

Constraints on Sustainable Energy Consumption: Market System and Public Policy Challenges and Opportunities

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The purpose of this essay is to identify factors that constrain customers' ability to engage in sustainable energy consumption, conceived of as a consumption practice that reduces the moral hazards associated with fossil fuel overconsumption. The authors outline some marketing policy and consumer research issues related to the market system and identify four constraints to sustainable energy consumption: policies and regulation, product accessibility and availability, pricing, and customer knowledge. This topic is important because of changes in the macro context of energy consumption—namely, the growing recognition of a fundamentally resource-constrained environment and the increased salience of various global commons effects to customers. The authors conclude with directions for further research.

Keywords: electricity, energy, market systems, sustainability, tragedy of the commons

The first purpose of this essay is to identify factors that constrain customers' ability to engage in sustainable energy consumption, conceived of as a consumption practice that reduces the moral hazards associated with fossil fuel overconsumption (Farley and Daly 2006; IPCC 2007; Shultz and Holbrook 1999). The second purpose is to outline some marketing policy and consumer research issues related to the market system and the constraints we identify. This topic is important because of changes in the macro context of energy consumption—namely, the growing recognition of a fundamentally resource-constrained environment and the increased salience of various global commons effects to customers (Farley and Daly 2006; Shultz and Holbrook 1999). Approaching this from a marketing systems perspective is useful because the challenges and opportunities associated with sustainable energy consumption accrue to various levels of and relationships within the market system (Layton 2007). A systems perspective moves the argument about sustainable energy consumption away from intractable moral debates and toward potential solutions within market structures, incentives, and regulations.

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Energy Consumption

Energy consumption has moved to center stage of disquiet about the global environment and economy because of concerns about the effect of current systems of energy production, the galloping growth of energy consumption (IPCC 2007), and the growing global competitive demand for energy resources. Macro policies, such as the Kyoto Protocol; regional policies, such as the European Union cap-and-trade carbon trading system; national and regional policies, such as state-level renewable energy portfolio standards (U.S. Department of Energy [U.S. DOE] 2008); and the introduction of various energy use and management options targeted at end customers by power companies, are indicative of the market system-wide recognition of the twinned global concerns of environment and energy.

Normatively speaking, market systems are supposed to respond to consumer demand to produce a desirable standard of living. However, a market system also generates externalities that challenge its existence and threaten desired standards of living. Frequently, there is also a lag between what the system produces and evolving consumer demand. These externalities and this lag, which are currently inducing a commons effect in the global ecosystem (IPCC 2007; Shultz and Holbrook 1999), may also produce consumption constraints (Layton 2007; Wüstenhagen, Wolsink, and Bürer 2007). Regarding energy consumption, a host of system-induced constraints may be identified depending on a disciplinary perspective, but we focus on four aspects of the market system that constrain sustainable energy consumption: policies and regulation, product accessibility and availability, pricing, and customer knowledge. We begin by placing this discussion in the context of sustainability.

Sustainability

Sustainability embodies a paradigm in which people and other social actors try to meet current needs, with an awareness of the necessary actions to take to preserve the ability of future generations to meet their needs (United Nations General Assembly 1987). The paradigm evaluates sustainability in business contexts as a “three-legged stool” (Barbier 1987). To ensure continuity, organizations must address the up- and downstream economic, social, and environmental repercussions of their activities to reduce waste and increase their value. Moreover, the health of each leg of this stool affects future sustainability. Because energy production and use are intricately tied to natural resources, environmental policy, and new product development, to understand constraints that affect the market system for energy consumption, we must examine energy use from the systemic level. We assess a few aspects of the systemic level here.

Corporate interest in sustainability has been influenced by several concerns. Corporations ranging from athletic shoe, furniture, and carpet manufacturers to big-box retailers are increasingly thinking about their carbon budgets, the cradle-to-cradle life cycles of their products, their energy and pollution costs, their natural resource use, and consumer concerns with these issues (McDonough and Braungart 2002; Wal-Mart 2007). The economic benefits of sustainability thinking to corporate cost controls and reductions in environmental liabilities have driven significant corporate sustainability initiatives (Epstein 2008; Global Reporting Initiative 2009; Green and Capell 2008). Finally, nationwide surveys find that both consumers and executives report that environmental issues (including climate change) are one of their greatest personal concerns for the next five years—a substantial increase even since 2006 (Bonini, Hintz, and Mendoca 2008).

Perhaps surprisingly, consumers have begun to express their concerns for and interest in sustainable behavior in energy consumption. For example, evidence of an emerging sustainability segment may be found in a recent IBM report on utility customers. A global research project identified four major utility customer segments among both end users and small businesses, differentiated in terms of financial resources and proactive propensity. A particularly notable group, representing a surprising 20%–55% of the total, depending on the country surveyed, is what IBM calls “energy stalwarts.” The individuals in this group have more disposable income to draw on than others and are interested in proactively managing their energy consumption by participating in differential metering systems that enable them, for example, to schedule their highest use at times of off-peak demand in return for favorable pricing. This group is also interested in managing its energy generation platform, supporting local power generation, and exploring the ability to sell back excess power to the secondary power grid. (However, the latter option is fraught with regulatory hurdles.) This new segmentation clearly identifies a group that is concerned with sustainability and offers exciting new segmentation possibilities to the conservative and not typically market-oriented electric utility industry (Valocchi et al. 2007). Thus, it is apparent that some consumers and firms are interested in thinking more about how their

actions affect the wider world (i.e., the commons); as such, they are becoming more involved in how they use energy and the sources of their energy.

Historical Context for Marketing Interest in Energy Consumption

Marketing scholars have taken an interest in energy before. In the early 1970s, several studies examined the connection between energy constraints and consumption (Fisk 1973; Levitt 1974; Ross 1980; Shapiro 1978). This research shows a glimmer of the three-legged stool approach that is common in sustainability work (Barbier 1987). Fisk (1973, p. 24) proposes a theory of responsible consumption, which “refers to rational and efficient use of resources with respect to the global human population.” This theory incorporates economic, social, and environmental factors (the three-legged stool) and challenges marketing managers to employ these criteria in running their organizations and as a guide to future marketing policy. Shapiro (1978, p. 3) examines the role of marketing in a society with “increased ecological concern and natural resource constraints.” He points to serious issues with increased product generation with no regard to the environmental impact of production and proposes (p. 7) that consumers should attempt to “do more with less” through resource sharing and that producers should institute “full-cost pricing,” which would incorporate hidden externalities (social cost and ecological services) into product prices. Shapiro goes on to suggest (p. 12) that changes should be made in managerial practice insofar as “practitioners find themselves in a world that values conservation, voluntary simplicity in lifestyles, and ecologically responsible corporate marketing.”

