Smart Energy in Everyday Life

Are You Designing for Resource Man?

Yolande Strengers, RMIT University

Insights

- Smart energy technologies and strategies embody a rational, individual, and masculine image of the energy consumer: Resource Man.
- Reimagining Resource Man might involve embracing and supporting “mess,” designing for “slow time,” or designing for other humans and non-humans in the home.

With the introduction of smart grids, meters, and associated technologies, electricity systems are going through an ICT transformation. The aim of this endeavor is similarly transformative: to decarbonize the electricity grid and reduce or shift peaks in electricity demand. Humble household energy consumers are set to play a key role in this transformation, where they, too, are being asked to become “smart.”

Harper-Slaboszewicz et al. sum up the vision for this new energy consumer as follows: “The goal isn’t to move utilities into our living room—rather, it’s to *allow consumers to take advantage of some of the same technologies utilities*

are finding useful in smart metering and monitoring/managing the distribution grid” [1]. In other words, the aim is to transfer electricity utility management knowledge, expertise, and tools into the heart of the home. This implies that smart technologies are designed for a smart consumer or user—one who is interested, immersed, and engaged in managing their energy demand, and willing and able to embrace new smart technologies and strategies to achieve energy-management goals.

The role intended for smart energy consumers is revolutionary. They are expected to become “the driving force behind the Smart Grid and the Green

COVER STORY

Economy of the Future” [2]. Data and technology made available via smart energy technologies will “empower consumers” [3] to “take control” [4] of their consumption and make “informed choices” [5] about how they use energy, thereby unlocking the “vast potential” [4] of the smart grid. This is positioned as a conscious and deliberate move taken by energy consumers, supported by electricity utilities and governments, and enabled by technology.

Contrast this vision with your home. There are likely to be piles of laundry in various stages of cleanliness. There might be debates over whose turn it is to do the dishes, what to have for dinner, which television shows to watch, whether to open or close a window, who left the light on, or at what temperature

to set the thermostat. These debates might even be with yourself. There might be exercise to fit in, work schedules and school timetables to plan for, and homework and housework to be done. HCI designers and practitioners have long recognized these dynamics; indeed, they have pioneered research on technologies in the home. However, when it comes to the study of energy and how to effect change through smart energy technologies, these issues often disappear from view. Instead, we are left with a largely rational and rationalizing

discourse, in which change is thought to take place via the provision of information (data) and technology. With the focus firmly situated on *energy*, we risk losing sight of the dynamic practices in which consumption is implicated.

My aim here is to draw attention to, and then away from, the pervasive and unified vision for the smart energy consumer, whom I name Resource Man. I view this consumer, or user, as an invisible persona, or as a largely assumed user. I use Resource Man as a way to simplify and generalize a significant body of knowledge to draw attention to a pervasive vision. My agenda is quite simple: to shine a spotlight on the dominant vision for household energy consumers, and to offer insights for how HCI designers can design, and already are designing, for other practices in the home involving humans and non-humans, with potentially significant energy implications.

WHO IS RESOURCE MAN?

Resource Man embodies a unified vision for the smart energy consumer. He is an efficient micro-resource manager—or a “Mini-Me” version of his utility provider [6]. Similar to the “scholastic bias” academics project toward the people they study [7], Resource Man represents the energy industry’s “resource bias” projected onto energy consumers. In his ultimate imagined state, Resource Man is interested in his own energy data, understands it, and wants to use it to change the way he uses energy. He responds rationally to price signals and makes informed decisions based on up-to-date and detailed data provided about the costs, resource units (kilowatt hours), and impacts (greenhouse gas emissions) of his consumption. For these tasks he needs information, dynamic prices, and enabling technologies, such as automated smart

appliances and micro-generation systems, which allow him to transform his home into a resource control station. He is both in control of his energy consumption and assigns this control to technologies to manage on his behalf.

I refer to Resource Man as a male, not because he is always directly identified as one, but because he is cast in the image of the male-dominated industries of engineering and economics that permeate energy management. Moreover, visions of him exclude much of the productive work of the home, which is still carried out by women. The strategies intended for Resource Man unsurprisingly capture the attention of men more than women, although resource women still exist. American consumer research reports that men are more interested in technological solutions for their energy use, and in monitoring and managing their use through the latest personal electronics [8]. I also refer to Resource Man as an individual, for while there are many resource men, they operate in isolation from one another, even within the context of their own homes, where the bill payer is positioned hierarchically, and somewhat traditionally, as the Resource Man of the house.

