

Practicing Energy, or Energy Consumption as Social Practice¹

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I. Introduction

Why do people use energy the way they do? If they know something about their energy use, will they reduce it, given appropriate information and incentives? How can their usage patterns be identified and measured, and what do those patterns mean? In the United States, there has been and continues to be considerable research directed towards understanding how to influence and change the behaviors of individual energy consumers (e.g., Strengers & Maller, 2015). The results of decades of various experiments and programs along these lines have not been as rewarding as once hoped; the thesis that individuals consider the benefits and costs of their energy use in an economic and rational fashion has not held up well in real life (except among a small subculture of people who are deeply interested in their energy costs, and can closely monitor their real-time energy use). Efforts to identify motivations and change behaviors through education, regulation, rewards, coercion, and admonition have uniformly been met with only limited success (Gerarden, et al, 2014). Calls to use public transportation, turn our thermostats down, and purchase more energy efficient appliances tend to posit energy usage behavior as the consequence of

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distinct individual economic choices that are unconnected to the deep complexity of the wider structures of everyday life or our personal interactions with others (Butler, et al., 2014). While individuals will engage in energy conservation—whether real or not—for reasons of personal “virtue,” they are less inclined to change behaviors unless forced to.²

Recent years have witnessed an upsurge of work on the application of “social practice theory” to energy consumers. A social practice approach to energy consumption assumes that it is not dependent on individual behaviors but, rather, on socially-normative, “appropriate” actions and behaviors in particular relational settings (Spaargaren, 2011; Shove & Walker, 2014). That is, as a set of social “practices,” individual energy use is shaped and conditioned by contextual “normal” behaviors in relationship to energy-producing and energy-using technologies and systems. Thus, for example, one or more members of a household may routinely turn off lights because that is what their parents taught them was appropriate, and not because electricity costs money.³ But the generalized social practice involved has to do with illuminating household spaces, which involves closing circuits. A more generalized social practice is reliance on the automobile for mobility: driving is normative practice in places such as Los Angeles because other forms of mobility are severely limited and drivers prefer to be alone or with friends and families, rather

² In response to the current drought in California, the state government has admonished cities, water districts and individuals to reduce their consumption, and some locales impose substantial fines on those who have not. But water conservation has come to be something that is done, from necessity and virtue, rather than coercive measures or efficiency goals.

³ In point of fact, our research indicates that our interviewees parents may have grown up during the Great Depression, when cost consciousness was very important.

than strangers on a train. The action of driving involves various kinds of normative practices on the highway, as well, including some that may be dangerous but are nonetheless pervasive.⁴ By finding ways to change or transform such normative practices at a collective or societal scale, it might be possible to effectively instantiate more efficient energy behaviors than would result from individually-focused change (we return to this below; see Strengers & Maller, 2015).

This article is directed largely to an American audience, although it has much broader application. To date, there has been little, if any, research on “practicing energy” in the United States, as reported in journals directed primarily at an American audience. By contrast, there is intensive work on this topic in Europe—primarily in Scandinavia and England—where social practice theory has been applied to a broad range of fields, disciplines and problems (e.g., Butler, et al., 2014; Gram-Hanssen, 2014; Shove & Walker, 2014). While that work has yet to develop robust strategies for clearly identifying and transforming social practices (Strengers, 2012; Shove, 2015), it appears possible that integration of social practice theory with various forms of energy monitoring and analysis might point the way to more effective energy conservation and, indeed, changes in how societies relate to energy (Strengers & Malley, 2015).

We begin this article begins with a general discussion of social practice theory (SPT): what it is, where it comes from and how it has been applied to both research

⁴ The archetypal version of such driving practices is to be found in metropolitan Boston, inside Route 128. New drivers from outside the area are frequently befuddled by Boston driving practices, but veteran drivers know what is appropriate on city streets and highways (Shor, 1964).

and practice. We then turn to the question of how social practices develop and change, highlighting the “social” aspect of action. In the third part of the paper, we narrow our focus to “practicing energy”: what it means empirically and a brief review the findings and conclusions of the rapidly-growing field of energy practice in Europe. We conclude with a description of a practice-oriented research project currently underway in California, and how monitoring and analysis of daily household load profiles could facilitate identification of modifications in “practicing energy.”

II. What is “social practice theory?”

In her path-breaking book, *Comfort, Cleanliness and Convenience: The Social Organization of Normality*, Elizabeth Shove (2003: 14) asks “[H]ow does the stuff and substance of consumption relate to the ordering of everyday life and to concepts of normal and proper practice?” This question lies at the center of social practice and theorizing about it: how are “normal,” taken-for-granted activities shaped by socially-generated knowledge, learning, expectations and meanings? How are individuals socialized into appropriate behavior in given contexts and with respect to particular material objects? In short, how do we know what to do and when to do it?⁵

Andreas Reckwitz (2002: 249) defines “practices” as

a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.

⁵ This, of course, was a major focus of Pierre Bourdieu’s (1990) work on fields and *habitus*.

This routinized type of behavior is a necessary element to effective human functioning amidst many daily tasks. As Butler, et al. write (2014:4, invoking Wilk, 2009: 150, who is writing on Bourdieu)

a completely cultivated self-reflective life would be impossible to live and... we therefore undergo processes of 'naturalization'. These take two forms: either conscious thought about practices is pushed back into the realm of habitus, or they are never consciously acknowledged in the first place.

