility provider and the household which frame an event as a crisis, thereby involving householders as part of the problem and solution in order to contribute to the common good.

Understanding the resource management issue at hand (i.e. peak demand) is not essential to the DPP response. The effectiveness of this strategy lies in the utility's engagement with householders.

DPP and IHD Feedback

Both DPP and IHD feedback place too much responsibility on individuals without assisting with the reconfiguration of practice components, or acknowledging how this composition is changing.

Relationships, responsibilities and consumer conceptualisations

Chapter 8 highlighted the need to reconfigure the relationship between the providers and consumers of power and water in order to achieve practice change. Drawing on interviews with industry stakeholders involved in the RG programs and similar smart metering interventions, I argued that the neo-liberal treatment of energy and water resources has

entrenched the provider–consumer relationship and led to the disaggregation of blame and responsibility for the rising demand associated with comfort and cleanliness practices. In their aim to 'provide' and generate a profit, I showed how these stakeholders were ignoring, and in some cases *encouraging*, the escalating resource consumption associated with these practices. Consequently, no one actor or actors were willing to accept responsibility for the seemingly non-negotiable practices of comfort and cleanliness. My analysis raises a series of previously overlooked contradictions and concerns that are likely to undermine the ability of smart metering to reconfigure comfort and cleanliness practices in less resource-intensive directions. These findings are particularly salient for policy-makers currently mandating smart metering with the expectation that the widescale diffusion of this device will lead to long-term peak demand and greenhouse gas reductions.

Chapter 8 also identified a series of contradictory consumer conceptualisations and relationships which inform demand management programs, but which bear little relevance to everyday life. Using these consumer conceptualisations, I showed how stakeholders were unable to account for the responses achieved through DPP programs, where the relationship between providers and consumers is reconfigured. Instead, stakeholders engaged in further research based on the same inadequate assumptions and methodologies inherent in the dominant rationale. Building on the contributions of researchers such as Chappells (2003) who focuses on the 'intermediaries' of demand, this analysis highlighted the critical role of the provider–consumer relationship in shaping what people do and why they do it. My analysis indicates that consumers may respond in unsustainable ways because the relationship between providers and consumers encourages them to do so. This finding represents a significant contribution that sheds new light on the ineffectiveness of many behaviour change programs, efficiency improvements and technological advancements. Significant findings from this chapter are identified in Table 10.3.

Table 10.3: Key findings: relationships, responsibilities and consumer conceptualisations

The neo-liberal policy paradigm is disaggregating the interests of the electricity sector and prioritising electricity sales. As such, some electricity sector actors are deliberately contributing to more resource-intensive comfort expectations. A similar situation may reoccur in the water sector when new energy-intensive capacity (such as desalination and pipelines) is brought online.
The provider–consumer relationship disaggregates blame and responsibility for the rising resource intensity of comfort and cleanliness practices. Instead it focuses attention on giving consumers what they want whilst educating and empowering them to make 'efficient' choices. This may lead to further changes in the configuration of comfort and cleanliness practices.
The provider–consumer relationship prioritises and reinforces a series of consumer conceptualisations that inform demand management programs. Stakeholders acknowledge that these conceptualisations may be inadequate for managing demand, but seek to understand consumers through the same assumptions and methodologies.

The co-management of everyday practices

Chapter 9 outlined the central contribution of this thesis, namely a new paradigm termed the co-management of everyday practices. The key characteristics of this new paradigm are summarised in Table 10.4. Building on literature regarding the co-management of energy and water systems (Chappells & Shove 2004; Chappells *et al.* 2004; Medd & Chappells 2007; Shove & Chappells 2001), as well as the conceptual framework of practices developed in Chapter 3, I proposed this paradigm as a way of reorientating the provider–consumer relationship towards the collective management and responsibility of everyday practices. This paradigm represents a significant new research contribution which offers an alternative approach to current resource and demand management policy and practice that could be immediately employed and tested by policy makers, demand managers and behaviour change practitioners. As such, this thesis goes beyond a critique of the production–consumption divide (Guy *et al.* 2001), an evaluation of smart metering demand management strategies (Marvin *et al.* 1999), or an analysis of everyday practices (Shove 2003a), to propose a practical and immediately operational approach to reconfigure everyday practices in less resource-intensive directions. In short, this thesis addresses the often overlooked area of practice change, going beyond the contributions of most other researchers in this area.

Table 10.4: Key characteristics of the co-management of everyday practices paradigm

Aim	**The co-operative management of everyday practices, such as heating cooling, bathing or laundering, in order to achieve specific resource management, economic, environmental or social outcomes.**
Concepts	Informed by an understanding of the composition and transformation of everyday practices. Choice emerges through the composition of everyday practices and change takes place in the everyday crises of routines.
Methodologies	Informed by questions about how and why practices change, how practices can be reconfigured, and how existing material infrastructures, rules, practical knowledge and common understandings already shape practices. Recognises and prioritises the expertise of carriers of everyday practices (i.e. householders).
Relationships and roles	Consumers are repositioned as carriers of everyday practices, who are knowledgeable reproducers of everyday life. Providers are repositioned as active facilitators of everyday practices. Both roles are interchangeable and flexible.
Strategies and approaches	A suite of approaches emerge across various scales, aiming to reconfigure particular practice components (material infrastructures, rules, common understandings, practical knowledge) leading to new forms of reproduction..

Furthermore, in Chapter 9 I considered how a paradigm shift might occur through the smart meter. I argued that this device was unlikely to lead to change in and of itself, but nonetheless represented a useful platform from which niche innovations might be more readily adopted by energy and/or water regimes. While other researchers have considered potential relationships and future pathways enabled by smart metering (Marvin *et al.* 1999;

Marvin & Guy 1997), my analysis offered new insights into thinking about this device as a transition catalyst or constraint which may be relevant for demand managers or policy makers interested in facilitating a paradigm shift.

Interdisciplinary and real-world implications

The insights and contributions identified above lead to a diverse range of interdisciplinary implications, some of which have already been identified. At a fundamental level, this research challenges the assumptions embedded in the dominant demand management paradigm and therefore a range of concepts central to the discipline of economics. In the field of computer–human interaction (CHI) design, this research offers practical insights into the development of interfaces intended to reduce resource consumption, and warns against the potentially negative implications of ignoring everyday practices through design. This insight is relevant to engineers of energy and water systems, and designers of household technologies, who play a significant role in shaping and scripting the composition of everyday life. Within my own discipline of social science, and the related disciplines of sociology, cultural studies and anthropology, this research raises important considerations regarding the role of everyday practices in shaping demand for resources, and sets out a conceptual framework that could be employed in other related research to understand, study and analyse the current and changing composition of day-to-day activities.