Resource Man’s origins can be traced back to Rational Man, or *Homo economicus*, differentiated by his access to more advanced and sophisticated technologically enabled tools compared with his economically minded ancestor. Despite this distinction, Resource Man still behaves rationally and in line with sophisticated and frequent information about energy prices and consumption. Resource Man’s preoccupation with technologies also positions him as a close relative of Tool Man (*Homo faber*). Another branch on Resource Man’s family tree is devoted to Choice Man (*Homo optionis*), who has passed down an interest in making detailed choices about the best (energy) technologies and solutions to suit Resource Man’s needs in response to accurate and up-to-date energy information. Resource Man is also loosely related to Social Man (*Homo sociologicus*): He is social in the sense that he is interested in sharing and comparing his energy performance with that of other resource men through social media apps such as Tweet-a-Watt.

Resource Man is not a figment of the imagination; in many ways he already exists. Consumer research indicates

In his ultimate imagined state, Resource Man is interested in his own energy data, understands it, and wants to use it to change the way he uses energy.

that many consumers aspire to become Resource Man and indeed expect this as an outcome of the emerging smart grid. However, other consumer research suggests the uptake of technologies like in-home displays (IHD) and home energy management (HEM) systems, which provide detailed consumption feedback, have been slower than anticipated, and that terms such as *smart grid*, *kilowatt hour*, and *energy portal* are not well understood. Despite these concerns, a global effort is now under way to bring Resource Man into reality.

REALIZING RESOURCE MAN

There are four clear strategies that Resource Man is thought to embrace and through which most consumer research, policy, programs, and technology design and development are focused. These revolve around the provision of data and smart technology, and can be broadly defined as energy feedback, dynamic pricing, home automation, and micro-generation.

I cover the first and third of these strategies here. However, it is important to note that there other strategies, such as greater uptake of electric vehicles and the gamification of energy demand, that are also emerging.

Resonating with the rhetoric of the health sector, electricity utilities are helping their energy consumers become “energy fit” and “active” as they move them toward their new role as Resource Man. This does not necessarily mean going on a resource diet, but implies getting smarter and more informed about resource decisions through access to information about their energy consumption. This involves a considerable amount of effort, which is needed to learn about energy and its impacts. Effort on consumers’ behalf is required to overcome the “disconnect between what consumers know about their electricity use and what they need to know for smarter energy use decisions” [9], the intention being that through increased energy knowledge, consumers will better manage their energy consumption. Consumer participation in the electricity system and in energy demand reduction is defined and contained within the scope of managing and acting on personalized data.

The primary methods by which this information is provided are in-home

displays (IHDs), energy monitors, home energy management (HEM) systems, and website portals, which provide detailed energy feedback on a household’s resource consumption (kilowatt hours), costs of energy (detailed billing information), and resource impacts (greenhouse gas emissions). The HCI community has played a strong role in contributing to the innovative design of these technologies, and many of these educational efforts are being accelerated through government mandates and industry partnerships.

A second key strategy for realizing Resource Man involves the provision of technologies that seek to automate appliances, lights, or the home itself so that energy management is taken care of on the occupants’ behalf. Direct load-control programs that automate air conditioners, hot-water systems, or pool pumps are a common example of this strategy, as are programmable or smart thermostats and the emergence of smart appliances that can be controlled remotely via smartphones.

In contrast to the vision of the active consumer, the strategy of automation assumes that humans are primarily lazy, too busy, or simply uninterested in managing their energy data. They not only want control over their energy consumption but they also want “cruise

control” [10], and this means putting in as little effort as possible. They should be able to tell their technologies how they want them to respond and then “let the system do the watching” [10]. Data is still essential here, although in this case data communicates with technology rather than people. For example, a high-price signal might send a message to the washing machine to turn off at a certain time.