Butler, et al. assert that the practice theories developed by Shove and Bourdieu are unified in that both position the social world as "emerging in and through practice" (Butler, et al., 2014: 4). This means that subjective structures such as consciousness, discourse or ideas do not exist prior to practice (although there are always mental and material precursors, so to speak). Instead, we come to understand the world through embodied practice and relations with others (Butler, et al., 2014: 4). Consequently, what we perceive to be normal practice is often integral to our social relations, as are many of our actions and consequent habits and practices.⁶

The literature on social practice theory tends to fall into four primary epistemological approaches. Two are identified by Gad & Jensen (2014) as *ethnomethodology*, represented by Bruno Latour and Steve Woolgar (1979) in *Laboratory Life*, and the study of *habitus* as a theoretical project, represented by Pierre Bourdieu (1990) in *The Logic of Practice*. A third involves analysis of "appropriate" actions while a fourth investigates big data sets.⁷ In *Laboratory Life*, Latour and Woolgar follow and document the ways in which scientific research must

⁶ More formally, this is a partial articulation of "Actor-Network Theory" first formulated by Bruno Latour; see, e.g., Latour, 1996.

⁷ Brief summaries of the origins of SPT can be found in Reckwitz (2002) and Gad and Jensen (2014).

be conducted in order to produce acceptable, verified results. Failure to follow the required norms may lead a scientist's and lab's findings to be rejected as invalid. Because the practice of science is a social one, the findings produced by that practice must be regarded as socially-constructed. Needless to say, this argument has never found much favor among scientists, who tend to interpret it as equivalent to the proposition that the real world does not exist (Latour, 1999: 1-23).

Bourdieu's approach is not necessarily that different from Latour's, even though they were never collaborators. Bourdieu posits the existence of social fields, in which individuals stand as one among many who possess appropriate knowledge, skills and recognition relative to each other. Fields are normally understood as being comprised by disciplines, (a)vocations, professions and identities. "Membership" in a field is achieved through action, accomplishment, recognition by others and the accumulation of "social capital" that can be used to gain recognition and further access to resources. But this is possible only if the individual engages in the practices attached to the particular field: an astronomer does not acquire social capital among her colleagues by writing a mystery novel (although she might achieve renown as a mystery novelist). Bourdieu calls these practices *habitus* (which is not the same as "habit"). As Butler, et al. (2014: 4) explain the creation of *habitus*,

objective social structures are inculcated into the subjective, mental experiences of agents. For Bourdieu...agents absorb objective social structures into a set of somatic dispositions, making their subjective structures of action commensurate with the objective structures and extant exigencies of the social field. The result is embodied action which is largely taken-for-granted or habitual and is, ultimately, socially constructed.

This description is somewhat misleading, inasmuch as “objective social structures” cannot really be said to exist; they are (re)produced via practice. Bourdieu himself does not recognize social practices as being relevant outside of specific fields in which they occur, although we could imagine the “household” as comprising a particular type of field, which is both particular to the occupants and general as encompassing “American” or European households, and in which appropriate practices take place (e.g., washing clothes). Air conditioning is a general social practice throughout the American South; a specific interior air temperature is a particular social practice in each household.

A third approach can be regarded as drawing on elements of both Bourdieu’s and Latour’s approaches, which can be called “appropriateness.” Social practice is what one does in specific contexts and contingencies (and not necessarily “fields”)—what is appropriate behavior—without consideration of recognition or reward. Such practices are learned and internalized in a variety of ways, from parents to schools to religious institutions, from peers, media and observation. They can involve speech, dress, syntax and actions, among other things. What might appear to be “appropriate” practice to one social group (e.g., Goth adolescents) might be regarded as inappropriate by another (e.g., parents of Goth adolescents). Some social practices are easy to identify and name, while others are hardly noticed until pointed out (Shove, 2003).

There is more richness to this approach than just enumerating norms and behaviors. Material and technological “actants”--things--can play a significant

agential role in the shaping, execution and reproduction of practices. We can see this, for example, in the phenomenon of the “distracted walker,” a walking individual so busy texting that she is unaware of what is going on around her and is prone to run into walls and other pedestrians or trip over curbs. We might say that the phone is “causing” the distraction, although it is clear that, without the walker/texter’s volition, the phone could not distract.⁸

Finally, there is the “big data” approach, which mines massive databases in an attempt to correlate household demography with specific features of household energy uses. For example, is there a relationship between particular demographic groups and identifiable energy-consuming practices? This approach may or may not include interviews, surveys and/or focus groups with individuals and groups (Gram-Hanssen, 2014); if the data sets are truly “big,” only a small number of ethnographic interviews of subjects recorded in the database is usually feasible. To do such analysis properly, in a fine-grained fashion, requires monitoring the energy consumption of specific appliances and, if possible, to have household occupants keep “energy diaries” (e.g., Baritoux, et al, 2006: 77-81). This can be complemented by monitoring of operational cycles of specific appliances, whose individual signals can be “backed out” from household electricity load profiles. In the absence of more intensive field research, however, such profiles cannot be connected to the intersubjectivities of individual users.

This raises a critical question: do practices matter or not? If so, how can they

⁸ For recent musings on the practice of texting while paying attention, see Turkle, 2015.

be identified and addressed, especially if the available data tells us little or nothing about them? Elizabeth Shove (personal communication; also 2015) makes it clear that “social practice theory” is ontological approach rather than a methodological one (Strengers, 2012: 228): it offers a way of understanding energy use ex post, but does not provide a method for actually researching or isolating social practice factors a priori. Moreover, so long as behavioral interventions are focused on individuals and households, social practices on the scale of millions to billions of people, as such, will not change visibly, at least not over short periods of time. This does not mean that practices don’t matter, only that changing them is complex: it requires more than swapping in new technologies and “educating” the public (see Strengers & Maller, 2015).