However, the general point of view in the 1970s was that consumers and firms needed to ride through a business cycle and that resource scarcity associated with the energy crisis would subside and life would continue as before (Hanna, Kizilbash, and Smart 1975; Ross 1980). Temporary resource reduction was considered a viable approach to resolving resource scarcity—an idea that current events discredit. Thus, suggestions for organizational coping included reducing the number of product offerings, downgrading products (i.e., no-frills automobiles), creating higher-efficiency products (i.e., air conditioners), and creating products in which consumers participated in production (i.e., do-it-yourself products; Levitt 1974; Shipchandler 1976). In general, organizations were encouraged to gain control of their channels and to engage in vertical integration (Hanna, Kizilbash, and Smart 1975). “Demarketing” was touted as another way to manage the energy crisis. Analogous to the contemporary idea of downshifting (Ghazi and Jones 1997), demarketing meant that firms should encourage consumers to purchase less on a temporary or permanent basis (Hanna, Kizilbash, and Smart 1975). Other proposals for consumers to survive the energy crisis—consistent with Jimmy Carter’s infamous “malaise” speech of July 15, 1979—included careful planning and limiting the purchase of nonessential food items, doing without, and reducing consumption in general (Shipchandler 1976). With the push for short-term solutions, ideas for paradigm shifts such as Shapiro’s (1978) faded.

It is striking to read through the research of the 1970s and recognize how today's business worldview is different. In the mid-1970s, the rising cost of energy and the environmental impact of human development were concerns relegated to the "marketing environment" netherworld in the dominant managerial frameworks. More recently, the links between the global market economy and environmental degradation have become clearer (IPCC 2007). Moreover, the seriousness of environmental degradation, the clear depletion of and constraints to natural resources, and the urgency for behavior change are now undeniable. Indeed, there are now daily reminders (even from the Weather Channel) that we live in a "risk society" (Beck 1992). In addition, perhaps because U.S. government policies have been inadequate to combat global environmental crises and make a smooth transition to a lower carbon energy future (e.g., Freidman 2008), firms and consumers are becoming more engaged with energy consumption issues. We now turn our attention to the four consumption constraints on increasingly sustainable energy consumption that we evoked previously.

Consumption Constraints: Policy/ Regulation, Availability/Access, Pricing, and Knowledge

Policy and Regulation

Policy and regulation constraints come in four main forms. The first is a lack of oversight in the sale of alternative power, the second is related to the interplay between regional and national policy, the third is national energy policy, and the fourth is environmental policy issues.

Lack of Oversight in Sales of Alternative Power

A lack of trust in utility companies (Lindeman 1999), coupled with a lack of third-party certification and labeling of branded alternatives, points to a constraint in which consumers lack tools to evaluate the alternative energy products that are increasingly offered (Roe et al. 2001; Wüstenhagen and Bilharz 2006). The sale of power remains problematic in the marketplace because energy is regulated as a commodity; for example, in general, consumers are rewarded with lower prices for volume purchases. Thus, electrical energy has not been sold as a product differentiated in terms of attributes that could address consumer concerns about global warming, the environment, or the well-being of producing communities. Until distinctions can be made in the marketplace for energy in terms of the resources used to generate the electricity (e.g., coal, natural gas, wind biomass, solar), clearer consumer understanding and improved management of energy consumption will remain problematic. Likewise, until there is differentiation in the marketplace for energy in terms of the energy source's carbon footprint, the social costs of creating the energy, and use periodicity (peak versus off-peak), clearer consumer understanding and improved management of energy consumption will also remain problematic. Changed state-level regulatory policies that would decouple utility profits from volume sold and allow utility companies

greater opportunities to offer differentiated products and services at different price points could induce more consumers to begin thinking of energy as a differentiated product.

Regional Versus National Policy

The second group of policy issues is related to the structure and infrastructure of the market. This includes discontinuity between local and national policies. As an example, most state regulations require power companies to purchase renewable energy from new independent providers (Database of State Incentives for Renewables & Efficiency 2007), but regulation also stipulates that the new entrants into the electrical grid are charged with upgrading and securing the grid to handle the additional power load (Kelly 2003). Because the power grid is managed regionally and monopolistically, regional power regulators may impose stiff maintenance and upgrade penalties on would-be renewable power generators, thus inhibiting new generation (Energy Information Administration 2009). As such, the burden of maintenance and upgrades that would benefit the whole system is forced onto specific producers.

Wind power producers are especially disadvantaged in this regard because wind generation is inherently intermittent and thus is considered by regional power operators to stress the grid. Intermittency can be mitigated by linking multiple wind plants or by exploiting multiple wind sources simultaneously, a prospect that is increased as generation capacity is added. Unfortunately, regional policy only allows the effects of each wind plant (intermittency) to be assessed individually rather than aggregated across the regional grid (Naughton 2008), thus underwriting discrimination of new wind plants and inhibiting the addition of new capacity. Furthermore, new transmission lines typically cannot be permitted until unmet demand can be documented, which means that lines dedicated to new alternative energy sources are difficult to justify as long as demand can be met from conventional sources (Walje 2008). Until national or regional policies that favor renewable energy generation are put into place to regulate construction and upkeep of transmission lines, real innovations in putting renewable energy into the grid will be difficult.

National Issues: Government Oversight of Power Infrastructure

Much of the problem with energy infrastructure comes from a lack of government oversight of national energy infrastructure despite the existence of a national regulatory authority, the Federal Energy Regulatory Commission. This means that regional market forces, or the lack thereof, have been the primary shapers of energy grid improvements rather than a national long-term plan with enlightened regulation. With energy market deregulation, increasing volatility in energy prices, and the long payback to major infrastructure investments, regional and local power companies and authorities have eschewed adequate investments in the electrical grid to contend with peak load and new renewable generation sources. At the same time, to deal with the ever-increasing demand for energy, power companies have given up a significant percentage of the power reserves that used to be an important part of the system (UIa 2008). In turn,

this has provoked rolling blackouts (i.e., supply shortfalls that have become a common summertime feature of the energy marketplace). As a result, consumers settle for a less reliable, less satisfying energy system, despite so-called mandatory reliability standards enshrined in the Energy Policy Act of 2005 and other legislation (Lenard 2002).