Resource Man features in this strategy as an efficient end-use programmer, able and willing to pre-program and automate many of his household appliances, such as the pool pump or air conditioner. He also allows signals sent from electricity providers to automate appliances on his behalf. Effort is still required here, in terms of sourcing and setting up the enabling technologies, but much of the day-to-day effort of monitoring and managing energy consumption is reassigned to these technologies (or to those who design and control them). This is again a primarily masculine vision of technology use, focused on functional and goal-centered ideals that resonate strongly with engineering disciplines.

These two seemingly contradictory strategies of encouraging active consumption or passive automation are sometimes used to differentiate between types of consumers (e.g., those

who are interested in energy data and those who are not). However, they also exist in tandem, as a united vision for Resource Man and his shared future. Smart homes, for example, combine both the provision of expert data with automated technologies, allowing Resource Man to both monitor *and* automate his appliances to efficiently operate on his behalf. Taken together, they are part of a compelling and tightly bundled set of strategies intended to transform more consumers into resource men (and women).

THE PROBLEMS WITH RESOURCE MAN

There are many reasons to exercise caution with the ideas, assumptions, and framings of human action embodied in the Resource Man vision. The issue is not that these strategies fail to achieve substantial energy savings—they actually do, and there are numerous studies and extensive evaluations to demonstrate that. Rather, the critical issue is that strategies intended for Resource Man overlook, almost entirely, what people actually do in their homes. We do not see the daily domestic dynamics and routines involved in preparing meals; cleaning the body, clothes, and homes; and making spaces and people comfortable, many of which are still predominantly performed by

women. Indeed, in some examples we don't see any people at all.

Instead, *smartness* is defined as engagement with and management of energy data and technology. Resource Man thus reproduces a vision of reality in which all human action and social change are mediated through data or technology. However, given that change does not happen only in this way, studies and strategies intended for Resource Man often wind up appealing to a limited number of people who are interested in their energy data and bills, who want to talk about their consumption with others, or who want to use new technologies to manage their energy demand. Where this interest does exist, change toward more energy-intensive practices often keeps occurring, independent of any energy savings achieved through energy data or smart technology programs. Trends toward home cooling or the use of new digital devices in the home, for example, have little to do with energy-saving strategies designed for Resource Man. As feedback expert Sarah Darby warns, this means that the continual focus on energy savings “so often turn[s] out to be steps taken down an upward-moving escalator” [11]. In other words, energy savings tend to be negated by the emergence of more resource-intensive practices and expectations, such as

increasing frequency of showering or trends toward climate-controlled homes.

A key risk with Resource Man is that we simply overlook the majority of social activity in which energy consumption is implicated. We focus on kilowatt hours rather than laundry, greenhouse gas emissions rather than home comfort, and electricity costs rather than new dietary trends, emerging cooking appliances, and meal planning.

The pursuit of Resource Man raises another key concern: It allows new forms of consumerism to take hold largely unnoticed and unquestioned. We easily forget that smart grids, meters, appliances, energy-management devices, and automation systems are all physical things that make other things redundant. They have the potential to become established as new household expectations and “needs” that embody electrically enabled ideals of comfort, convenience, entertainment, and security. With the lure of efficiency benefits and energy savings, we too easily forget that becoming smart also necessitates the consumption of smart stuff.

Attempts to sell new smart products and services are coming from a diverse group of interests extending beyond utility providers and governments, such as energy service companies (ESCOs), appliance manufacturers, ICT companies (including HEM and home automation businesses), and housing developers. Tellingly, some of these companies feature in history as the purveyors and promoters of past energy visions that have attempted to increase our expectations for electricity-enabled ways of life. General Electric (GE), for example, previously led the charge to create and foster “a new electrical consciousness” in America, expressed as “the desire of individual families to make their homes into electrified dwelling places” [12]. In the modern-day smart grid, GE has reinvented itself as a key innovator and promoter of smart home appliances that aim to improve lifestyle and promote high standards of climate-controlled comfort.

DESIGNING FOR SOMETHING OTHER THAN RESOURCE MAN

It is difficult to think beyond Resource Man when the ideals and ideas behind this vision continue to pervade industry, policy, and design circles,

and attract significant funding and investment. However, it is necessary and productive to do so if our aim is one of achieving lower-carbon ways of life and more flexible energy demand. Here, I briefly introduce some areas into which HCI designers could potentially delve, and have already ventured, to disrupt the Resource Man vision and to design for someone, or something, else to achieve energy-demand reductions. This is by no means an exhaustive list of possibilities, but rather a way to provoke discussion and reflection on how and why energy is consumed in the home, and how HCI designers can support households and societies in using fewer resources or shifting their use to other times of the day.