III. Theories of change in social practices

We turn next to the question of how and why social practices change or evolve. The approaches posed above require a brief detour to consider another important question: what is the role of individuals in changing social practices? If behaviors are an expression of individual preferences and choices, we should study what people do, and identify causal relationships between variables. If behaviors are structurally determined, we need to identify those large-scale social forces that induce or require change. If behaviors are socially-motivated, we need to examine what phenomena, processes and actions lead to emergence, normalization, and internalization of specific practices.

Consider first what Shove (2010) calls the “ABC” approach—Attitudes, Behavior, Choices— premised on certain social psychological and economic theories. This is sometimes called “rational choice.” It assumes that individuals seek to maximize their utility, preferences and desires, and calculate whether specific actions represent a net benefit or a net cost to them. One requirement for such calculations is possession of the knowledge and information necessary to make a rational choice--neither of which are necessarily available on short notice. Most efforts to change behaviors therefore focus on economic (dis)incentives, since price changes are communicated easily, and education, which addresses the general costs and benefits of particular actions, is widely available.

In the residential energy field, the ABC-rational choice approach remains dominant; As Strengers (2012:227) puts it with respect to household demand management,

the focus of the ABC model is expanded to include the transfer of demand management skills to energy consumers. Householders are expected to transform into micro resource-managers, and are represented as ‘Mini-Me’ versions of their utility providers, who must make similar resource management decisions at the household level.

As resource managers, occupants can be provided with aggregate or real time energy consumption and cost data, and decide whether and what to turn off and on, and when to do it (if prices differ over the day or during periods of peak demand). Forty years after this model began to define the mainstream approach to changing individual consumer energy behavior, many have concluded that it has largely failed (Strengers and Maller, 2015). Decades of behavioral research and interventions, and

considerable sums of money, have not had much measurable impact on consumers' behaviors, or induced them to conserve (Fuller, et al., 2010).

By contrast, social practice theory assumes that "end-use services are not...the outcome of attitudes, behaviours or choices (ABC), but rather...the product of social practices" (Strengers, 2012: 229). As a result,

The focus shifts from individual and autonomous agents, or self-directive and purposive technologies, and onto assemblages of common understandings, material infrastructures, practical knowledge and rules, which are reproduced through daily routines (id.).

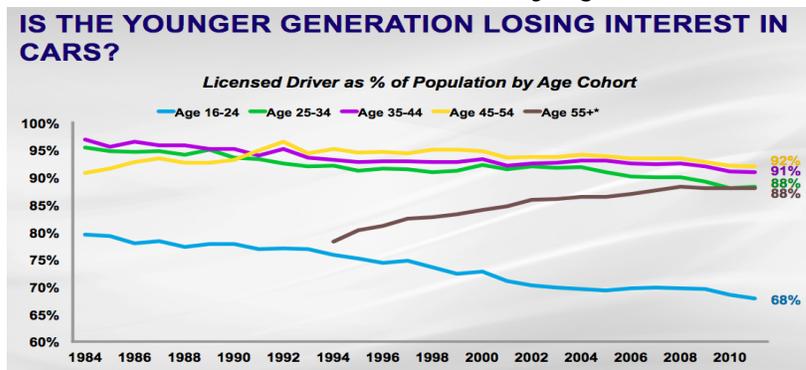
In this scheme, practices are what emerge from the mutual relationship between technologies and individuals; they are not the result of individuals consciously operating subtle technologies on the basis of rational choices. One difficulty in tracing the emergence (and disappearance) of social practices is that, while they can change rather quickly, identifying or measuring such changes while they are occurring is difficult. Usually, it is only in retrospect that the change becomes visible (Lipschutz, 2012) and, even then, the causes of such changes are usually overdetermined. Like the fabled drunk looking for her car keys where the light is brightest, rather than where she dropped them, it is more straightforward, to adopt an ABC approach, and to differentiate agent and structure or supply and demand.

One example of an overdetermined change in social practices is the recently-observed global decline in the rate at which adolescents and young adults are acquiring driving licenses (Figure 1).⁹ This would certainly appear a counterintuitive

⁹ There appears to be a secular decline in car usage across the industrialized world; see, e.g., Van Dender & Clever, 2013; Sivak & Schoettle, 2011.

trend in the United States, a society shaped by and dependent on private automobiles. How might this change be explained? Certainly, there has not been a commensurate increase in accessibility to alternative modes of transportation, and young adults, at least, tend not to rely on their parents to get around. The cost of owning, insuring, operating and repairing a vehicle is hardly negligible and is rising—which could be a factor behind the decline, although most people in this age bracket do have driver’s licenses and cars. Perhaps the bloody-minded accident videos traditionally shown in high school and during new driver training are finally scaring people out of cars. But these same factors were in place prior to the 1980s, so it is unlikely that they matter very much more now. Note also that this trend might have begun even earlier than 1984, although it has only been remarked on during the last decade or so.

Figure 1: Licensed Drivers in the U.S. by Age Cohort



Source: Thompson, 2013.

One broadly-offered explanation for this decline is the rise of the new communication and social technologies and media: smartphones, tablets, Facebook Twitter, etc. (Nevia & Gifford, 2012; Rosenthal, 2013; Ball, 2014). According to this line of thought, cars used to be the “social medium” via which adolescents and young

adults communicated with each other—recall, for example, the importance of “cruising” and drive-in restaurants in the film “American Graffiti.” Today, such social interaction is more easily and cheaply effected via communications technologies and social media. Not everyone buys into this proposition (e.g., Ball, 2014), especially because the decline began long before the advent of smart technologies, but this example highlights a change in social practice (see also Lipschutz, 2012, for a discussion of the decline of social smoking).