Outside academia, the contributions of this research are significant to a range of practitioners, such as energy and water demand managers, housing developers, behaviour change practitioners, marketers, policy makers and CHI designers, some of whom may use this research in unintended ways, such as to *increase* the resource consumption of comfort and cleanliness practices. Most particularly, the findings are salient for smart metering demand management practitioners and policy-makers, who are currently developing niches of this technology and have a small but critical window of opportunity to shape its future orientation and the types of programs it will enable. Similarly, many of these findings are relevant to those deploying smart meters around the globe. This thesis provides these practitioners with an alternative resource management paradigm and related set of concepts, methodologies and strategies that could be immediately tested and trialled.

Limitations and future research directions

This research has been conducted within a series of practical parameters which have limited its scope and potential application. First and foremost, this study focused on the empirical example of smart metering demand management programs and comfort and cleanliness practices. However, it has proposed a new resource management paradigm that extends beyond this empirical focus. As a result, the co-management of everyday practices paradigm

requires testing and refinement. Future research should begin by testing this study's findings in other contexts, asking questions such as: how do residential demand management programs, both in Australia and internationally, shape everyday practices, including, but not limited to, comfort and cleanliness? How do demand management programs in the commercial and industrial sectors shape everyday practices? And, how does the relationship between providers and consumers of resources in different sectors and geographical contexts shape everyday practices?

Secondly, although I have identified various insights for policy makers, demand managers and behaviour change practitioners regarding the current and changing composition of comfort and cleanliness practices in Australia, there is significant scope for further empirical studies within this area. In particular, the gender and age differences within comfort and cleanliness practices require further investigation in a representative study of these demographic factors. If women and teenagers are more sensitive to common understandings of presentability, hygiene, smell and sweat, as this research suggests, then this finding has important and immediate implications for the effectiveness of demand management approaches such as water campaigns. Similarly, the 'environmental' bias of the research participants selected for this study, as well as the risk of self-reporting bias, pose limitations that need to be addressed in future investigations. Nonetheless, the initial depth of data and analysis enabled by my methodological approach was valuable and essential in understanding a previously overlooked and misunderstood area of everyday life. Furthermore, the environmental bias of research participants self-selected for this study highlighted how 'green' householders are engaged with 'saving' energy and water and reducing waste, whilst largely ignoring normal and taken for granted practices of comfort and cleanliness.

Thirdly, this research has been unable to explore a range of real-world examples where the relationship between providers and consumers is already being reconfigured, and/or where practices are being co-managed. Consequently, there is significant scope for testing this new paradigm in action. Alternatively, future research should focus on areas where the production–consumption divide is further entrenched, such as in locales where utilities (Strang 2004), or supply infrastructures (Ker 2009), are being privatised. Indeed, other researchers have already (although not always explicitly) considered the ways in which this divide is further ingrained or reconfigured in response to co-operatively managed energy and water systems (ATA 2007), crises or disruptions such as blackouts (Chappells & Shove 2004), droughts (Medd & Chappells 2008; Sofoulis *et al.* 2005), or rules and recommendations such as water restrictions (Sofoulis 2005). Similarly, there is significant scope for considering how relationships shift, or can be shifted, in response to crises such as

droughts, heatwaves (Dowling 2009) and bushfires (Doherty 2009) in Australia, which often lead to widespread blackouts and supply shortages, and how these events reconfigure everyday practices.

Finally, an important starting point for future research is to assess how policy decisions affecting energy and water provision and consumption — such as water targets, desalination, building regulations, appliance standards, 'green' programs and new household technologies and infrastructures — reconfigure or further entrench the composition of everyday practices and/or provide a platform for a potential transition towards the co-management of everyday practices. In particular, there is a critical need to assess where and how a transition might take place in the not-too-distant future, and to identify strategic opportunities for the deployment of micro-level trials and further research adopting this alternative paradigm. As identified in Chapter 9, socio-technical transitions theory (Geels & Schot 2007) provides a promising tool for assessing how such a transition might occur. Furthermore, changing policy contexts provide fertile ground for researchers wishing to explore ways for a transition towards a new paradigm that accounts for the dynamic and changing context of everyday life.

Conclusion

While practices such as bathing, laundering and air-conditioning may seem inconsequential, perhaps even trivial, to current policy makers, utility providers and householders, their impact is significant. Household comfort and cleanliness practices constitute most of Australia's residential energy consumption, the greatest proportion of urban centres' potable water supplies, and are the primary contributors to the nation's growing peak demand problem. Together, such practices are contributing in a fundamental way to the development of new energy-intensive urban water supply systems, new power stations, and investment in economically inefficient electricity distribution infrastructure. Compounding these challenges are path-dependent material infrastructures, such as air-conditioning, which become implicated in new practice configurations that are difficult to change. While such transformations are neither inevitable nor necessarily desirable, they are occurring at a problematic rate.

Using the example of smart metering, I have illustrated the wider resource management problems associated with overlooking the changing composition of everyday life. Specifically, current policy and practice may be inadvertently legitimising, encouraging and accelerating the development of new and more resource-intensive practices by failing to acknowledge, take responsibility for, or address these transformations in their strategies. This insight led

Elizabeth Shove (2003a, p. 199) to the following conclusion in her book *Comfort, Cleanliness and Convenience*:

> Rather than promoting energy and resource-efficient versions of products and technologies that inadvertently sustain unsustainable concepts of service, environmentalists should argue for social and cultural diversity. They should do all that can be done to engender multiple meanings of comfort, diverse conventions of cleanliness and forms of social order less reliant on individual modes of co-ordination.

This research has revealed that following Shove's advice will be difficult, if not impossible, within the current demand management paradigm, which prioritises energy and water provision at all cost. The problem, I have argued, lies in the relationship between resource managers and householders, and in particular the disconnection between the policies and practices of demand managers and the constantly changing composition of everyday practices. We are therefore left with the daunting challenge of fundamentally changing the dominant demand management paradigm. In light of these considerations, I have proposed a new paradigm aimed at bringing together the disparate realms of resource management and everyday life in order to co-manage everyday practices. I have suggested that smart metering may provide a catalyst for this paradigm to take shape as new thinking emerges that prioritises resource and environmental concerns such as climate change, water shortages and peak electricity demand. However, I have argued that further analyses are required to consider how a transition towards this new paradigm might gain hold, and to identify strategic leverage points where future research should be focused and niche innovations trialled. In conclusion, I task the research arena, environmentalists, behaviour change practitioners and demand managers with the critical role of discovering, documenting and facilitating methods of co-managing everyday practices, whilst continuing to highlight the compounding and contradictory challenges of delivering approaches that do not.