Supporting mess. If energy data and technologies are smart, then domestic mess is dumb. It is the antithesis of the rationality underpinning the vision for Resource Man; it implies a lack of order in an otherwise ordered reality. While consumer reports and scholarly papers on smart energy technologies in the home often note that life is complicated and nuanced, they rarely engage productively or conceptually with the mess of everyday life. Quite simply, domestic activity—such as doing the laundry, showering, cleaning, cooking, and even puttering—is positioned as a problem to be overcome, eradicated, managed, or “taken into account.”

This is concerning given that domestic activity arguably constitutes the majority of energy demand, the routines of which also play a significant role in shaping peaks in demand. Laundry and bathing, for example, constitute the majority of hot-water consumption in most contemporary societies, and the dynamics of residential heating and cooling are also big concerns for peak electricity demand. Despite several attempts, the vision for Resource Man has so far failed to avoid or eradicate the mess of everyday life.

Paul Dourish and Genevieve Bell [13] invite researchers and practitioners to take a different approach. Rather than seeking to remove mess, they suggest embracing and valuing messiness as “inspiring, productive, generative, and engaging.” Mess is not something to be fixed, tamed, or removed, they argue; indeed, this is an impossible goal. Rather, messiness is “dynamic, adaptive, fluid, and open” [13]—it

is the stuff upon which innovation, improvisation, and adaptation are founded. The challenge here is to understand, embrace, conceptualize, and design for mess in visions for a smart energy future.

This might involve conceptualizing and theorizing mess as something other than mess—a term that tends to provoke negative and chaotic connotations. Mess could be reconceptualized as fine-grained networks of routines, or the outcome of different householders’ intersecting practices. It has dynamics, rhythms, and patterns. It is observable and knowable, and in many ways it is a type of “smartness” or competence that householders already demonstrate. It could be supported by and through design that seeks to shift domestic activity in new directions.

Designing for others. The smart home vision has been critiqued for containing largely Caucasian and trouble-free families. Within this heterogeneous assemblage we find a very specific notion of “the user,” whom scholars have critiqued for “constru[ing] HCI’s concerns too narrowly” [14]. Even in extensive consumer segmentation research, in which diverse householders are accounted for, people are commonly defined by their use of energy as a commodity (e.g., Money Minded Strivers), their concern with energy’s impact on the environment (e.g., Green Boomers), or their use of new (energy) technologies (e.g., Big Toys, Big Spenders) [15].

This current preoccupation means there is significant scope to consider other people, animals, and things in the home, their relationships with each other, and the implications for energy consumption. The world’s 1 billion pet cats and dogs, for example, do not think about energy as a commodity, technology, or resource, or its impact. However, they are very good at seeking out cool and warm places and spaces,

and can communicate with their owners about what sort of comfort they expect and desire. Children and teenagers are more commonly recognized as lacking interest in the energy bill, and yet they participate in many practices that result in energy consumption. Cleanliness, in particular, is a concern among teens as they aspire to fit in with social norms and participate in rituals and practices of bodily grooming, and this has very little to do with energy data or smart energy technologies. As such, these householders are often noted in studies of energy feedback as confounding and limiting the ability of adult households to effect energy reductions in their homes. Seeking ways to design for these overlooked consumers and their practices represents an interesting and

underexplored area of inquiry for HCI designers.

Designing for slow time. Electricity providers are increasingly interested in using smart energy technologies to shift electricity consumption outside peak times through dynamic pricing or automated technologies such as programmable thermostats. The assumption is that Resource Man will make decisions or use technologies to shift energy demand to other times of the day. Another way social researchers are approaching this issue is to think

The world’s 1 billion pet cats and dogs do not think about energy as a commodity, technology, or resource, or its impact. However, they are very good at seeking out cool and warm places and spaces.

about the flexibility and adaptability of practices and routines, and the sorts of conditions that allow them to be performed at other times of the day. Working schedules, school times, circadian rhythms, early-bird parking rates, and congestion charges are just some of the considerations that have a bearing on when and how the electricity network experiences hot and cold spots in demand.