Not making policy decisions on a national level leads to market system inability to provide increasingly necessary services to firms and customers. The demand for energy services is both growing and becoming more differentiated from a consumer standpoint, while the delivery system remains outdated, commodity oriented, and increasingly unreliable. Because of state renewable portfolio standards, wind power generation is growing at 40% per year, but there is a ten-year backlog on wind turbine orders (Naughton 2008). Strong nationwide policy regarding renewable energy entering the grid could increase the opportunities for wind plants and other renewable sources to contribute to the market and open the field to more competition. This would help meet state renewable portfolio energy targets for production and consumers' evolving demands.

Environmental Policy Issues

The federal government has also failed to upgrade vehicle corporate average fuel economy and power plant emissions standards aggressively and to act on carbon capture and storage, carbon ownership, carbon emissions regulation, and storage liability issues (we set aside discussion of the federal government's failure to enact nuclear waste storage legislation). Power plant emissions standards and carbon capture and storage regulations affect, for example, the introduction of new cleaner-coal technologies, which are especially salient given the preponderant role of coal in the United States' electric energy portfolio. Coal provides more than half the electricity in the United States. However, some states have begun to legislate these issues, and a few states are working to determine who owns the spaces under the ground and, thus, who should get paid for the use of those spaces for carbon dioxide capture. Related to this is deciding who owns the captured carbon—that is, who takes ultimate responsibility for the captured carbon, and who has the rights to the carbon if it becomes more valuable in the future? For example, Wyoming has determined that surface landowners also own the space under their land, and therefore this falls under a different legal and regulatory regime than mineral rights. Meanwhile, Texas has decided that the state will take ultimate liability for the carbon itself. Although capture and storage is a technologically viable way to reduce greenhouse gas emissions in some regions and to increase the sustainability of energy consumption at the point of production, until these complex policy issues are dealt with, companies or venture-capital investors may not seriously consider investing in building carbon capture capabilities onto existing or future power plants (Coddington 2007; Siever 2008).

Availability and Access

Constrained availability and access to renewable energy and energy-efficient products contribute to the underdeveloped market for differentiated energy. This is evident in the

way energy companies respond to consumer demand and the so-far tepid efforts put into stabilizing the grid (Pacific Northwest National Laboratory 2007), in various principal-agent issues, and in the limited product choices available to consumers.

Energy companies may be at a loss for how to respond to demand for more renewable power because deficiencies in the transmission infrastructure make renewable power unavailable in most parts of the country (Stade 2008; Ula 2008; Wald 2008; Wyoming Infrastructure Authority 2008). This is partially because the so-called national power grid is balkanized with power lines divided among at least 500 owners (Wald 2008). New and critical long-distance transmission lines that could link the different regional power grids in use in the United States have not been built for 30 years (Energy Information Administration 2009; Ula 2008), and the nine- to ten-year lag between the time new power lines are planned and when they actually go online makes this constraint even more serious. Furthermore, many transmission lines and the connections between them are too small for the amount of new renewable power that companies would like to upload to them (Wald 2008). In summary, the U.S. DOE estimates that it needs approximately 2100 miles of new line to achieve the target of serving 20% of the country's energy users with renewables. This would cost approximately \$60 billion over a ten-year period (Wald 2008). Taking into account the permitting and construction lag time, it is difficult to foresee how energy supply, above all renewable energy supplies because of the need for new technologies to stabilize the effects of intermittent wind generation on the grid, can meet projected demand. This situation reduces consumer access to green power and stunts market development for more sustainable energy consumption.

Despite the obstacles, approximately 600 utilities in 34 states offer green power options, whereby consumers may purchase "wind-generated" power, such as Austin Energy's GreenChoice or Rocky Mountain Power's BlueSky Renewable Energy (Bird, Wüstenhagen, and Aabakken 2002; Swezey and Bird 2000). Consumers can also purchase "green" power using renewable energy certificates. However, in the United States, what consumers typically buy are "offsets." That is, the power company actually may be selling wind-generated power as part of its overall power generation, or it may be reselling wind power from some other generator or paying another company to buy wind elsewhere to offset its own fossil fuel power. It is not evident that energy companies must actually change their overall environmental behaviors. There are no guarantees that the environmental footprint of what comes out of the electrical outlet in the consumer's home or business is truly green. Often, consumers are not actually purchasing green power but rather are supporting renewable energy development. Thus, power companies offer more sustainable power options, but consumers may not be taking advantage of them in part because of the lack of transparency about what happens to their investments.

When the involvement of intermediaries in the purchase of energy technologies limits consumers' ultimate role in decision making, this is labeled the "principal-agent problem." It is widespread in the U.S. energy market. Because

of principal-agent issues, restrictions on access to more sustainable energy consumption are built into building construction and management systems. For example, investment costs for more sustainable heating, ventilation, and air-conditioning systems that can dramatically reduce operating costs are typically higher than what rule-of-thumb norms dictate, and as a result, more sustainable systems on a life-cycle cost basis are underinstalled. In other words, users might prefer buildings and appliances that are cheaper and more efficient to use, but because of higher up-front costs, these efficiencies are usually not purchased. Building designers can be second-guessed if investment costs exceed norm (Brown 2001, p. 1199).

A related example of principal-agent problems can be found in the landlord-tenant relationship in building leases. If tenants pay energy bills, landlords have no incentives to invest in more energy-efficient equipment. Conversely, if landlords pay for energy costs, tenants have no incentive to use energy efficiently. Because 90% of households in multifamily buildings are renters—and there are tens of thousands of multifamily buildings in the United States—the disincentive to more sustainable energy consumption is particularly problematic (Brown 2001, p. 1200).