References

Primary references

Householders

Coding reference	Date of research activities
Dromana and Frankston ACF GreenHome program	
RG1, 1	9 May 2007
RG1, 2	9 May 2007
RG1, 3	22 May 2007
RG1, 4	22 May 2007
RG1, 5	3 May 2007
RG1, 6	6 May 2007
RG1, 7	7 May 2007
RG1, 8	7 May 2007
RG1, 9	13 May 2007
RG1, 10	16 May 2007
RG1, 11	29 August 2007
RG1, 12	31 August 2007
RG1, 13	31 August 2007
RG1, 14	31 August 2007
RG1, 15	3 September 2007
RG1, 16	3 September 2007
RG1, 17	11 September 2007
RG1, 18	12 September 2007
RG1, 19	12 September 2007
SEW EcoPioneer pilot program	
RG2, 20	13 August 2007
RG2, 21	16 August 2007
RG2, 22	16 August 2007
RG2, 23	20 August 2007
RG2, 24	22 August 2007
RG2, 25	22 August 2007
RG2, 26	29 August 2007
RG2, 27	3 September 2007
RG2, 28	16 August 2007
Currumbin EcoVillage housing development	
RG3, 29	20 June 2007
RG3, 30	23 June 2007
RG3, 31	23 June 2007
RG3, 32	25 June 2007
RG3, 33	25 June 2007
RG3, 34	24 June 2007
RG3, 35	22 June 2007
RG3, 36	22 June 2007
RG3, 37	14 April 2008
RG3, 38	14 April 2008
RG3, 39	17 April 2008
RG3, 40	17 April 2008
RG3, 41	25 June 2007 and 18 April 2008
RG3, 42	24 June 2007
EnergyAustralia DPP trial	
RG4, 43	2 May 2008
RG4, 44	29 April 2008
RG4, 45	1 May 2008

RG4, 46	1 May 2008
RG4, 47	1 May 2008
RG4, 48	29 April 2008
RG4, 49	1 May 2008
RG4, 50	1 May 2008
RG4, 51	2 May 2008
RG4, 52	2 May 2008
RG4, 53	30 April 2008
RG4, 54	30 April 2008
RG4, 55	29 April 2008
RG4, 56	1 May 2008
RG4, 57	28 April 2008
RG4, 58	1 May 2008
RG4, 59	28 April 2008
RG4, 60	30 April 2008
RG4, 61	28 April 2008
RG4, 62	30 April 2008
RG4, 63	2 May 2008
RG4, 64	2 May 2008
RG4, 65	2 May 2007

Industry stakeholders

Coding reference	**Date interviewed**
Energy retailer, 1	20 April 2007
Consultant, 2	15 May 2007
Smart metering manufacturer, 3	15 May 2007
Electricity distributor, 4	19 May 2007
Electricity distributor, 5	19 May 2007
Electricity distributor, 6	19 May 2007
IHD manufacturer, 7	29 May 2007
Water retailer, 8	19 June 2007
Advocacy organisation, 8	1 June 2007
Smart metering manufacturer, 9	1 June 2007
Electricity retailer and distributor, 10	20 June 2007
Electricity retailer and distributor, 11	20 June 2007
Electricity retailer and distributor, 12	20 June 2007
Electricity retailer and distributor, 13	20 June 2007
Housing stakeholder, 14	21 June 2007
IHD manufacturer, 15	21 June 2007
Smart metering manufacturer, 16	18 July 2007
Electricity retailer and distributor, 17	18 July 2007
Consultant, 18	27 July 2007
Energy retailer, 19	30 October 2007
Electricity retailer and distributor, 20	14 November 2007
Water retailer, 21	14 November 2007
Energy retailer, 22	14 November 2007
Electricity retailer and distributor, 23	15 November 2007
Consultant, 24	27 November 2007
Electricity distributor, 25	26 August 2008
Housing stakeholder, 26	17 June 2008
Housing stakeholder, 27	20 June 2008
Government department, 28	6 September 2007
Government department, 29	6 September 2007
Government department, 30	7 May 2007
Electricity distributor, 31	13 November 2007

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Appendices

Appendix 1: Demand responses estimated by Australian and international reviews of residential smart metering demand management trials

Consultant/ Department/ Author	Jurisdiction considered	Type of intervention	Estimated demand response
Electricity Services Commission (ESC 2002)	Victoria	Smart metering roll-out	• Up to 20% peak demand reduction
CRA and Impaq Consulting (CRA & Impaq 2005)	Victoria	Smart metering roll-out	• 8-18% peak demand reduction
David Cornelius Consulting (Cornelius 2007)	Victoria	IHD roll-out	• 4-10% overall consumption reduction
Office of Tasmanian Energy Regulator (OTTER 2006)	Tasmania	Smart meter roll-out	• 2-10% peak demand reduction
CRA Consulting (CRA 2004)	North Adelaide region, SA	DPP and DLC	• 10% peak demand reduction during DPP events • 0.62kVA load reduction for air conditioner DLC with 25 min. cycling (per customer)
NERA Economic Consulting (NERA 2008a, p. vii)	Australia (national)	IHDs	• 0-4% peak demand response • 0-3% overall consumption reduction
NERA Economic Consulting (NERA 2008a, p. vii)	Australia (national)	DPP	• 16.53% summer DPP response (average across all states) • 5.18% winter DPP response (average across all states)
NERA Economic Consulting (NERA 2008a, p. vii)	Australia (national)	TOU tariffs	• 3.61% summer TOU response (average across all states) • 1.17% winter TOU response (average across all states)
Energy Futures Australia (NERA 2008a)	Australia (national)	Smart metering roll-out	• 4-10% overall consumption reduction
International Energy Agency Demand-Side Management Programme (Formby 2005)	Europe	Feedback of disaggregated energy end use information	• 10% overall energy saving
Renwick and Green (Renwick & Green 2000, p. 51)	California, USA	Water demand-management initiatives	• 5-15% reductions in aggregated demand can be achieved through modest price increases and "voluntary" alternative DSM policy instruments, such as public info campaigns. • Larger reductions (above 15%) require large price increases, mandatory policy instruments (such as restrictions) or a package of policy instruments.
Rocky Mountain Institute (RMI 2006a, p. 23)	USA	DPP (using manual reduction strategies and simple controls)	• 10-20% load reductions
Rocky Mountain Institute (RMI 2006a, p. 5)	USA	DLC	• Up to 60% load reduction per site for small customers
Rocky Mountain Institute (RMI 2006a, p. 8)	USA	TOU tariffs	• 4-17% peak energy reduction per site
The Energy Savings Trust (Challis 2004)	UK	IHDs	• 10-20% reduction in energy consumption possible
Office of the Gas and Electricity Markets, UK (OFGEM 2006)	UK	Smart metering roll-out	• 2.5% peak demand reduction • 1% overall consumption reduction
Environment Change Institute (Darby 2006)	International	Direct feedback through a meter or IHD	• 5-15% overall energy savings
International Institute for Energy Conservation (Boyle 1996, p. 358)	International	Demand-side management initiatives	• 5-13% reduction in demand (doesn't necessarily correlate with reduction in greenhouse gas emissions)
Parliamentary Commissioner for the Environment (PCE 2009, p. 28)	International	Combination of DPP and automated control of smart appliances	• 25-45% reduction in demand

Appendix 2: Demand response from international residential smart metering demand management trials