Returning to the practice of “walking while distracted,” we know that this is unlikely to have predated the advent of texting (the closest corresponding behavior was pedestrians with their noses in books) Pedestrians not owning or carrying smartphones bemoan such disregard for others, but there is no indication that such complaints are leading to its decline. And notwithstanding warnings that this can be dangerous (as in texting while driving), and stories about people killed while walking and texting, the practice continues unabated. For safety reasons, we might imagine a future in which pedestrians are equipped with the implanted equivalent of Google Glasses, and can watch and walk at the same time. That would give rise to other social practices. Note also that, without the particular user-technology assemblage common today, walking while distracted would not have become (somewhat) normalized.

There are other ways in which social practices may be changed, for example, via what Robert Thaler and Cass Sunstein (2012) call “nudges,”¹⁰ and “libertarian paternalism” (Jones, Pykett & Whitehead, 2011) and the “new maternal state” (Pykett, 2012). This literature describes how “government” of the body is becoming state policy and practice, and is directed toward managing or eliminating “excessive” liberties and undesirable habits cultivated under neoliberalism (Jones, Pykett & Whitehead, 2011: 489). Some of this government is manifested through advertising and advisories, education, norm change, some by changing both incentive structures and the very materiality of infrastructure, for example, by physically intervening in spaces and bodies and changing “choice architectures,” which seek allow “freedom of choice” while directing individuals in particular directions desired by the “choice architects” (Sunstein, 2014). Such paternalist tendencies are also apparent in the rise of the neurosciences and behavioral psychology, both of which seek to explain, predict and shape individual behaviors as part of the effort to impose order on them. The individual benefits from accepting the nudge, but can always ignore it.¹¹

Another version of nudging appears in what are known as “persuasive technologies.” IJsselsteijn and colleagues (2006: 1) define these as a

¹⁰ “Noodging” (*dg* pronounced as *j*) is a similar-sounding Yiddish term, which the *OED Online* defines as “To pester, to nag at. Also *intr.*: to whine, to complain persistently.” But there is apparently no connection between the two, according to the same source.

¹¹ Benefits” as defined by the nudger, not the nudgee. This is the creepy part of applying persuasive technologies to motivate or force behavior change. The nudger/nudgee relationship is almost never an interaction between equals. Nudging on a large scale requires logistical resources that presume the nudger is a dominant economic, political, and cultural power. By definition, that dominant corporate or institutional collective is seeking to nudge atomized individuals in a shaped cultural matrix towards behaving in a way that supports and extends the agenda of that dominant power. Sometimes that’s benign to positive. In our culture, often it’s not.

class of technologies that are intentionally designed to change a person's attitude or behaviour. Importantly, persuasion implies a *voluntary* change of behaviour or attitude or both. If force (coercion) or misinformation (deception) are used, these would fall outside of the realm of persuasive technology.

Most persuasive technologies involve the use of media or personal devices to sell goods and services and to provide feedback and instructions to consumers. As Ijsselsteijn, et al (2006: 1) put it,

the development of new sensor technologies and algorithms that allow for context-aware computing, will make it possible to infer elements of a person's context and activity, and deliver appropriate persuasive health-related messages to that person *at the right time* when decisions are made or behaviour is executed, i.e., just-in-time messaging (emphasis in original).

Both nudges and persuasive technologies seek to influence and alter *individual* behaviors, in the belief that information and feedback will induce consumers to choose actions that will benefit them.¹² The goal is that, after repeated interventions, the individual will simply know what to do and not require nudging.

With nudging and persuasive technologies, however, we are slipping back into behavioral and rational choice territory. Experiments (Ham & Midden, 2013) suggest that Individuals respond more readily to "social feedback" from their peer groups than "factual feedback" devices, and more readily to negative than positive social feedback. Other research (Foster, et al., 2010) indicates that comparative feedback, whereby individuals and households can compare their energy use to others, whether

¹² Research has shown that such "persuasion" is more likely to be effective if feedback is social and comparative; see Ham & Midden, 2014.

neighbors or a peer group, provides a context that is more effective than simple factual feedback.¹³

IV. Practicing Energy: Theory & examples

What do we mean, then, by “practicing energy?” This question reflects the ontologies of “social practice”: people don’t “consume” energy directly or even through services. Rather, they engage in various practices--traveling, washing, heating, computing, cooking, cooling, etc.--that require forms of energy. As Kirsten Gram-Hanssen (2014: 94) writes

Energy consumption is not a practice in itself, but all the different things that people do at home which consume energy, such as cooking or washing, are practices and these are guided by different elements. Although it is the individuals who wash clothes in their homes, this practice must be understood as part of a collective structure in which some common rules are followed for what clothes washing actually involves.

For example, Higginson, McKenna and Thomson (2014) examine the “practice” of washing clothes (in the context of energy use). A conventional analysis of doing laundry focuses on the frequency of clothes washing, the energy and water efficiency of washers and dryers, alternatives such as outdoor clothes lines and even the relative life cycle impacts of different fabrics and detergents. By contrast, Higginson,

¹³ One more thing worth mentioning: ABC presumes that each and every potential behavior is equally important, and equally worthy of deep analysis based on robust and accurate information. Persuasive technologies tend to presume that their informational and behavioral payload, whether it's warning about an impending stroke or rhapsodizing about the 3-for-2 socks sale down the street, is critical to the health and happiness of every individual. This is how persuasive becomes coercive.