Incomplete markets for energy efficiency are another serious obstacle to access to more sustainable energy consumption across a range of product/service categories. In part, this is because the energy efficiency of a product or service is typically bundled with a host of other services provided (e.g., style, appearance, varied functionalities), and this attribute is not often broken out for consumers. Moreover, it is rarely the case that higher energy efficiencies are treated as separate product/service options and priced differentially. Thus, in general, consumers are unable to purchase a given brand/model of car, computer, or major appliance that is priced differentially on the basis of energy inputs, greenhouse gas emissions in production, energy efficiency in operation, energy costs in disposal, and so on (Brown 2001, p. 1202).

In some markets, access to more energy-efficient products is increasing. The U.S. Environmental Protection Agency [EPA]/DOE Energy Star program has engaged more than 2000 manufacturers and 1000 retailers to use Energy Star labels to differentiate more than 40,000 individual product models in terms of energy performance. Evidence of the existence of demand for energy efficiency can be observed in the growth of units purchased from slightly more than 500,000 in 2000 to more than 2.5 billion in 2007 (U.S. EPA 2008a). However, because participants are not mandated to achieve particular energy-saving targets and because there is some question about the conditions under which appliances are tested for compliance with Energy Star criteria, customers still face major barriers to purchasing higher-efficiency products.

Pricing

Pricing constrains consumer choices in energy use and products in several ways, including the cost of generating more sustainable power at a residential level, the cost of purchasing green power and how that is explained to consumers, and the difficult choices consumers make in pur-

chasing new products. The cost to consumers of generating their own power through local windmills or solar panels remains prohibitive, and in most cases, it pushes these options into the luxury product category. A residential wind turbine can cost \$6,000–\$22,000 (American Wind Energy Association 2008), and a one-kilowatt solar panel system can cost \$8,000–\$12,000 (SolarBuzz 2008). Some tax credits and assistance are available to cover part of the purchase cost, but the price of these residential systems is a consumption constraint for users who might otherwise engage in a small-scale energy production. Zoning and covenant restrictions might well add to the potential costs of installing alternative local energy generation equipment.

Justifying the pricing of green energy is difficult because consumers can detect no difference in electricity at the point of consumption with regard to origin, source, or level of pollution generated (Wüstenhagen and Bilharz 2006). It is remarkable that several market segments report that they are willing to pay a small amount more for decreased air emissions, and certain subsegments of these people are willing to pay even larger amounts for decreased air emissions coupled with increased reliance on renewable energy sources (Roe et al. 2001; Valocchi et al. 2007; Wüstenhagen and Bilharz 2006). Although 50%–95% of Americans report that they are willing to pay more for power derived from renewable sources, market simulations or field studies demonstrate that a far smaller percentage (10%–20%) are actually willing to do so. Actual marketing efforts in 2001 achieved even lower penetration levels. Among the 40 million U.S. households with access to green power through either regulated or restructured markets, approximately 350,000 households (~1%) chose to buy green power (Wiser et al. 2001). Nevertheless, from 2003 through 2007, renewable energy consumption's average annual growth rate was 3%, compared with just 1% for total energy consumption. Biofuels and wind were largely responsible for the increase, with five-year average annual growth rates of 25% and 29%, respectively (Energy Information Administration 2008). Perhaps this modest growth reflects consumer desires to pay the "full cost" for energy consumption—costs that would take into account environmental and social costs (Shapiro 1978)—but this is not known.

Variable pricing along with the use of smart meters is another way that consumers encounter pricing issues. Because of the strain on the grid and predictions for increased energy use in the future, power companies are piloting programs that are designed to entice consumers to use less electricity during peak times (Baltimore Gas and Electric Company 2009). Some of these programs give customers smart meters, which monitor their electricity use in real time, and give them reduced price rates for energy used at off-peak times. For example, the cost of electricity may jump from approximately \$.04 per kilowatt/hour during off peak times to \$.24 per kilowatt/hour during regular peak times and \$1.50 per kilowatt/hour during "critical peak" times. In one program, users were sent an e-mail 30 minutes before critical peak times that alerted them about a looming price increase and invited them to reduce use (Smith 2008); in another program, utilities provided real-time cash incentives to customers to allow them to reduce their residential

energy use; and in a third program, automated controls installed in appliances made real-time adjustments to decrease demand on the grid and consumer costs. In each of these programs, customers responded positively to the price signals by reducing energy use. Furthermore, if generalized, the dramatic drop in demand from automated appliance controls would entail significantly decreased demand for costly new infrastructure development (Pacific Northwest National Laboratory 2007). Smart-meter programs offer customers value not only through the variable pricing, which provides customers the opportunity for large savings on their energy bills (Smith 2008), but also through promises of decreased commons crises, such as power outages and brownouts (Baltimore Gas and Electric Company 2009; Pacific Northwest National Laboratory 2007).

Investment in smart-metering technology is a public policy issue that needs resolution—in many cases, in state public service commission venues. Many public service commissions require that utilities provide them with a comprehensive description of the costs and benefits they can expect to attribute to a smart-metering investment. There are several prototypes and business cases that provide examples of how smart metering can be accomplished. How readily or quickly the public service commission will act and how to characterize and quantify the societal benefits of smart metering are unknown.

In the realm of product choice, a lack of understanding about the energy that products use may hinder consumers from making more sustainable long-term energy consumption choices. Consumers tend to focus on the cost of investing in a new product rather than the cost of using that product throughout its life cycle (Brown 2001). The Energy Star label is one information program that has increased consumer awareness of the benefit of paying an initially higher cost for a more efficient product. In 2007, Energy Star products prevented an additional 40 million tons of greenhouse gas emissions and saved consumers more than \$16 billion on electricity bills (U.S. EPA 2007). However, inexpensive technologies, such as automated controls on appliances that allow consumers or the appliances themselves to adjust power use to changing grid conditions, have yet to be broadly extended (Pacific Northwest National Laboratory 2007; U.S. EPA 2007).

Knowledge

Marketing systems tend to focus on the exchange of goods and services for the benefit of at least the two exchanging parties. Information is one element of marketing systems that is typically asymmetrical and managed through some intermediary structure (i.e., advertising agencies, spokespeople, or governments; Layton 2007). In the case of energy use, the product or service being purchased is understood by the value of what it does (e.g., power a refrigerator, turn lights on), not what it is (e.g., electrons channeled into a grid). Thus, from a consumer perspective, information regarding energy is confusing from the beginning because energy sources and management are not well understood. Downstream efforts to provide consumers information on the energy costs of products have met with confusion (Green and Capell 2008, p. 54). For consumers

who want to know details about the origins of their energy, a broader understanding of the product they are purchasing may be necessary. To understand the extremely complex electrical system, various stages of the creation of electricity must be considered, from the raw materials to the electrons in the grid, as well as the infrastructure and stakeholders involved in creating, distributing, and monitoring energy use after electricity is in the grid. We noted these aspects of the energy market previously; we limit our discussion here to home and office energy use.