Name of trial	Delivered by	Location	Strategy	Number involved	Demand response
Californian Statewide Pricing Pilot (CRA 2005)	Pacific Gas and Electric Company, San Diego Gas and Electric and Southern California Edison	California, USA	Critical peak pricing (fixed)	606	• Summer critical peak days – 7.61-15.83% peak demand reduction (dependent on climatic region) and 2.4% reduction in overall consumption • Winter critical peak days – 3.39-4.25% peak demand reduction (dependent on climatic region) and 0.62% reduction in overall consumption • Summer non-critical peak days – 4.71% reduction in peak demand and 0.17% increase in overall consumption • Winter non-critical peak days – 1.38% reduction in peak demand and 0.02% reduction in overall consumption
Californian Statewide Pricing Pilot (CRA 2005)	Pacific Gas and Electric Company, San Diego Gas and Electric and Southern California Edison	California, USA	TOU tariff	200	• Summer 4.71% reduction in peak demand and 0.17% overall consumption reduction • Winter 1.39% reduction in peak demand and 0.02% reduction in overall consumption
Californian Statewide Pricing Pilot (RMI 2006a, p. 9)	Pacific Gas and Electric Company, San Diego Gas and Electric and Southern California Edison	California, USA	Automated load control (DLC) technologies and DPP	250	• 20-60% peak load reduction
Ontario Smart Price Pilot (OEB 2007)	Ontario Energy Board	Ontario, Canada	DPP	124	• Critical peak days – 17.5% reduction in peak • Non-critical peak days – 8.5% reduction in peak • Overall consumption reduction of 7.4%
Ontario Smart Price Pilot (OEB 2007)	Ontario Energy Board	Ontario, Canada	TOU	124	• 5.7% reduction in peak on critical peak days (not statistically significant at 90% confidence level) • 6% overall consumption reduction
Northern Ireland TOU tariff trial (OFGEM 2006, p. 44)	Office of the Gas and Electricity Markets	Northern Ireland, UK	TOU tariff	186	• 10% peak demand reduction and • 3.5% overall consumption reduction
Cooking appliances energy consumption display study (Wood & Newborough 2003)		UK	Energy consumption display (IHD) with real-time consumption information for cooking appliances (IHD)	41	• 15.2% overall consumption reduction
Puget Sound Energy TOU tariff trial (FERC 2006, p. 56)		USA	TOU tariff	240,000	• 5-6% reduction in peak demand • overall consumption reduction of 5%
Hydro One trial (HydroOne 2006, pp. 7-8)	Hydro One	Canada	Provision of real-time feedback device (IHD)	435	• Average 6.5% reduction in overall consumption. Higher response among households with electric hot water than with non-electric heating • Study notes that overall average reduction of 7-10% is 'feasible' if customers were provided with energy conservation 'tips' in addition to IHD (particularly relating to heating behaviours)

Name of trial	Delivered by	Location	Strategy	Number involved	Demand response
USA east-coast utility TOU trial (Braithwait 2000)	N/A	USA	TOU, DPP, IHD and timer technology	N/A	• Average 26% reduction in peak demand usage on weekdays during hottest summer month • 5% reduction in overall consumption during summer

Appendix 3: Demand response from Australian residential smart metering and DLC demand management trials

Name of Trial	Delivered by	Location	Type of mechanism	Number involved	Demand response
EnergyAustralia Strategic Pricing Trial (Collins 2009; NERA 2008a, pp. 136-8)	EnergyAustralia	Sydney, NSW	TOU and CPP, IHD (various combinations)	756	• 23–25% reduction during CPP events (30% in winter and 36% in summer) • Conservation of energy dominated deferral effect. Preliminary results indicate conservation effect of 7-15% on summer CPP days • No statistically significant different response for participants with and without IHD • 11–13% information-only response (notification only)
Integral Energy Pricing Trial (NERA 2008a, pp. 138-9)	Integral Energy	Western Sydney, NSW	TOU and DPP, IHD (various combinations)	900	• Conservation of energy dominated deferral effect. Preliminary results indicate a conservation effect of 7-15% on summer DPP days. • 5% additional reduction in peak demand for households with IHD • Other results N/A
CountryEnergy Home Energy Efficiency Trial, HEE (NERA 2008a, pp. 140-1)	CountryEnergy	Queanbeyan and Jerrabomberra, NSW	DPP, IHD	150	• 25% DPP reduction in peak demand in summer and winter. • Overall consumption reduction of 8%
Energex smart meter trial (NERA 2008a, pp. 141-2)	Energex	Brisbane, QLD	TOU, TSCs, DLC and education (various combinations)	370	• TOU and DLC resulting in a 34% reduction in peak demand • TOU and timers resulting in a 13% overall reduction and 12% peak reduction • TOU pricing alone resulted in no change in peak demand
SEW EcoPioneer trial (Wetherall 2008, p. 1)	SEW, AGL, Landis & Gyr (formerly AMPY Metering) and Alinta Asset Management	Melbourne, VIC	IHD with water, gas and electricity real-time consumption feedback	50	• 18% gas consumption reduction • 15% electricity consumption reduction • 5% water consumption reduction (in addition to 17% reduction achieved by Melbournians under Stage 3a water restrictions)
ETSA Utilities demand management trial (ETSA 2007a, p. 3)[25]	ETSA Utilities	Glenelg, Mawson Lakes, Northgate, Murray Bridge, SA	DLC	1575	• 17% reduction in peak demand from DLC of air-conditioners from Phase 1 (20 customers) • Results from Phase 2 (750 customers) and Phase 3 (805 customers) n/a

[25] DLC trial only (smart meter not utilised)

Appendix 4: Recruitment information emailed to RG3 participants

Attention Stage I (Creek EcoHamlet) Residents
PLEASE HELP!
Research participants requested for important social and environmental research

Yolande Strengers, from the School of Global Studies, Social Science and Planning at RMIT University in Melbourne, is seeking research participants for her PhD project, which is investigating the behavioural change impacts of new smart metering technologies in the home.

Smart meters are set to become a major part of Australia's energy (and probably water) infrastructure in the not-too-distant future. Yet we have very limited information on the ways that meters might be used to change everyday household practices that rely on the consumption of energy and water.

Yolande is particularly interested in exploring the ways that smart meters might be used to challenge our idea of comfort and cleanliness in the home. These concepts are expressed through daily activities such as bathing, laundering, heating and cooling.

Yolande's research is supported by the Australasian Cooperative Research Centre for Interaction Design (ACID) in Brisbane. The project itself will involve approximately 100 households from three or four locations around Australia where different types of smart meters are being installed. Yolande is also interviewing stakeholders involved in the delivery of smart metering programs and trials.

To participate in this research, Currumbin EcoVillage residents who are part of Stage 1 (Creek Eco-Hamlet) are being asked to spare:

- One hour for an interview in the near future at your current home where Yolande will ask you about your existing household practices which rely on energy, water and domestic technologies.
- Approximately 30 minutes to one hour to complete some simple written activities which can be undertaken at your leisure.
- A second shorter interview approximately 1-2 months after your smart meter has been installed at your Currumbin EcoVillage home.

