Energy Research & Social Science 11 (2016) 195–208

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Original research article

# Energy use, behavioral change, and business organizations: Reviewing recent findings and proposing a future research agenda

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ARTICLE INFO

*Article history:*
Received 26 November 2014
Received in revised form 31 August 2015
Accepted 3 September 2015

*Keywords:*
Energy
Behavior
Business
Organizations

ABSTRACT

A sizable literature has begun to emerge on individual energy behavior, but research on energy behavior in business organizations has been far more limited, despite businesses' responsibility for a far larger fraction of energy use, global warming and other impacts. This article reviews studies of energy behavior in businesses, and suggests areas for additional social science research. We conducted a systematic review of bibliographies on energy and behavior, papers presented at recent conferences on behavior and energy, and reference lists of publications thus identified, and keyword searches on energy behavior and business and related topics. From these sources we identified research articles addressing energy behavior in businesses, and categorized them by qualitative content analysis into three levels of analysis: individuals within organizations, organizations, and institutional forces influencing organizations' behavior. Using this method, we found several well-developed research areas but also significant gaps on other important topics. Under-developed topics include factors influencing businesses' adoption of renewable energy; sector-specific studies on barriers to energy innovation; integrated studies of influences on businesses' energy behavior at the individual, organizational and institutional levels; and cross- cultural comparisons. Such studies offer opportunities both for scholarly contributions and for improving business decision-making and public policy.



## 1. Introduction

Over the past several decades, a growing body of scholarship has begun to address energy use and its environmental impacts as questions of human behavior. Why do people choose to behave in ways that use energy in environmentally damaging ways, or conversely, in ways that are "greener" in their impacts? What are the drivers of such behavior, and how do they differ among people and households with differing characteristics? What are the barriers to change in energy behavior—both external, such as the availability and costs of greener alternatives, and internal, such as attitudes, beliefs, and values—and how can they be altered? What predictable biases are embedded in energy behaviors that defy both economic and environmental rationality, and how can they be diminished or leveraged [12,99,101–103,113]?

Most of this scholarship so far has focused in two areas. One is energy behavior by individual energy consumers: examples include studies of energy conservation behavior by individuals, households and motor vehicle drivers, of recycling behavior by homeowners, and of the effects of environmental or energy labeling of products ("ecolabels") on consumer choices [5]. The second major research area is the "energy-efficiency gap," including failures both by individuals and by businesses to adopt apparently cost-effective energy-efficiency measures (see e.g., [17,25,26,35,57,72]).

With the exception of the energy-efficiency literature, however, surprisingly little research so far addresses energy behavior in business organizations [83]. Even an exceptionally thorough recent review article on energy behavior, while calling for more research relevant to real-world problems related to what businesspersons actually think and do, addresses energy behavior in businesses only briefly – mentioning managerial ignorance of consumer energy demand, and possible institutional influences in engineering cultures – and not as one of its highlighted areas for further research [99]. One other recent article identifies energy use in organizations as one of six important priorities for research, but does not elaborate on it [72]. A few authors have begun to articulate a richer social and behavioral understanding of energy use in buildings [52,76].

Given the magnitude of businesses' influence on energy use, it is surprising that there has been so little research on their energy

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http://dx.doi.org/10.1016/j.erss.2015.09.001
2214-6296/

behavior. There has been considerable scholarship on the "greening of business" and "sustainability" [11,70]; but other than energy efficiency, there has been little specifically on energy choices in business behavior, whose rationale overlaps with environmental behavior in some respects but does not coincide with it.

A primary argument of this review is that energy behavior in businesses represents an important yet underdeveloped opportunity for social science research, not only to increase scholarly understanding but also to improve business decisions and public policy. In the first issue of this journal, Sovacool reported on a wide-ranging synthesis of energy studies over the past fifteen years, and proposed 75 key questions for social-science energy research across fifteen content areas including policy, behavior, politics and institutions [99]. For example, what types of information and feedback are most effective at influencing energy producers and users? How can the advantages of decentralization be synergized with those of centralization? How can one persuade or introduce behavioral change in ways that subjects do not perceive as overly controlling? What role do emulation and imitation, status competition and conspicuous consumption, play in high rates of energy consumption, and how can they be reversed? And can particularly effective or successful "engineering cultures" be transplanted without a loss in their effectiveness? This article addresses several of these questions in the context of business organizations, and provides a review of what research literature exists to answer them, what questions remain underexplored, and what conceptual approaches might be used to address them.