Consumers' lack of understanding of issues related to energy does not stop at green power offerings from local power companies. In addition to the upstream systems issues we identified, more subtle issues that most consumers are not aware of are also relevant, such as the amount of energy that different products use or energy lost through "leaks" when appliances and electronics are in standby mode or ostensibly turned off. For example, few consumers realize that new electronic gear, such as gaming stations and plasma televisions, are "energy hogs," adding many dollars a year to household energy bills (Choice 2008). Furthermore, leaking electricity accounts for approximately 5% of total household energy use, and the leakage is growing as homes add appliances (Meier, Huber, and Rosen 1998).

Because electricity bills are aggregated across uses and paid on a monthly basis, it is difficult for consumers to evaluate and revise their decision making with regard to the cost effects of their households of appliance use or leaking electricity. On a monthly basis, the marginal costs are minimal; however, if the principles of mental accounting could be applied to reframing energy bills so that consumers could see the detailed costs of appliance use and leakage as a yearly dollar amount, perceptions and behavior might change (Gourville 1998; Heath and Soil 1996).

Smart circuitry, which could stop energy leaks, could be installed in many consumer products. If all appliances and electronics in the United States were replaced or retrofitted with units designed to leak no more than one watt, aggregate energy loss due to leakage could fall by as much as 70%, leading to a savings of more than \$2 billion a year (Meier, Huber, and Rosen 1998). Because consumers lack knowledge and because there is little regulatory oversight over leakage issues, appliance producers are not induced to incur the relatively minimal cost of introducing smart circuitry into their products.

The U.S. EPA/DOE Energy Star program is an example of a public policy-driven approach to increase awareness and knowledge of energy consumption and to spur more sustainable energy consumption. A recent study shows that substantial portions of U.S. households recognize, understand, and are influenced by the Energy Star label. The proportion of households that exhibit a high understanding of the program is significant (65%). More than one-third of households the EPA surveyed had purchased an Energy Star-labeled appliance in the 12 months before the survey, and of these households, three-fourths cited the Energy Star label as playing a role in their purchase decisions. The study showed that publicity may increase consumer recognition and understanding. It also showed the influence of the label on purchase decisions (U.S. EPA 2008b).

Thus far, we have identified factors that constrain customers' ability to engage in sustainable energy consumption. We outlined issues related to policy, access, pricing, and consumer knowledge. We conclude with some thoughts on the relationship between the energy market and commons issues, and we discuss promising areas for further research.

The Market System and the Energy Commons

The market system constraints to more sustainable energy consumption we briefly identified—regulation, access, pricing, and knowledge—and others we are unable to discuss because of space constraints contribute to a larger market systems challenge. This is an example of the tragedy of the global ecological commons (Shultz and Holbrook 1999). The commons dilemma occurs whenever there is a conflict over a finite resource between individual interests and the common good, resulting in a dramatic drawdown in that resource and eventually a collapse of the resource and the socioeconomic system it supported. A consequence of current energy consumption patterns is the dramatic and accelerating increase in atmospheric carbon dioxide and the resultant global warming and climate change, which has negative consequences for the whole biosphere (IPCC 2007). Regulation is the most commonly proposed solution to commons dilemmas such as this, but often regulation is ineffective or comes too late, as in the case of the collapse of the Grand Banks fisheries (Greenpeace International 2005). The Grand Banks, off the coast of Newfoundland, were some of the richest fishing grounds in the world and fed people from Europe to South America for more than 500 years. Overfishing for many years, made more severe by technology introduced in the 1950s, is credited for a disastrous decline in fish populations and species. The fisheries were closed in 1992, and 30,000 people lost their jobs. Fish populations have been slow to recover, and many experts question whether they will ever recover (Rose 2008). The three-legged stool approach to sustainability highlights the interdependence of ecological, economic, and societal impacts of choices and actions for good or ill. This approach helps foster an ecosystems perspective in which market system elements are embedded. It provides an approach to solving commons dilemmas that could complement the moral approach others have proposed (Shultz and Holbrook 1999) to resolving the ecological commons problem of global warming, pollution, and energy shortfalls. We have suggested that improvements in the energy market system are necessary, if insufficient, solutions to the commons issues provoked by unsustainable energy consumption.

Researchable Issues

A way to approach research opportunities for marketing scholars of sustainable energy consumption is to embed these in a model of market system stakeholders in the global energy commons. Such a framework can begin with the household and firm levels; move on to community, society, and the broader ecosystem levels; and touch on knowl-

edge, access, pricing, and policy issues as appropriate at each level.

Household and Firm Levels

Stimulating demand for energy-efficient appliances among households and firms and stimulating consumer interest in household and firm energy management so that customers demand such technologies from appliance makers and utilities are steps toward more sustainable energy consumption. With that in mind, it may be useful to experiment with marketing stimuli that position energy savings and management in terms of cultural values, such as freedom, frugality, independence, stewardship, and ingenuity, or in terms of orientations toward technology in general (Kozinets 2008; Pillar 1993). Recent revisionist thinking in diffusion theory invites testing network versus opinion leadership effects in the domain of sustainable energy consumption, in which effective innovations in energy retailing have proved elusive (Watts and Dodds 2007). In a complementary vein, research on innovative products indicates that any behavior change required of consumers may be perceived as a "loss," and thus the offsetting "gains" the product offers must be relatively large. Research might address how large such gains in performance or savings must be to offset losses and what kind of gains they must be (Gourville 2006).