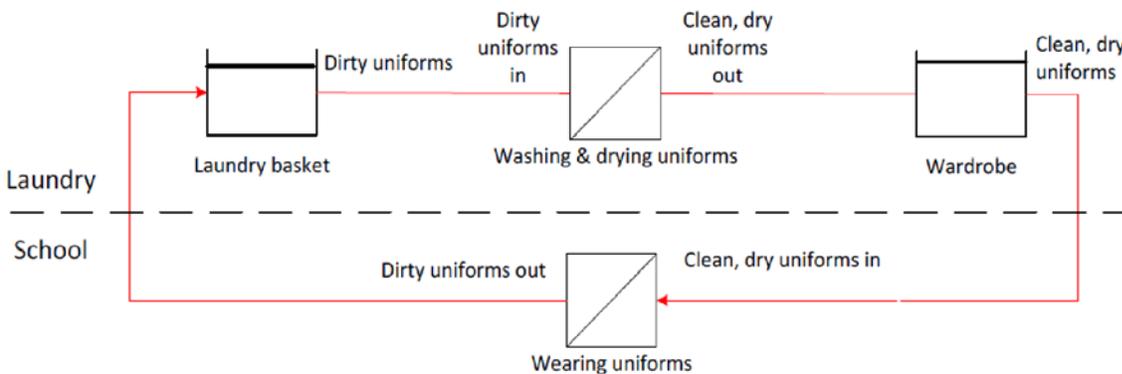
There is a peculiar hubris to the existing energy behavior literature that never seems to get the possibility that either people are behaving rationally, just not like you want them to, or that people have other, personally more important things occupying cognitive bandwidth. There's also a peculiar disconnect in the presumption that understanding and changing irrational behavior by the institutions and corporations that create and maintain our built environment is not important, but changing the cognitive patterns of individuals is critical.

McKenna and Thomson treat clothes washing as a series of practices that, ultimately, are linked to social skills, images and rules: what kind of clothing is expected in particular settings (e.g., school uniforms), how one is stylish in that setting (image) and how frequently those clothes must be cleaned (skill). And, they observe (2014: 13),

changing the school culture would impact on lots of performances of laundry practice and so potentially has a very large impact, whereas changing the washing machine would only alter the laundry practice of the household in which that appliance was kept.

Of course, untangling “school culture” is not such a simple task as might seem (Figure 2), since it is part of a great assemblage of which school uniforms are only one small part.¹⁴

Figure 2: The practice of washing and wearing clothing



Source: Higginson, et al., 2014: 10.

Butler, et al. (2014) look at the practice of clothes washing in a similar way, but connect it to the availability of choices (different for today’s generation from

¹⁴ In our fieldwork, we have asked household residents about their clothes washing behaviors. Most have replied that they wash when they run out of clean clothes, which can range from one to several weeks. No one admitted to a regular “wash day.”

previous ones). One of Butler, et al.'s interviewees (Debbie, aged 50) distinguishes between possibilities of choice in relation to her daughter's washing working clothes daily by contrast with her mother's generation hardly ever washing their outer clothes (presumably lacking washing machines). This example highlights a changing practice of clothes washing over time, whereby complex relations between improved technological and material structures such as improved washing machines and clothing are linked to social expectations generated by interaction with others, who "demand" clean clothes. This has shaped different generations' practices and normativities (Butler, et al., 2014: 8).

Thus, to study "practicing energy" we must ask not "How do you use energy every day" but, rather, "in what kinds of activities do you engage on a regular basis?" where those activities implicitly require expenditures of energy. In methodological terms, the best way of identifying regular activities as practices would be something like participant observation, but this is normally too intrusive and impractical.¹⁵ One alternative is to conduct semi-structured, in-depth interviews with "relevant actors" in which they are asked "to describe their understandings, frames, contexts, theories, metaphysics and ontologies regarding energy behaviour" (Galís & Gyberg, 2011: 307). In this instance, relevant actors can include not only building occupants but also landlords, architects and even builders. It is also possible to apply actor-network theory (ANT) here, treating devices, structures and materials as "actants" with

¹⁵ A wonderful example of the problems arising from ethnographic research is provided by the Swedish film "Kitchen Stories" (2004). In the film, set in the 1950s, a group of Swedish researchers observe the daily practices of Danish bachelor farmers. Inevitably, the glass wall between researcher and subject is broken, and they become friends.

agency in their own right (id.). A washer-dryer combination in a residence will “cause” occupants to periodically produce clean clothes--usually more frequently than if they had to visit a laundromat. In other words, social practices are co-constituted through socially-normative requirements, individual volition, and available technology.

Identifying the best method for doing research on practice theory thus becomes difficult (Shove, 2015), as does the identification of individual practices: the occupants of households without washer-dryers also produce clean clothes. According to Halkier (2001: 27), therefore, a “sharp distinction between reflexive and routinized consumption practices is impossible to sustain in empirical analysis.” Individual behaviors related to, for example, household practices are embedded not only in internal micro-level social relations, they also arise from broader and often ambivalent social dynamics (Halkier, 2001: 27). That is, normative social expectations are also conditioned by technological developments, media exposure and popular culture, which are hardly static (Henriksson & Rivera, 2014). Butler, et al. (2014: 6) agree that uncovering practices is difficult, particularly through interviews, because “the phenomenon under research [practice] does not have a static decontextual and therefore uncoverable existence.” Nonetheless, Butler et al. opt for interviews in the belief that people use narratives to locate and make sense of their own practices, and that narratives can be a primary approach to knowledge creation for both the interviewer and interviewee.