No special knowledge, experience or preparation is required to participate in this research. All activities are intended to be completed within 2007. This project has received ethics approval from RMIT University and is being supervised by senior academic RMIT staff. Further details will be provided to research participants when they make contact with Yolande.

By participating in this research you will have the opportunity to learn more about your own household behaviours, as well as contribute significant social knowledge to our understanding of human-technology interactions, environmental behaviour change and the management of Australia's energy and water resources. Please note that although there are no expenses associated with participating in this research, Yolande is unable to offer financial compensation.

For more information or to volunteer for this important research, please contact Yolande Strengers on 0408 408 572, (03) 5987 3074 OR yolande.strengers@rmit.edu.au

Appendix 5: Recruitment letter sent to RG4 households

NAME
ADDRESS 1
ADDRESS 2
ADDRESS 3

DATE

Dear <NAME>,

I request your participation in important national research

My name is Yolande Strengers from the School of Global Studies, Social Science and Planning at RMIT University in Melbourne and I am seeking research participants for my PhD. You have been contacted because your household is part of a pioneering Dynamic Peak Pricing (DPP) trial run by EnergyAustralia.

I aim to understand if and how your household has changed its energy and water related behaviours to account for the high price of electricity during DPP events, and how this has impacted on your household's lifestyle. More broadly, my research is investigating how household expectations of comfort (heating and cooling) and cleanliness (bathing and laundering) are influenced by programs such as the DPP trial, which are delivered through new 'smart' energy meters.

This research is important for several reasons. If comfort and cleanliness expectations increase or decrease as a result of smart metering programs, so too will greenhouse gas emissions, water consumption and the cost of electricity for consumers. These impacts will be magnified if the Federal Government mandates the national roll-out of smart meters, which is expected in the foreseeable future.

No special knowledge, experience or preparation is required to participate in this research. If you choose to participate, your household will be asked to spare around one hour of your time during which I will visit your home (at a time convenient for you) to conduct an interview.

I will ask your household questions about your heating and cooling practices and how they have changed (or not changed) since participating in the DPP trial. I will also ask some

questions about your household's cleanliness practices. I expect to be interviewing in your area in April or May.

This research is being conducted independently of EnergyAustralia. The research is supported by the Australasian Cooperative Research Centre for Interaction Design in Brisbane, and the Australian Housing and Urban Research Institute. A report on the outcomes of this research will be provided to these organisations. You will not be identified in any of these reports or subsequent publications.

My project has received ethics approval from RMIT University and is being supervised by senior academic staff. Further details will be provided to research participants when they make contact. There are no expenses associated with participating in this research.

Kind Regards,

Yolande Strengers
Australian Housing and Urban Research Institute
School of Global Studies, Social Science and Planning
RMIT University

For more information and to volunteer for this important research, please contact Yolande Strengers on 0408 408 572, (03) 9925 9039 OR yolande.strengers@rmit.edu.au

Appendix 6: Interview questions and themes tailored towards RG4

INTERVIEW QUESTIONS

Basic data

- How long have you lived in this house?
- Where did you live before?
- Why did you decide to move?
- What are your occupations?
- What is the age range of this household?
- How many people live in this household?

In-home displays and pricing trial

- When did you join/ start the DPP trial? Are you still on it?
- Do you have an IHD? When was it installed?
- How did you find out about the DPP trial?
- What made you decide to participate in the program?
- Why do you think EnergyAustralia is conducting this pricing trial? Why do you think this?
- What has your response been during DPP events? Why do you respond in this way?
- Do you ever leave the home during DPP events? Why/ Why not?
- What information did you receive about the trial? Was this information useful? Would you like more? If yes, what information do you want?
- Has the information you received influenced your response? How?
- How do you receive notification of a DPP event?
- Who receives notification of a DPP event? (which person in household)
- Does any particular household member take charge during DPP events to save energy? Does anyone resist? Does this cause conflict in the home? If yes, how?
- Does the DPP event change the way you use energy at other times of the day? If yes, what have you changed?
- Has there been any circumstance where you have been unable or unwilling to reduce your consumption during a DPP event? Explain.
- Has the in-home display assisted you in saving energy during DPP events or at other times of the day? How?
- Do you know which technology uses the most amount of electricity in your home? If not, do you think this information would be useful? Why/ why not?
- Do you talk about the DPP trial with friends/ family? Is this discussion positive/ negative…?
- Have your bills gone up/ down since you joined the trial? Did the result surprise you? Why/ why not?
- Who do you think might benefit from the DPP trial? Do you think everyone should pay for energy in this way?
- Have you had any difficulties/ problems with the DPP trial/ in-home display? If yes, explain.
- Would you like to continue with the DPP program permanently? Why/ why not?
- Would you like to keep your in-home display? Why/ why not?

Comfort

- Tell me about how you heat and cool your house.
- Do you have an ideal temperature that you like to keep your house at?
- Do you prefer artificial heating and cooling to natural ventilation? Why/ why not?
- Do some people feel the heat/cold more than others in the household? If yes, who?

- Do you argue or discuss when to adjust the comfort level of your home? What do you argue about/ discuss? How is this situation resolved?
- How did you stay cool/hot before you owned an air conditioner? Do you ever use these practices now to stay cool/hot?
- What makes you decide to turn the air conditioner/ heater on? E.g. guests, babies, certain temperatures, weather forecasts, personal temperature threshold etc.
- Do you think air conditioning/ heating has made you, or members of your household, less tolerant of natural weather conditions? Explain.
- Are there any other things you do apart from using the heater and air conditioner to stay cool/ hot (e.g.: put on warm clothes when cold, open windows and close blinds)?
- Did you turn the heater on before I came over or was it already on/ not on at all?
- Have you changed the way you heat or cool your home as a result of the DPP trial? If yes, what have you done? If no, why not?
- Has the DPP trial made you think differently about what kind of comfort is necessary during DPP events? If yes, how? Do you think you could permanently maintain these changes?
- Do you think the way you heat and cool your home is normal?

Cleanliness

- BATHING: Tell me about your bathing practices… e.g. How often do you shower? How long do you shower for? Why do you shower? Do you take baths? etc

Normal/ not normal?

- LAUNDERING: Tell me about your laundering practices in your household. Who does the laundry? How often is the laundry done? What are the procedures surrounding the process? What do you use to get your clothes clean? Where does your water go etc.? Do you use hot or cold water? Do you separate colours/ whites? Do you have different cycles you use for different clothes? Do you handwash?

Normal/ not normal?

- CLEANING HOME: Who do you clean your home for? E.g.: yourself, guests, partner, kids etc. What is the primary reason why you clean your home? E.g.: to kill germs, to make you feel good, to keep up with neighbour expectations? Why do you clean? Normal/ not normal?

Have you changed any of your cleaning/ bathing/ laundering practices as a result of the DPP trial?