Full-cost energy pricing has been suggested as a way to address the ecological and social costs of energy production and use. How can the cost of ecological services be inserted into the price of utilities and appliances, and how might people respond to full-cost pricing? It might be that the higher price of energy alternatives (wind credits or energy-efficient appliances) creates a negative perception in the minds of consumers, leading them to reject full-cost pricing. How might research on framing effects, task compatibility, loss aversion, schema incongruity, and the like, be harnessed to understand better the poor penetration of sustainable electricity choices and the ways to increase their attractiveness (Chatterjee and Heath 1996; Dhar and Sherman 1996; Levin, Schneider, and Gaeth 1998; Meyers-Levy and Tybout 1989)? For example, in a recent study, framing environmental costs either as an earmarked tax or as an offset differentially affected the preferences of Democrats and Republicans (Hardisty, Johnson, and Weber 2009). In the future, it would be worthwhile to vary the price stimuli and demographic sample criteria—for example, using IBM's segments or residence in an energy-producing or consuming region.

Because there is so much missing information in the choices consumers make regarding energy consumption, this area holds great potential for understanding dynamic processes and how consumers react to missing information (Venkatraman, Maheswaran, and Peracchio 2006). For example, if offered smart meters or other energy management tools, would consumers tend to overestimate their ability to reduce their energy consumption and then become disappointed to learn subsequently that individual effects are limited because of inefficiencies that are built into the current market system?

IBM is among the first to identify different segments of consumers in terms of resource endowments, knowledge,

and interest in energy management cross-nationally. Can such segmentation schemes be enriched by investigating intranational differences in cultural, economic, and social capital? Moreover, how can the proactive energy management orientations of segments such as IBM's energy stalwarts be more broadly diffused to other segments? For example, can segments underendowed with energy choices be effectively targeted, or should companies tout successes targeted to stalwarts, such as the smart housing program in Boulder, Colo., to induce broader interest (Snider 2008)?

A host of research projects may be helpful in developing new theoretical perspectives on energy consumption. A list might include research on alternative energy consumption communities; the ideological foundations of cheap energy policy and consumption behavior; the individual and family identity issues associated with various energy segments, such as those identified in the IBM study (Epp and Price 2008; Valocchi et al. 2007); possible links among energy savings, sacrifice, and frugality (Miller 1998); and the relationship between lay theories of the relationship between energy and consumption (Arnould and Thompson 2005).

Experience in other countries suggests that people must trust and accept political leadership if meaningful new energy policies are to be accepted (Wüstenhagen, Wolsink, and Bürer 2007, p. 2689). Researchers might explore how consumers feel about policy makers and how policy leadership should be framed to make it more acceptable to various skeptical constituents. In other words, does it make a difference if the Nuclear Regulatory Commission, Consumer Product Safety Commission, or the Federal Trade Commission weighs in on energy choices, given how consumers may react to words such as "nuclear," "safety," or "federal" in the titles of these organizations? Furthermore, research might explore how the past behavior of energy companies, especially as mediated through various memory effects (e.g., Three Mile Island), affects skeptical constituents' willingness to consider new energy policy or to demand or adopt new technologies.

Community and Society Levels

Creating a smarter, more stable, and more sustainable energy grid should be a priority for the country. A key challenge to more sustainable energy consumption is to bridge gaps between national and local policies that mirror gaps in interests between different stakeholder communities. Research might explore what kinds of marketing energy companies could engage in to create a more favorable environment for energy grid investments. Another general question is what information about the nature of demand should be communicated to whom to influence policy that would reinforce and stabilize the energy grid.

How national or state objectives can be translated into locally acceptable policies could also be examined. For example, a problematic issue is siting decisions for new decentralized production and transmission facilities that are more sustainable (e.g., carbon sequestered coal burning plants) or based on renewable energy sources (e.g., solar collector fields, wind plants). How can these be effectively addressed in the face of local NIMBY responses (e.g., Mal-

oney 2008; Vietor 2008)? These generation and transmission projects that could reduce some market systems constraints and increase consumer choices are bedeviled by jurisdictional conflicts between governmental agencies and commons dilemmas. Viewed from another angle, we might ask how local and regional initiatives to develop energy alternatives can be translated into supportive federal policies. Likewise, we might question how federal policy frameworks that favor local project initiatives rather than overruling them can be fostered.

A better understanding of stakeholders' conflicts may be derived from studies of escalation of commitment that examine suboptimal decision making under hardened attitudes (Pillar 1993; Ross and Staw 1993; Sivanathan et al. 2008; Whyte 1993; Whyte and Fassina 2007; Wong, Kwong, and Ng 2008). Approaches to solutions may be explored through research that explicates the structure of attitudes toward technology and nature (Kozinets 2008; Pillar 1993); through willingness-to-accept frameworks; and from research that examines the conditions for customer community attraction, engagement, and coproduction of value (Bagozzi and Dholakia 2006; Maruyama, Nishikido, and Iida 2007; Mathwick, Wiertz, and De Ruyter 2008; McAlexander, Schouten, and Koenig 2002).

Another related challenge is how entrenched institutional pressures against optimal renewable energy technologies may be overcome. Lessons from case studies of successful natural resource management initiatives (Arnould 1990), grassroots investment in community wind power in Japan and Denmark (Kolbert 2008; Maruyama, Nishikido, and Iida 2007), and other siting controversies (Dorshimer 1996) could be transferred to other countries and across other renewable energy technologies. From such studies, pertinent research issues include determining the mix of leadership and network effects that drives successful energy innovations (Watts and Dodds 2007). Another direction for investigation concerns the kinds, amounts, and distribution of stakeholder benefits that can reduce opposition to infrastructure development (Groothuis, Groothuis, and Whitehead 2008).

Accountability is another major issue for changes and lack of changes along the energy-value chain. A significant problem is how market intermediaries (e.g., architects, installers) influence the market acceptance of sustainable energy technologies and management practices. A researchable question related to this principal-agent issue is examining what kinds of policies could induce appliance manufacturers to begin installing smart electric monitoring and consumption technologies in the appliances they produce. A major value chain issue raised here is how the carbon footprint of an energy product should be measured. What is a fair way to apportion fiduciary and other legal responsibility? Who in the value chain should take responsibility for what percentage of the emissions? Who should be punished for violations? Who should oversee production and transmission projects? Against whom should punitive sanctions for intentional or unintentional violations of standards be addressed (Green and Capell 2008)?