Simultaneously, there is an emerging body of research that considers the role that different information and communication technologies are playing in scheduling routines and in creating periods of slowness or downtime. HCI designers are contributing to these discussions through concepts of “slow design”

[16], the possibility of designing for downtime rather than improved efficiency and productivity, and the possibility of designing for “slow energy” [17], in which we might see routines emerge around the availability of power, such as “windy-day bread making” or “sunny-day laundering.” There is also significant opportunity to think about designing for slow time during periods of peak demand, such as during a heatwave, when despite the considerable electricity demands of air-conditioning, routines and practices

can continue on in their normal state of busyness. An alternative might see a raised thermostat or forgoing air-conditioning on hot days coinciding with a more relaxed pace, a reduced rate of activity, or a series of alternative household activities and adaptations that use low or minimal electricity in the home. Studies of blackouts and other electricity interruptions have revealed cases of exactly that: When the power goes out people are often to slow down, and this can be both deeply frustrating and thoroughly enjoyable. Designing infrastructures, technologies, and strategies around the creation of slow time represents a promising design pathway for shifting energy demand.

Assuming new assumptions.

Technologies are full of assumptions about how we live. This is glaringly apparent in the design of automated appliances and technologies for the home, where these devices are intended to take over from assumed “normal” human activity. An automated climate-control system, for example, commonly embodies a very specific and engineering-led definition of thermal comfort informed by the pervasive ASHRAE Standard 55: Thermal Conditions for Human Occupancy. The standard assumes that humans are most comfortable within a fairly stable temperature band culminating around 22 (°C)/72 (°F).

Although widely critiqued from a number of disciplinary fronts, assumptions about mechanical cooling, humidity, and temperature ranges are often designed into heating and cooling appliances and automation programs. Resource Man, while using automated and highly efficient climate-controlled systems, is nonetheless dependent on this very specific definition of thermal comfort, which the majority of the world’s population has yet to even experience. This raises serious concerns about the long-term sustainability of

comfort assumptions built into smart technologies.

HCI scholars are uniquely placed to design a different set of assumptions into automated systems, using different models, theories, and concepts; and some have already begun to do just that. For example, the alternative “adaptive approach” to thermal comfort proposes that humans adapt to and actually prefer a range of different thermal comfort conditions. Similarly, Lisa Heschong’s seminal book *Thermal Delight in Architecture* invites reflection and design speculation on supporting multiple and different thermal experiences to avoid what she describes as “thermal monotony” [18].

Reimagining everyday life. A final, and perhaps more radical, proposition is to reimagine the sort of low-energy life we want or could have. Following design fiction practitioners and scholars, and research informed by theories of social practice, there is an opportunity to speculate on what life might look like with a lower energy footprint and less peaky electricity demand. There is scope not only to imagine future possibilities, but also to draw insights from the past and from the billions of people who currently have no or extremely limited access to electricity.

This proposition is distinct from the current futuristic predictions of life with smart energy technologies, which emphasize Resource Man’s interest in, and relationship with, energy data and new smart technologies. Instead, I am suggesting reimagining *how we live*. Questions we might ask, and which some are already asking, include: How could we cool and heat our homes (or bodies) without any or very minimal electricity? How might our practices change around increasing incidences of extreme hot and cold weather? What might bathing look like without the energy- and water-intensive shower that has dominated personal grooming in the 20th and 21st centuries? With new imaginaries in mind, there is scope for designing for different possible low-energy futures and realities.

LOOKING FORWARD TO A (NON) ENERGY FUTURE

I have argued that Resource Man represents a narrow and problematic perspective of human experience—one that promotes the ideal of a data-driven,

When the power goes out people often slow down, and this can be both deeply frustrating and thoroughly enjoyable. Designing around the creation of slow time represents a promising design pathway.

technology-savvy home energy manager who is interested in, and capable of making, efficient resource-management decisions. This vision hides as much as it reveals and potentially hinders progress toward a low-carbon and less peaky energy future.

I do not wish to suggest that this vision is somehow wrong or without some merit, but rather that it is productive in ways that may serve to undermine efforts to achieve longer-term changes in energy consumption and its impacts. If we continually invest our time, attention, and money into understanding, realizing, and designing for Resource Man, then we may produce a version of this reality at the expense of other, perhaps more inclusive and fruitful, visions of the future.