Differing normalities

- Have you ever lived anywhere else where the way you use energy and water was different to the way you use it now? I.e. Have you grown up on a farm, managed your own energy and water resources, or lived in another country?
- How have these experiences affected the way you use energy and water now? Explain.

Responsibilities and relationships

- Has being on the DPP trial changed your relationship with EnergyAustralia? How?
- Whose responsibility do you think it is to manage our energy and water resources?
- Do you think households can make a difference on issues like climate change, drought and peak demand?
- Do you think we pay enough for energy and water? Why/ why not?

Tour of home – ask interviewee to show me energy and water consuming technologies/ infrastructures in the home and identify any other comfort or cleanliness practices they've forgotten, or point out any changes they've made. Ask about toilet flushing.

Appendix 7: Letter provided to all household participants explaining the research

AHURI RMIT/NATSEM RESEARCH CENTRE
AUSTRALIAN HOUSING & URBAN RESEARCH INSTITUTE (AHURI)
SCHOOL OF GLOBAL STUDIES SOCIAL SCIENCE AND PLANNING
DESIGN AND SOCIAL CONTEXT PORTFOLIO
CITY CAMPUS
PHONE: +61 3 9925 2272
FAX: +61 3 9925 9888

DATE:_____

Dear _____

My name is Yolande Strengers and I am undertaking a PhD at RMIT University within the School of Global Studies, Social Science and Planning. The working title of my research is *Challenging standards of comfort and cleanliness through interactive energy and water technologies.*

This research is supported by the Australasian Cooperative Research Centre for Interaction Design (ACID) as part of the *Suburban Communities* project (www.suburbancommunities.net); and the Australian Housing and Urban Research Institute (AHURI).

My PhD is exploring how new types of interactive energy and water technologies, such as 'smart meters', 'in-home displays' and 'direct load control' mechanisms, encourage people to reduce their energy and water consumption, or shift it to other times of the day. More specifically, I'm in interested in how programs delivered through these technologies influence standards of comfort and cleanliness in Australian households. I hope to use this knowledge to inform the future design of these programs and technologies, with the aim of ensuring sustainable energy and water consumption both now and into the future.

I am focusing my attention specifically on household thermal comfort (heating and cooling) and cleanliness practices, such as bathing and laundering, because these practices are directly attributed to approximately 60 per cent of energy use and 60-70 per cent of water consumption in Australian households. The recent rise in residential air-conditioner usage is also a major contributor to peak electricity demand, which is causing strain on our electricity network.

You have been approached to participate in my research because you are involved in a program utilising of one of these technologies. To understand how your household standards may have changed as the result of participating in this trial, I want to ask you a series of questions about your comfort and cleanliness practices. If you choose to participate, you will be asked to spare around 1 hour of your time to undertake the following research activities.

A visit to your current home consisting of:

- A tape-recorded semi-structured interview, where I will ask you to talk about your daily comfort and cleanliness practices and your experience with the program you are participating in;
- A tape-recorded tour of your home – where I will ask you to show and tell me a bit more about the 'comfort' and 'cleanliness' technologies or artefacts in your home (air-conditioners, showers etc.)
- Photos taken of the comfort and cleanliness technologies and artefacts in your home.

I expect to involve around 100 people in my research. Some of my research activities will involve entire households. In these cases, consent will be sought from all members of the household, including the guardians of any household members who are under 18 years of age. Under 18 year-olds will only be involved in research

activities where one or more of their legal guardians are present. I may approach you or your household again some time in the future for a follow up interview or research activity if you and your household agree.

Your participation is purely voluntary. I will not be asking or expecting you to reveal any private information. However, you may be asked to discuss and reveal your personal attitudes and behaviours regarding technology and the environment, as well as those of your household, community and workplace.

The tapes of interviews and any other research data will be securely stored in archives managed by Professor Mike Berry at the Australian Housing and Urban Research Institute (AHURI) within RMIT University and will only be shared with my PhD supervisors. The data will be kept for five years in these archives and then damaged and destroyed. Your data will not be available to any third parties. The interviews will be coded and any quotes or other information that you pass onto me will be referred to anonymously in my future analyses and publications, unless you agree to be identified. A report of the project outcomes will be provided to the Australasian Cooperative Research Centre for Interaction Research (ACID), the Australian Housing and Urban Research Institute, and the School of Global Studies, Social Science and Planning at RMIT University.

The notes, transcriptions and other data I collate from my research activities with you and your household will be provided to you for comment, revision and/or withdrawal over a period of a fortnight. If I haven't heard from you after this period I will proceed to use your data in accordance with the terms agreed to on your consent form. If you are a guardian of a minor that has participated in this research, you will also receive data collected from their involvement in the research for review in line with this process. If you have agreed to be photographed, any photos that I intend to use in a publication will be sent to you for review.

You are free to withdraw yourself, or any minors under your guardianship from this project at any time, and to withdraw any unprocessed data previously supplied. You are also free to access any of your data, or the data collected about a minor under your guardianship at any time.

I am unable to provide you with any financial compensation for participating in my study. However, all the relevant materials required to participate in this research will be supplied to you at no cost to yourself. By participating in this research you will have the opportunity to contribute new knowledge to our understanding of human-technology interactions and environmental behaviour change. You will also be assisting in finding new ways to manage and control the supply and demand of Australia's energy and water resources through the design of new technologies and infrastructures. Who knows, you might even learn something interesting about yourself and your household!

This PhD project is being supervised by Dr Anitra Nelson and Professor Mike Berry who are located in AHURI. If you have any further questions or comments about this research, please do not hesitate to contact either myself or one of my supervisors on the numbers or email addresses below.

If you agree to participate in this research, please read and sign the consent form attached to this letter.

Regards,

Yolande Strengers
BA (Deans Scholars Program), Monash University

Ms Yolande Strengers	Email:	yolande.strengers@rmit.edu.au	Phone:	0408 408 572
Dr Anitra Nelson	Email:	anitra.nelson@rmit.edu.au	Phone:	02 4782 9003
Professor Mike Berry	Email:	mike.berry@rmit.edu.au	Phone:	03 9925 1594

Any complaints about your participation in this project may be directed to the Secretary, RMIT Human Research Ethics Committee, University Secretariat, RMIT, GPO Box 2476V, Melbourne, 3001. The telephone number is (03) 9925 1745. Details of the complaints procedure are available from: www.rmit.edu.au/council/hrec

Appendix 8: Ethics consent form signed by all research participants

RMIT HUMAN RESEARCH ETHICS COMMITTEE

Prescribed Consent Form For Persons Participating In Research Projects Involving Interviews, Questionnaires, Focus Groups or Disclosure of Personal Information

PORTFOLIO OF **Design and Social Context**

SCHOOL/CENTRE OF **Global Studies, Social Science and Planning & Australian Housing and Urban Research Institute (AHURI)**

Name of participant:

Project Title: *Renegotiating standards of comfort and cleanliness through the smart metering system: implications for sustainable resource consumption*