The tensions among empirically-directed methods is visible in research conducted by Kirsten Gram-Hanssen and her colleagues (2014), who collected consumption and survey data in a sample of 71 houses in Odense, Denmark, and correlated occupant attitudes regarding “carefulness in saving energy” use with the fraction of household energy use by a set of appliances and practices (e.g., dishwashing, refrigeration, cooking). They also conducted in-depth interviews in 10 of the households. The results of the larger set show that, for those devices over which the user has “discretion,” there are significant differences between “careful” and “indifferent” households, by a factor of 50-100% (Gram-Hanssen, 2014: Table 4). The same does not hold true for refrigerators, which operate on an automatic cycle over which the user has only limited control. By contrast, users can decide how frequently to clean plates and cutlery (dishwashers), produce clean clothes (washers and dryers), have meals (stoves and ovens), go places (drive or ride) and process words and surf the Internet (computers and media devices).

All of these practices involve energy use, but what is less clear, even from interviews, is how “discretion” and “social practice” are related. It would appear that occupants consciously “decide” when and how frequently to engage in these behaviors; as we shall see, below, sometimes clean clothes are produced only when there is nothing left to wear. The “practice” can be repeated at specified times, but it need not be; the occupants can decide when to engage in the practice, or to leave it to a designated clothes washer “operator.” Consequently, the interviewer or surveyor cannot simply ask “when and how do you use energy?” A more appropriate

question would be “Could you tell us what you do in a typical day, from getting up to going to sleep?” From this, it may be possible to identify social practices and gain at least some insight into their relationship to energy use.

Gram-Hanssen’s research group also analyzed energy use data from district heating in 22,400 detached houses and electricity consumption in 40,000 apartments. For houses (Gram-Hanssen, 2014: Table 1), the two most important factors in energy use are house floor area and year of construction; the number of occupants in a unit has only a small effect. For apartments (id: Table 2), the two most important factors are number of occupants and floor area. The effects and differences are easily explained: heating requirements are related to house volume, regardless of the number of occupants, and the conservation features installed in the house, which have increased over the decades. By contrast, electric appliance and device use is largely discretionary: the number of devices in a home, and their frequency of operation, are roughly proportional to the number of people turning them on and off. Such practices as might be present appear marginally, if at all, in the aggregated data.

V. Practicing energy in California

How is social practice research actually done? Here, we turn to our current research project in intermittent, community-based renewable energy microgrids.¹⁶ A microgrid is a relatively small-scale generating system (100 kW-10 MW), providing electricity to a group of houses, neighborhood, or community. Our specific interest is in systems

¹⁶ NSF-PIRE Award #1243536, PIRE: US-Denmark Cooperative Research and Education in Intermittency-Friendly Community Scale Renewable Energy Microgrids.

utilizing renewable energy sources, such as solar and wind. Inevitably, the power provided by such a system is *intermittent* and, in the absence of adequate power storage for times when the sun isn't shining or the wind blowing, a backup source is required.¹⁷ For the moment, this is assumed to be the surrounding utility "macrogrid," but other configurations are possible.

While few operating *community* microgrids exist at the present time in the United States, these could become a significant or even dominant source of power within a few decades. But widespread deployment poses a number of complications - -technological, economic, regulatory and cultural--for both communities and utilities. In particular, variable microgrid generation can mean rapidly varying flows of power into and out of the grid, with the potential to destabilize power systems. Hence, microgrids will require "smart grid" technology,¹⁸ so that power flows can be managed in a stable fashion as well as co-management by users so that demand will not spike at inopportune times (Strengers, 2012). There are a number of other considerations that are relevant, but we will not go into detail here about them (see Farhangi, 2010; Wolsink, 2012).

A key element in operating stable power systems is demand management, that is, regulating and leveling electricity consumption so as not to exceed or destabilize real time power supply and the utility distribution network. In the case of microgrids, high performance demand management must embed the behaviors and proclivities of

¹⁷ Any excess energy from the local microgrid gets put back in the utility macrogrid through a process called "net-metering."

¹⁸ Essentially, a smart grid provides a two-way communication infrastructure of information and energy flows, which allows control over distributed generation, storage, consumption and flexible demand (see Farhangi, 2010).

both individual energy consumers and daily/seasonal building loads. These affect both the sizing of a microgrid and the operation of the utility grid, especially if demand from many microgrid users peaks at times when microgrid power production is minimal or nil. It is at this point that social practice becomes germane, for several reasons. First, many electricity uses are motivated by user practices, e.g., cooking, laundry, etc., and occur at particular times of the day. Second, notwithstanding public rhetoric about “saving energy,” the continuing electrification of many aspects of daily life is driving up peak demand around the country; changing practices might offer potential for “load-shifting” to other times of day, when demand is lower. Finally, identification of patterned and normalized behaviors reveals to users how their daily activities integrate with practicing energy.

In order to study energy user behavior with respect to a hypothetical microgrid, UCSC investigators have identified a cohousing (coho) site of 16 residences built to one of two standard designs, with roughly 60 occupants.¹⁹ According to the Cohousing Association (2014)

Cohousing is a type of intentional, collaborative housing in which residents actively participate in the design and operation of their neighborhoods. Cohousing provides the privacy we are accustomed to within the community we seek. Cohousing residents consciously commit to living as a community. The neighborhood’s physical design encourages both individual space and social contact. Private homes contain all the features of conventional homes, but residents also have access to extensive common facilities...