The challenge I pose here to HCI scholars and practitioners is to imagine and design for possible futures that don't focus on smart energy. This means moving beyond Resource Man's interest in energy as a commodity (cost), resource (kilowatt hour), or impact (greenhouse gas emissions) enabled by data and technology. Instead, it means engaging seriously with topics like laundry and heating and cooling; and looking, for example, at how energy is experienced through these practices within the dynamic site of the home. This represents a significant opportunity for the HCI community to do what the discipline does best: interrogate, reimagine, and design for low-carbon and less peaky human (and non-human) interactions.

ACKNOWLEDGMENTS

This article is based on content from Yolande Strengers' recent book, *Smart Energy Technologies in Everyday Life* (Palgrave Macmillan, 2013). The author thanks Ron Wakkary, Phoebe Sengers, and James Pierce for their constructive comments on this article.

ENDNOTES

1. Harper-Slaboszewicz, P., McGregor, T., and Sunderhauf, S. *Chapter 15. Customer View of Smart Grid—Set and Forget?* In *Smart Grid*. F.P. Sioshansi, ed. Academic Press, Boston, 2012, 371–395.
2. Zpryme. *The New Energy Consumer*. Zpryme Smart Grid Insights, Austin, 2011.
3. OSTP. New industry commitments to give 15 million households tools to shrink

- their energy bills. Office of Science and Technology Policy, Wash., D.C., 2012.
4. CEA. Unlocking the potential of the smart grid – a regulatory framework for the consumer domain of smart grid. Consumer Electronics Association (CEA), Arlington, 2011.
5. AEMC. Issues Paper: Power of choice – giving consumers options in the way they use electricity. Australian Energy Market Commission (AEMC), Sydney, 2011.
6. Sofoulis, Z. Skirting complexity: The retarding quest for the average water user. *Continuum: Journal of Media & Cultural Studies* 25, 6 (2011), 795–810.
7. Bourdieu, P. *Habitus*. In *Habitus: A Sense of Place*. J. Hillier and E. Rooksby, eds. Ashgate Publishing Ltd., Aldershot, U.K., 2005, 43–49.
8. Accenture. Revealing the values of the new energy consumer: Accenture end-consumer observatory on electricity management 2011.
9. AEMC. Overview summary: Power of choice review - giving consumers options in the way they use electricity. Australian Energy Market Commission (AEMC), Sydney, 2012.
10. Berst, J. Smart grid momentum: Think less about people more about devices. SmartGridNews.com. Feb. 28, 2012; http://www.smartgridnews.com/artman/publish/Technologies_Home_Area_Networks/Smart-grid-momentum-Think-less-about-people-more-about-devices-4533.html#.U1VmA0ZdUdY
11. Darby, S., Energy feedback in buildings: improving the infrastructure for demand reduction. *Building Research & Information* 36, 5 (2008), 499–508.
12. Healy, S. and MacGill, I. *Chapter 2. From Smart Grid to Smart Energy Use*. In *Smart Grid*. F.P. Sioshansi, ed. Academic Press, Boston, 2012, 29–59.
13. Dourish, P. and Bell, G. *Divining a Digital Future*. The MIT Press, Cambridge, MA, 2011.
14. Satchell, C. and Dourish, P. Beyond the user: Use and non-use in HCI. *Proc. of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group: Design: Open 24/7*. ACM, 2009, 9–16.
15. SGCC. *2012 State of the Consumer Report*. Smart Grid Consumer Collaborative, Roswell, 2012.
16. Hallnas, L. and Redstrom, J. Slow technology—Designing for reflection. *Pers. Ubiqu. Comput.* 5, 3 (2001), 201–212.
17. Pierce, J. and Paulos, E. The local energy indicator: Designing for wind and solar energy systems in the home. *Proc. of the Designing Interactive Systems Conference*. ACM, 2012, 631–634.
18. Heschong, L. *Thermal Delight in Architecture*. MIT Press, Cambridge, MA, 1979.

✉ **Yolande Strengers** is a vice chancellor's senior research fellow in the Centre for Urban Research at RMIT University, Melbourne, Australia, where she co-leads the Beyond Behaviour Change research program.
→ yolande.strengers@rmit.edu.au