Name(s) of investigators: (1) **Yolande Strengers** Phone: **03 9925 9039**

1. I have received a statement explaining the research activities involved in this project.
2. I consent to participate in the above project, the particulars of which - including details of the research activities I will be involved in - have been explained to me.
3. I authorise the investigator to interview me or administer a questionnaire.
4. I give my permission to be audio taped. ☐ Yes ☐ No
5. I give my permission for my name or identity to be used. ☐ Yes ☐ No
6. I give my permission for myself and/or technologies within my home and/or my workplace to be photographed and for the photographs to be reproduced in publications relating to this research (over 18s only). ☐ Yes ☐ No
7. I acknowledge that:

   (a) Having read the Plain Language Statement (letter), I agree to the general purpose, methods and demands of the study.
   (b) I have been informed that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied.
   (c) The project is for the purpose of research and/or teaching. It may not be of direct benefit to me.
   (d) The privacy of the information I provide will be safeguarded. However should information of a private nature need to be disclosed for moral, clinical or legal reasons, I will be given an opportunity to negotiate the terms of this disclosure.
   (e) The security of the research data is assured during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes will be provided to the Australasian Cooperative Research Centre for Interaction Research (ACID) and the School of Global Studies, Social Science and Planning. Any information which may be used to identify me will not be used unless I have given my permission (see point 5 above).
   (f) The data collected by the researcher from the research activities will be kept for 5 years in secure AHURI archives managed by Professor Mike Berry and then damaged and destroyed.

Participant's Consent :

Name: _____ Date: _____
(Participant)

Name: _____ Date: _____
(Witness to signature)

Where participant is under 18 years of age:

I consent to the participation of _____ in the above project.

Signature: (1) (2) Date: _____
(Signatures of parents or guardians)

Name: _____ Date: _____
(Witness to signature)

Participants should be given a photocopy of this consent form after it has been signed.

Any complaints about your participation in this project may be directed to the Secretary, RMIT Human Research Ethics Committee, University Secretariat, RMIT, GPO Box 2476V, Melbourne, 3001. The telephone number is (03) 9925 1745.

Appendix 9: Comfort and cleanliness diary

Example of a 'copy-cat' diary response

DAY 1

Date 30 August 2007 (Thursday)

Daytime temperature inside	23.5 c
Daytime temperature outside	22 °C.
Evening temperature inside	22°C.
Evening temperature outside	15 °C.
No. of showers taken by your household today	2
Reason(s) for shower(s)	Clean, Freshen up, Wash, Hair.
Average length of showers	3 + 4 minutes.
Household cleaning tasks undertaken (e.g. laundry, vacuuming, dishes etc.)	Sweeping, Stacked Dishwasher (not used as ½ empty). Raking, Cleaning. (grocery shopping)
Approximate time spent cleaning today	3 hours.
Please specify any technologies you used to confirm these figures today (e.g. clock, shower timer, weather report on tv/ radio etc.)	Shower timer, weather report, temp on heater control,

How did you make yourself comfortable in your home today?

Think about:

- What technologies (heater, air-conditioner, shower) and artefacts (chairs, couch, clothing, blanket etc) did you use to make yourself comfortable?
- What prompted you to make the change to your comfort (eg: habit, too hot/ cold, guests coming over, household members complaining/ nagging etc.)? Hot Flushes. (50+ y.o.).
- Did you discuss comfort adjustments with your household members or guests? No.
- Did someone in your household make a comfort adjustment that you didn't agree with (e.g. turning up/down the heater/air-con)? No
- Were the comfort adjustments you made today the same as what you would usually do? If not, what made you change your practices today? Yes

Opened the verticals to let sunlight in the morning + north windows (love the sun)

Example of an in-depth diary response

DAY 2

Date Friday 17th August.

Daytime temperature inside	17°C - not heated
Daytime temperature outside	15°C daily high as per weather report.
Evening temperature inside	19.5°C
Evening temperature outside	6°C. expected o/n low.
No. of showers taken by your household today	2. + 1 shared bath (kids).
Reason(s) for shower(s)	daily washing
Average length of showers	6 mins.
Household cleaning tasks undertaken (e.g. laundry, vacuuming, dishes etc.)	2 loads washing, tidying, 2 loads drying, vacuuming, sweeping, dishwasher, wiped table, cleaned toilets, swept floor
Approximate time spent cleaning today	3 hrs.
Please specify any technologies you used to confirm these figures today (e.g. clock, shower timer, weather report on tv/ radio, EcoMeter etc.)	clock - TV what programs entertained the kids while I cleaned! kitchen timer in bathroom for shower. weather report.
What did you use your EcoMeter for today?	to check when dinner had finished! lights went from 3-1! [MY PARTNER] looked to see 2 loads washing + drying had been done!!

How and why did you clean your body today?

Think about:

- What technologies (shower, washing machine, iron etc) and products (soap, laundry powder, toothpaste, deodorant etc.) did you use to make yourself clean? Do you think they worked? Why/ why not?
- What prompted you to clean your body (eg: habit, guests coming over, household members complaining/ nagging etc., didn't feel clean etc.)?
- Do you think other people would make the same adjustments you made today in a similar situation? Why/ why not?
- Were the cleaning practices you undertook today the same as what you would usually do? If not, what made you change your practices today?

[MY PARTNER] + I both have morning showers straight after we wake up, this is both habit + as I feel dirty (sticky) when I wake up. We both wash our hair daily. [MY PARTNER]

uses shampoo + conditioner + I use 2 in 1 (Pert). I use a facial cleanser. We both use shower gel (not soap) as this stops soap scum build up in shower + therefore I don't need to clean shower very often (only every couple of MONTHS!!). I usually use a foot scrub a couple of times a week in the shower. (not today) Today I shaved my armpits in the shower + did a quick breast examination - took a bit longer than usual.

All 4 members of house brush teeth (using toothpaste) twice a day. (as recommended by dentists).

[MY PARTNER] + I use deodorant in morning (I used an extra squirt after getting sweaty vacuuming).

I used dynamo + Hygene rinse to wash our clothes + towels + Harpic scrub to clean toilets. I use Hygene rinse to (hopefully) stop the spread of tinea etc through the family.

[MY PARTNER] wore a previously ironed shirt to work as it is expected that he presents himself professionally.

Kids bathe in soap-free soap bubble bath for kids/babies (daily). I wash their hair twice a week (not today though) with 2 in 1.

We use disposable nappies, wipes (both flushable + non-flushable) and barrier cream for the kids nappies + toileting.

I wipe my face with facial toner before bed each night.