Our coho research site consists of 14 single-family houses (2,800 square feet) and two duplexes with four units (1,600 square feet). There is also a large (2,500 sf) commons

¹⁹ Data and interview materials have been anonymized to protect occupant confidentiality.

building on-site, with a kitchen, dining room, and other shared facilities. The single family homes are three stories tall and include five bedrooms and three bathrooms; the duplexes are two stories high, some with three bedrooms and two bathrooms, others with 2 BR and 1.5 BA. Many of the single family dwellings include an attached 500 square foot apartment unit (included in the five BR and 3 BA). All the houses have central gas heating, none have central air conditioning (there are a couple of window units), and a few have solar panels on their roofs. The entire development occupies about five acres. Most of the houses are unshaded; a few are shaded.

The project has five research objectives:

- Conduct open-ended, semi-structured interviews with occupants in order to identify energy use patterns that might constitute social practices;
- Inventory energy-consuming devices and appliances in each household and connect social practices to patterned activities;
- Install circuit load monitors in each household and the common house to record daily load patterns at microsecond intervals, and selectively monitor individual plug loads to back out identifiable signatures of devices and appliances in the household;
- Design a hypothetical renewable energy microgrid matched to the demand profile of the community, within economic constraints; and
- Develop a dynamic model of the interactions between microgrid and load shaping supply, local community demand, and utility macrogrid operations, including ancillary system support services such as voltage regulation, power factor control, and dispatchable microgrid operations.

This particular research site offers us a number of advantages over a more heterogenous collection of houses, such as might be found in a random city block or neighborhood, and makes it possible to eliminate several variables that often bedevil such energy research. First, all of the buildings have similar architectural design, construction materials, interior layouts and infrastructural systems (heating, hot water, etc.). Second, the occupants are relatively homogeneous in demographic

terms: white, middle-class with a relatively high income, grown children still in residence, one or more cars. A large majority of the homeowners have lived in the coho development since it was completed in 2000; there has been little turnover in ownership. A number of residents also have children and tenants in their homes. Finally, almost all the occupants are self-described environmentalists, although green practices vary widely among them. Of course, our research results will not be very generalizable, as a result, but our goal is as much to test methodologies as to collect qualitative and quantitative data.

In what follows, we report on only the first objective and preliminary data drawn from a set of 12 interviews to date with homeowners (individuals and couples). Each interview lasted approximately one hour, during which we asked interviewees to describe their energy use during a typical day, from rising to going to bed. In doing so, the interviewees reported on the activities associated with that energy use and particular conceptions they held about their energy use (i.e. that their car was inefficient and that they felt a need or desire to switch to a more energy efficient vehicle). If they reported engaging in specific conservation practices, we asked when they had started to do so, and what had motivated this. We asked whether their parents or some experience had played any role in teaching them about conservation and efficiency. We asked about transportation, work, food, laundry and other activities (some were volunteered without prompting), and about the types of cars they owned. A significant number own new-generation hybrids and electric cars; we asked why they had bought those cars. In general, and as suggested above, we have

found it difficult to distinguish between social practices and what appeared to be deliberate and conscious activities by individuals. Most of our interviewees were unfamiliar with the concept of social practice prior to our explanation, although we found that they were more thoughtful in their responses once they understood our objectives. It quickly became evident that identifying a *social practice* is not the same as identifying *patterned behavior*, if the latter is assumed to take place at specified times on specific days. For example, cooking takes place at relatively fixed times during the day (albeit not always at the same times every day). By contrast, doing laundry is a social practice but, for many of our interviewees, laundry day tended to take place when there were no more clean clothes, rather than on a set day of the week.

Many interviewees identified college and adolescence as formative periods during which they adopted or acquired core conceptions or awareness of environmental issues. One interviewee told us that, although his parents did not play a direct role in his environmental education or provide much information or instruction about what to do and how to do it, they did provide the psychological and moral basis for his later attitudes. As he put it, "attitudes came then, but the knowledge came later." Some interviewees whose parents had lived through the Great Depression and Second World War spoke of their inculcation into frugal practices that persist today, demonstrating that the behavioral signal from seismic cultural events on energy attitudes and practices can span multiple generations.

These frugal practices were sometimes created or nurtured in liberal environments, either while living abroad or growing up in college or other liberal towns across the United States, where certain types of conservative or money saving behaviors were widespread or created under parental supervision.²⁰ Sometimes these materially conservative behaviors and frugal values were described in combination with certain inherent (individual) characteristics. Such frugal practices range from consciously turning off lights to sensitivity about cars. One of our interviewees told us that: “my nature is not to use more than I need. To make stuff last longer... [and] learning to do more with less,” which he attributed, in part, to his upbringing. One of our interviewees, asked about the sources of her preference for cars with high miles per gallons ratings (she does not own a hybrid or electric vehicle), responded:

I think I learned that from my dad. ... Frugal would describe his approach to life. He was always interested in how he could squeeze more miles per gallon out of his cars. I remember him telling me; never drive too fast. If you drive slower you make better mileage. And he always selected efficient cars.

Perhaps it is not surprising that many of our self-described frugal interviewees were also conscious of their energy usage. A notable example was a participant who single-handedly designed and implemented a rainwater collection system in his backyard. It was not environmental concern that was on his mind; instead, he explained, his household was recently penalized several hundred dollars for exceeding the city’s

²⁰ Note for later versions: So, two more vectors, and one important one that's missing: Practices transferred from deep engagement with a different cultural frame, and practices developed as an adaptive response to fundamental constraints. Missing: practices embedded in current or past communities of identity other than family or a different culture.

limits for domestic water consumption (a result of seven occupants in the house instead of the normative four).