One important question, for instance, is what types of information and feedback are most effective at influencing businesses' energy decisions? Answering this question requires consideration not only of what kinds of information and feedback to use, but of how it will be received by individuals in their roles within business organizations, shared through their groups and networks, and institutionalized in organizational norms, rules, and structures. Feedback on individuals' peers' performance, for instance – an effective influence in household energy behavior – may be less effective in stimulating energy behavior change in business settings than team-based comparisons. Conversely, information, feedback and marketing by businesses also strongly influence the behavior of individual consumers.

Another key question is how business managers and employees make decisions about energy when those decisions require tradeoffs. In a business context, such tradeoffs involve not only personal preferences and priorities (as at the household level), but also tradeoffs among organizational goals and priorities, among those of different organizational subunits, and between established routines and new options that may require organizational change.

A third key question concerns the roles of emulation and imitation in rates of energy consumption, and how they can be influenced. In a business context, how do emulation and imitation of other firms influence businesses–or in some cases, fail to influence them–to adopt greater use of energy efficiency and renewable energy? Recent trends among leading businesses provide hopeful indications, as companies seek to emulate and imitate successful strategies in branding their initiatives in energy efficiency and renewable energy adoption; but questions remain as to how universal such emulation may become, and whether it extends only to some types of firms.

In short, we argue that there are both a need and important overlooked opportunities for research on energy behavior in businesses. Such inquiry also offers promise beyond its applications to environmental and energy behavior per se, suggesting broader research questions about how individual behavioral patterns function in organizational settings and about how to engage organizations as behavioral agents.

### 1.1. Why study energy behavior in businesses?

For at least three reasons, business organizations offer an important setting in which to examine behavioral aspects of energy use.

First, businesses are major direct consumers of energy. Individual and household energy use accounts for only 22 percent of total U.S. energy use; by comparison, business use of energy accounts for at least 50 percent (commercial 19 percent, industrial 31 percent), and these figures include only direct energy use, not the many other business decisions that also affect energy use by households and other sectors ([116]:38). Businesses are therefore major contributors to global warming and other problems associated with heavy energy use, and they also are potential market drivers as well as role models for others who might consider adopting energy efficiency (EE) or renewable energy (RE) technologies. Large business customers can create early demand to support emerging markets for both EE and RE technologies: examples include purchases of hybrid-electric or natural-gas-powered vehicles by large fleet operators, EE and RE investments by large corporations (Walmart, for instance [119]), and procurement standards for EE and RE in corporate and government buildings and vehicles. Beyond simply saving energy, many energy-related choices have multiple benefits, such as daylighting of buildings and shading of windows as workplace enhancements.

Business decisions also shape the energy behavior of their employees, such as the organization's own energy sources and consumption; access to transit vs. automobile dependence, and allowing or discouraging telecommuting; and the energy characteristics of their products, by considering or failing to consider the embedded energy demands of the products as well as production processes in their supply chains [105]. Energy behavior in business organizations also involves barriers that are not present in household settings, such as lack of a personal stake in the consequences of workplace energy use; lack of effective feedback on the impact of their actions on the organization's outcomes; and the fact that workplace equipment is often used by multiple employees, which may diminish the degree to which employees feel they can individually affect energy consumption [19,33].

Research would be valuable, therefore, on differences in energy use patterns among businesses, both within and across sectors. Why are some firms leaders and others laggards in EE and RE choices even within the same sectors, and what factors influence these differences? What differences are evident between large corporations and small or medium-sized enterprises, and between market-based businesses and their public-sector counterparts such as universities, school systems, hospitals, municipalities, and government agencies such as the Defense Department?

Second, businesses provide—or fail to provide—the products and services that would allow individual consumers choices to increase their use of EE and/or RE [71]. Consumer choices are constrained by the options that businesses make available and market to them. Consider, for instance, the adoption of EE or RE in both residential and commercial buildings, a category that collectively accounts for some 40 percent of energy use. Multiple business sectors and their energy behaviors are involved: technology vendors and retailers, architects, developers, builders and subcontractors, realtors, banks and assessors, insurers, government building code agencies and inspectors, as well as the behavior of building owners and tenants themselves [52,76] . Reducing the energy demand from buildings requires consideration of the incentives, barriers and opportunities influencing behavior patterns in each of these sectors, and of how these might be changed to promote EE and RE. Reducing fossil-fuel energy demand by consumers will not be possible without concurrently assuring that the relevant businesses provide the energy technologies and related services – reliable installation and maintenance, and valuation of energy savings and renewable