The kids get wiped with wet facecloths after each meal/snack, as necessary. I use separate a fresh cloth each time as I worry about spreading (for example) conjunctivitis from one child to the other! - (I wash my hands (seemingly) hundreds of time each day)

P.S. If I was to get v. sweaty from exercise in summer or from lots of exercise I would usually wipe my torso with a wet facecloth + change my t-shirt + bra. So I didn't have to smell myself for the rest of the day. I would have changed just my t-shirt today due to sweat marks but was able to put jacket on

Appendix 10: Industry stakeholder organisations interviewed

Organisation	Coding in thesis
Alternative Technology Association (ATA)	Advocacy organisation
Ampy Email (Landys & Gyr)	Smart metering manufacturer
Australian Gas Light Company (AGL)	Energy retailer
CountryEnergy	Electricity retailer and distributor
Department of Primary Industries, Victorian Government	Government department
Department of Sustainability and the Environment (DSE)	Government department
Currumbin EcoVillage	Housing stakeholder
EcoVision	IHD manufacturer
Energex	Energy retailer
EnergyAustralia	Electricity retailer and distributor
Energy Response	Consultant
Ergon Energy	Electricity retailer and distributor
ETSA Utilities	Electricity distributor
Future Reach (for United Energy)	Electricity distributor
Housing Industry Association	Housing stakeholder
Integral Energy	Electricity retailer and distributor
Metropol	Smart metering manufacturer
Millennium	IHD manufacturer
Origin Energy	Energy retailer
RMIT University	Consultant
South East Water	Water retailer
Social Change Pty Ltd.	Consultant
Sydney Water	Water retailer
Urban Development Institute of Australia (UDIA)	Housing stakeholder

Appendix 11: Base template for stakeholder interview questions

Position and role in organisation

- Where do you work?
- How would you describe your role? What do you do?
- Do you work full-time/ part-time?
- How long have you held this position?
- How long have you been with the organisation?
- What other types of positions have you held within the organisation (if relevant)?
- What is your employment background and experience?
- Do you have a manager or director that you report to?
- How is your position/ work unit viewed within the organisation? Is it a high priority/ low priority etc.?
- What is your definition of smart metering?

Program/ project

- Tell me about your program/ project
- Tell me about the smart metering technology you are using?
- How do smart meters fit into the wider project you are delivering?
- What do you hope to gain from using smart metering technology in this project?
- Do you intend to use the meters as a behaviour change tool? How?
- What evidence have you received to suggest that smart meters will work the way you are intending them to?
- What research will you be conducting with households?
- Tell me about the behavioural change component of your program/ project
- Will smart meters be used to change the energy and water infrastructure in this project? (e.g. introduce renewable energy systems that are linked to meter)? How necessary are the meters to achieving this goal?
- What difficulties are you experiencing in delivering the project?
- Are people responding as expected to the technology and program?

Comfort and cleanliness

- How do you think comfort/ cleanliness practices are currently changing?
- Is there a link between comfort/ cleanliness practices and the program/ service you are delivering?
- Do you see your program as responding to changing comfort/ cleanliness expectations? Why/ why not?
- Do you think your program will have any impact on comfort/ cleanliness practices? How?
- How/ why do you think comfort/ cleanliness practices changing?
- Do you have a role in addressing/ managing these changes? If not, who does? Are you talking to these people?
- Does your program challenge current standards of living or strive to meet them? Do you think you have a role to do this? If not, who does?
- How is your company planning for water shortages/ peak demand/ climate change?

Ask about opportunities for further interviews and potential RGs

Appendix 12: Letter explaining research to stakeholder interviewees

AHURI RMIT/NATSEM RESEARCH CENTRE
AUSTRALIAN HOUSING & URBAN RESEARCH INSTITUTE (AHURI)
SCHOOL OF GLOBAL STUDIES SOCIAL SCIENCE AND PLANNING
DESIGN AND SOCIAL CONTEXT PORTFOLIO
CITY CAMPUS
PHONE: +61 3 9925 2272
FAX: +61 3 9925 9888

Date_____

Dear _____,

My name is Yolande Strengers and I am undertaking a PhD at RMIT University within the School of Global Studies, Social Science and Planning. The working title of my research is *Challenging standards of comfort and cleanliness through interactive energy and water technologies.*

This research is supported by the Australasian Cooperative Research Centre for Interaction Design (ACID) as part of the *Suburban Communities* project (www.suburbancommunities.net); and the Australian Housing and Urban Research Institute (AHURI).

My PhD is exploring how new types of interactive energy and water technologies, such as 'smart meters', 'in-home displays' and 'direct load control' mechanisms, encourage people to reduce their energy and water consumption, or shift it to other times of the day. More specifically, I'm in interested in how programs delivered through these technologies influence standards of comfort and cleanliness in Australian households. I hope to use this knowledge to inform the future design of these programs and technologies, with the aim of ensuring sustainable energy and water consumption both now and into the future.

You have been approached to participate in my research because you are a stakeholder in one of the projects or communities that I have identified as being of value to this study. If you choose to participate, you will be asked to spare approximately one hour of your time for a semi-structured interview where I will ask you about the current and future direction of your organisation's smart metering interests.

I expect to involve around 100 people in my research. I may approach you again some time in the future for a follow up interview or research activity if you agree.

Your participation is purely voluntary. I will not be asking or expecting you to reveal any private information. However, you may be asked to discuss and reveal your personal attitudes and behaviours regarding technology and the environment, as well as those of your household, community and workplace.

The tapes of interviews and any other research data will be securely stored in archives managed by Professor Mike Berry at the Australian Housing and Urban Research Institute (AHURI) within RMIT University and will only be shared with my PhD supervisors. The data will be kept for five years in these archives and then damaged and destroyed. Your data will not be available to any third parties. The interviews will be coded and any quotes or other information that you pass onto me will be referred to anonymously in my future analyses and publications, unless you agree to be identified. A report of the project outcomes will be

provided to the Australasian Cooperative Research Centre for Interaction Research (ACID) and the School of Global Studies, Social Science and Planning at RMIT University.

The notes, transcriptions and other data I collate from my research activities with you will be provided to you for comment, revision and/or withdrawal over a period of a fortnight. If I haven't heard from you after this period I will proceed to use your data in accordance with the terms agreed to on your consent form.

You are free to withdraw yourself from this project at any time, and to withdraw any unprocessed data previously supplied. You are also free to access any of your data at any time.

By participating in this research you will have the opportunity to contribute new knowledge to our understanding of human-technology interactions and environmental behaviour change. You will also be assisting in finding new ways to manage and control the supply and demand of Australia's energy and water resources through the design of new technologies and infrastructures.

This PhD project is being supervised by Dr Anitra Nelson and Professor Mike Berry who are located in AHURI. If you have any further questions or comments about this research, please do not hesitate to contact either myself or one of my supervisors on the numbers or email addresses below.

If you agree to participate in this research, please read and sign the consent form attached to this letter.

Regards,

Yolande Strengers
BA (Deans Scholars Program), Monash University

Ms Yolande Strengers	Email:	yolande.strengers@rmit.edu.au	Phone:	03 9925 9039
Dr Anitra Nelson	Email:	anitra.nelson@rmit.edu.au	Phone:	02 4782 2235
Professor Mike Berry	Email:	mike.berry@rmit.edu.au	Phone:	03 9925 1594

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