Some of our interviewees vividly recalled the first Earth Day, in 1970, as an important marker during their adolescence, one that influenced their thinking about and understanding of the Earth and its environment. Others recalled the Energy Crisis of the 1970s as formative. This suggests that specific events may stand out in people's memories and have a long and continuing influence on their norms, preferences and beliefs.²¹ We will be interviewing younger residents of the Coho site in pursuit of this hypothesis. The emergence of certain technologies (e.g., electronic devices, hybrid vehicles) and changing cultural and social dynamics (e.g., government policies, advertising) may also have played a role in the development of particular behaviors and practices (e.g., recycling). We illustrate these points below.

Several interviewees spoke of childhood fears whose origins they were not quite able to identify. For instance, one participant told us:

I remember I was in first grade, so let's see, I was 5 ... so probably 1962, and I remember there was a water faucet in the classroom, and I remember turning the water faucet on, it was like a drinking fountain, thinking: this could save someone's life. And I remember thinking in 1962 that this [the water] was very precious and we wouldn't have enough of it. When I was older, I have no idea where that came from really, but I remember this feeling of fear in my heart, so I think that's been with me always. Of really trying to do the right thing, to influence others (even though I'm not very effective) and try to make a difference and make the world so that it will go on.

²¹ Interestingly, research into the impact of early experiences on later environmental attitudes points to opposite conclusions (see, e.g., Ewert, Place & Sibthorp, 2005 & Wells & Lekies, 2006).

For this individual, memories of the awareness and personal conceptions of environmental scarcity now conjure a sensibility related to her/his and society's well-being, today and in the future.²²

But such early influences are not always clear-cut as shapers of later attitudes and practices. For instance, during a long conversation about installation of solar panels on the roof, practice of water conservation, and discussions with others about energy conservation, we asked whether the interviewee's environmental consciousness developed at a younger age. She responded

No. My family are immigrants from Cuba and there really just was this attitude of plenty [after arriving in the U.S.], you know, so no. And even the community that my siblings ... still live in, this community is called Rossmoor, and they still don't have a recycling thing. Everything goes in the garbage. ... It just drives me nuts, because I have all these nieces and nephews and they have no clue [about recycling] because they don't do it at home.

While many of our interviewees are taking steps to preserve the local environment, most did express some form of guilt about an unsustainable habit, for instance, taking the car downtown instead of their bicycle. Furthermore, many did express a concern about the direction in which the planet is headed. As one of our interviewees informed us:

With the advent of global warming, I can't help but despair a little bit. To me it's almost, it's not like it couldn't be reversed, I just fail to see any concrete steps in that direction. I mean part of living in California is that people are responding, but I'm just suspicious that it might be too little too late, so turn around what looks like an almost irreversible trend to me.

²² As noted earlier, the current drought in California has played a significant role in social imaginaries, norms regarding water, and practices for conserving water. This is an example of the "ambivalent" social dynamics alluded to above (Halkier, 2001).

As a followup, we asked an interviewee whether he personally had taken any steps to change his practices. He responded

I can honestly say I have not. We have been reasonably frugal to begin with, I'm not sure what else we could do. To take a car that has already been built, and stop using it ... does not seem very useful to me, because the cost of making a car is so high in terms of energy. The one thing I feel guilty about is that when I'm in town driving around, is that I do not use my bicycle more. So I've increased my level of guilt.

Despite individuals' sense of guilt about specific habits, a general awareness (or consciousness) of the environment appears, in our very small sample, to translate into the adoption or adaptation of certain specific practices. Examples include buckets in the shower to collect greywater to flush toilets, which might become reified in the person's direct environmental and social relations later on. This could be initiated through a conscious (active) cultivation, as a new routine becomes normalized. Wilk (2009m 149-50) describes "cultivation" as referring "to the processes which bring unconscious habits and routines forward into consciousness, reflection and discourse." Cultivation can be active or passive, but conflicts between routines may push practices forward because we have to decide on what gets priority. This decision is followed by a period of naturalization, in which conscious practices are pushed back into the realm of *habitus*, where the individual no longer thinks about them but simply does them.

We find that, while upbringing is influential, one's direct environment and interactions with others certainly goes a long way toward creation of consciousness of often-mentioned issues, and the adaptation of certain types of new behavior that are slowly transformed into the realm of practice. While individual practices have been

difficult to identify (largely due to their complex nature), we have also noted that changes of practice may be driven by certain morals and viewpoints people hold about the planet and themselves. Consequently, we believe, changes of practice are likely more closely connected to a consciousness of the environment within the boundaries of personal priorities embedded within overarching social structures.

VI. A Few Inconclusive Conclusions

It is evident that neither our research nor this paper are complete. Our intention here has been less to report on the findings of our research than to introduce social practice theory in the context of energy and to problematize practices themselves. Furthermore, we ask whether social practices matter in attempting to change consumer behaviors in the interest of both energy conservation and the face of new technologies and material realities. To date, much of the research done in Europe and the United Kingdom remains uncertain about what kinds of interventions might be able to change practices or how they would be deployed, although there is considerable interest in the topic (Strengers & Maller, 2015). One difficulty is that social practices tend to change very slowly, and are driven more by technology and changing norms than by information and incentives. Another is that the normative change might already be in place, but it is difficult to change the institutions that have an interest in supporting status quo practices.

As far as our research is concerned, the conclusions we can draw are limited. We find that experiences, seminal events, parental instruction all contribute to the practices in which individuals engage, but this says little or nothing about the advent of normative *social* practices or how they might disappear (as in the case of social smoking; Lipschutz, 2012). A more fundamental problem is one that faces all researchers interested in the relationships between micro behaviors and macro structures--especially if this is the nexus for social practices. It is an epistemological problem that, if not yet (or ever) solved, will nonetheless occupy many of us for a long time.

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