Ecosystems Energy Commons Levels

The ecosystem level is the widest vantage point used to consider the energy commons. Researchable issues at this level yield questions about the environmental effects of producing, managing, and consuming energy. A key issue at the ecosystems level is how to apply techniques used to recover common property resources, such as fisheries, national parks, or marine reserves, to solve the energy commons problem at the local and national level. In general, joint commitments among many stakeholders are needed to create long-term solutions to the commons dilemma. How can such joint commitments to confront the energy commons dilemma be produced (Arnould 1990; Scammon and Mason 2007)? Research suggests that values can be mobilized to induce joint commitments to investments in energy infrastructure (Dorshimer 1996; Groothuis, Groothuis, and Whitehead 2008; Kolbert 2008). However, research could also investigate the values that are most effectively mobilized to induce joint commitments.

Conclusion

The ultimate question is whether applied policy research can help lead to resolution of energy commons dilemmas and improvements in policy, access, pricing, and informed customer choice within an evolving market system. Prior research on improving natural resource management has identified several keys to successful innovation. Among these are some measure of transparency in systems governance; a modicum of support for policies that induce behavioral changes; delivery of short-, medium-, and long-term benefits to key stakeholders; sustained investment over a five- and ten-year time line; improvements in market structure and efficiency; and engagement of boundary-spanning actors with legitimacy among different stakeholder groups (Arnould 1990; Jacobsson and Lauber 2006). Linking research to this type of framework for action may indicate a way forward that could provide relief from sustainable energy consumption constraints.

To the extent that there is consumer debate about electrical energy consumption, it has tended to fall into predictable positions embedded in contradictory normative frameworks. On one side is a framework espousing or endorsing a resource-intensive way of life based on ideas, such as rugged individualism (a don't-tread-on-me worldview); personal (wasteful) choice as an inalienable American right; an equation of material affluence with spiritual grace; an aversion to elitism and a laissez-faire aversion to authority; an assumption that American nature is a boundless resource; and a conception of American nature as the wellspring of the American national character. On the other side is a social-reforming normative framework espousing an anticonsumerist ethic based on ideas such as Protestant asceticism, the necessity of moral restraints on market choices, the view that community interests should trump individual self-interest, the notion that collective sacrifice leads to national solidarity, an equation of material affluence with moral transgression and "affluenza," and a conception of American nature as a fragile system that requires careful stewardship (Arnould, Price, and Tierney 1998;

DeGraaf et al. 2001; Luedicke, Giesler, and Thompson 2009; Scott 2006). Our systems perspective moves the argument away from such intractable moral and ethical debates and toward market structures, incentives, and regulations. Although moral concerns play a role in sustainable energy policy, they are not enough in and of themselves to drive solutions.

References

- American Wind Energy Association (2008), *The Economics of Small Wind*. Washington, DC: American Wind Energy Association, (accessed January 30, 2009), [available at http://www.awea.org/smallwind/toolbox2/TOOLS/factsheet_economics.pdf].
- Arnould, Eric J. (1990), "Changing the Terms of Rural Development: Collaborative Research in Cultural Ecology in the Sahel," *Human Organization*, 49 (4), 339–54.
- , Linda L. Price, and Patrick Tierney (1998), "Communicative Staging of the Wilderness Servicescape," *Service Industries Journal*, 18 (3), 90–115.
- and Craig J. Thompson (2005), "Consumer Culture Theory: Twenty Years of Research," *Journal of Consumer Research*, 31 (March), 868–83.
- Bagozzi, Richard P. and Utpal M. Dholakia (2006), "Antecedents and Purchase Consequences of Customer Participation in Small Group Brand Communities," *International Journal of Research in Marketing*, 23 (July), 45–61.
- Baltimore Gas and Electric Company (2009), "Smart Energy Pricing," (accessed August 27, 2008), [available at <http://www.bge.com/portal/site/bge/menuitem.c0e9417dc04afc23b4933312376166a0/>].
- Barbier, Edward B. (1987), "The Concept of Sustainable Economic Development," *Environmental Conservation*, 14 (Summer), 101–110.
- Beck, Ulrich (1992), *Risk Society: Towards a New Modernity*. London: Sage Publications.
- Bird, Lori, Rolf Wüstenhagen, and J. Aabakken (2002), "A Review of International Green Power Markets: Recent Experience, Trends, and Market Drivers," *Renewable & Sustainable Energy Reviews*, 6 (December), 513–37.
- Bonini, Sheila M.J., Greg Hintz, and Lenny T. Mendoca (2008), "Addressing Consumer Concerns About Climate Change," *The McKinsey Quarterly*, (accessed August 12, 2008), [available at <http://www.mckinseyquarterly.com/PDFDownload.aspx?L2=21&L3=37&ar=2115>].
- Brown, Marilyn A. (2001), "Market Failures and Barriers as a Basis for Clean Energy Policies," *Energy Policy*, 29 (November), 1197–1207.
- Chatterjee, Subimal and Timothy B. Heath (1996), "Conflict and Loss Aversion in Multiattribute Choice: The Effects of Trade-Off Size and Reference Dependence on Decision Difficulty," *Organizational Behavior and Human Decision Processes*, 67 (June), 144–55.
- Choice (2008), "Computers' Energy Costs," (May), (accessed September 5, 2008), [available at <http://www.choice.com.au/viewArticle.aspx?id=106346&catId=100245&tid=100008&p=4&title=Computers%27+energy+costs>].
- Coddington, Kipp (2007), "What Are the Risks? Risk, Liability and Carbon Trading," paper presented at Finding the Balance:

- Governors Conference on Energy and Climate, Jackson, WY (October 8–10, 2007).
- Database of State Incentives for Renewables & Efficiency (2007), "Rules, Regulations, and Policies," (accessed September 27, 2008), [available at <http://www.dsireusa.org/glossary/glossary.cfm?EE=0&RE=1&CurrentPageID=8#net>].
- De Graaf, John, David Wann, Thomas H. Naylor, and Redefining Progress (2001), *Affluenza: The All Consuming Epidemic*. San Francisco: Berrett-Koehler.
- Dhar, Ravi and Stephen J. Sherman (1996), "The Effect of Common and Unique Features in Consumer Choice," *Journal of Consumer Research*, 23 (December), 193–203.
- Dorshimer, Karl R. (1996), "Siting Major Projects & the NIMBY Phenomenon: The Decker Energy Project in Charlotte, Michigan," *Economic Development Review*, 14 (Winter), 60–63.
- Energy Information Administration (2008), *Renewable Energy Consumption and Electricity Preliminary 2007 Statistics*. Washington, DC: Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, U.S. Department of Energy.
- (2009), "Electric Power Industry Overview: Electric Power Transactions & the Interconnected Networks," (accessed September 23, 2008), [available at <http://www.eia.doe.gov/cneaf/electricity/page/prim2/toc2.html#netw>].
- Epp, Amber M. and Linda L. Price (2008), "Family Identity: A Framework of Identity Interplay in Consumption Practices," *Journal of Consumer Research*, 35 (June), 50–70.
- Epstein, Marc J. (2008), *Making Sustainability Work: Best Practices in Managing and Measuring Corporate, Social, Environmental and Economic Impacts*. San Francisco: Berrett-Koehler.
- Farley, Joshua and Herman Daly (2006), "Natural Capital: The Limiting Factor: A Reply to Aronson, Blignaut, Milton and Clewell," *Ecological Engineering*, 28 (November), 6–10.
- Fisk, George (1973), "Criteria for a Theory of Responsible Consumption," *Journal of Marketing*, 37 (April), 24–31.
- Friedman Thomas L. (2008), "Imbalances of Power," *The New York Times*, (May 21), (accessed January 30, 2009) [available at <http://www.nytimes.com/2008/05/21/opinion/21friedman.html>].
- Ghazi Polly and Judy Jones (1997), *Downshifting: The Guide to Happier, Simpler Living*. Philadelphia: Coronet Books.
- Global Reporting Initiative (2009), "About GRI," (accessed October 30, 2008), [available at <http://www.globalreporting.org/AboutGRI/>].
- Gourville, John T. (1998), "Pennies-a-Day: The Effect of Temporal Reframing on Transaction Evaluation," *Journal of Consumer Research*, 24 (March), 395–408.
- (2006), "Eager Sellers & Stony Buyers," *Harvard Business Review*, 84 (June), 98–106.
- Green, Heather and Kerry Capell (2008), "Carbon Confusion," *BusinessWeek*, (March 17), 52–55.
- Greenpeace International (2005), "No Cod? Blame the Seals!" (February 24), (accessed April 5, 2008), [available at <http://www.greenpeace.org/international/news/no-cod-blame-the-seals>].
- Groothuis, Peter A., Jana D. Groothuis, and John C. Whitehead (2008), "Green vs. Green: Measuring the Compensation Required to Site Electrical Generation Windmills in a Viewshed," *Energy Policy*, 36 (April), 1545–50.
- Hanna, Nessim, A.H. Kizilbash, and Albert Smart (1975), "Marketing Strategy Under Conditions of Economic Scarcity," *Journal of Marketing*, 39 (January), 63–80.
- Hardisty, David, Eric J. Johnson, and Elke U. Weber (2009), "A Dirty Word or a Dirty World? Attribute Framing, Political Affiliation, and Query Theory," working paper, Department of Psychology, Columbia University.
- Heath, Chip and Jack B. Soil (1996), "Mental Budgeting and Consumer Decisions," *Journal of Consumer Research*, 23 (June), 40–52.
- IPCC (2007), *Climate Change 2007: Synthesis Report*, Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Core Writing Team, R.K. Pachauri and A. Reisinger, eds. Geneva, Switzerland: Intergovernmental Panel on Climate Change.
- Jacobsson, Staffan and Volkmar Lauber (2006), "The Politics and Policy of Energy System Transformation: Explaining the German Diffusion of Renewable Energy Technology," *Energy Policy*, 34 (February), 256–76.
- Kelly, Kevin (2003), "Transmission Expansion Cost Recovery: FERC's Generator Interconnection Rule and Other Proposed Policies," Federal Energy Regulatory Commission, Rocky Mountain Subregional Transmission Planning, (accessed September 23, 2008), [available at <http://psc.state.wy.us/htdocs/subregional/kelly.ppt>].
- Kolbert, Elizabeth (2008), "The Island in the Wind: A Danish Community's Victory over Carbon Emissions," *The New Yorker*, (July 7), 68–77.
- Kozinets, Robert V. (2008), "Technology/Ideology: How Ideological Fields Influence Consumers' Technology Narratives," *Journal of Consumer Research*, 34 (April), 865–81.
- Layton, Roger A. (2007), "Marketing Systems: A Core Macromarketing Concept," *Journal of Macromarketing*, 27 (September), 227–42.
- Lenard, Thomas M. (2002), "FERC's Flawed Assessment of the Benefits and Costs of Regional Transmission Organizations," *Electricity Journal*, 15 (May), 74–78.
- Levin, Irwin P., Sandra L. Schneider, and Gary J. Gaeth (1998), "All Frames Are Not Created Equal: A Typology and Critical Analysis of Framing Effects," *Organizational Behavior and Human Decision Processes*, 76 (2), 149–88.
- Levitt, Theodore (1974) "Marketing Tactics in a Time of Shortage," *Harvard Business Review*, 52 (November–December), 6–7.
- Lindeman, E. (1999), "Public and Media Acceptance of Nuclear Materials Transport," *Nuclear Energy*, 38 (October), 297–302.
- Luedicke, Marius, Markus Giesler, and Craig J. Thompson (2009), "Defying the Jeremiad Against Consumerism: How American Exceptionalism Provides a Moral Justification for Resource-Intensive Consumption Practices," working paper, Innsbruck University, Switzerland.
- Maloney, Peter (2008), "Solar Projects Draw New Opposition," *The New York Times*, (September 24), (accessed October 8, 2008), [available at <http://www.nytimes.com/2008/09/24/business/businessspecial2/24shrike.html?ref=businessspecial2>].
- Maruyama, Yasushi, Makoto Nishikido, and Tetsunari Iida (2007), "The Rise of Community Wind Power in Japan: Enhanced Acceptance Through Social Innovation," *Energy Policy*, 35 (May), 2761–69.

- Mathwick, Charla, Caroline Wiertz, and Ko de Ruyter (2008), "Social Capital Production in a Virtual P3 Community," *Journal of Consumer Research*, 34 (April), 832–49.
- McAlexander, James H., John W. Schouten, and Harold F. Koenig (2002), "Building Brand Community," *Journal of Marketing*, 66 (January), 38–54.
- McDonough, William and Michael Braungart (2002), *Cradle-to-Cradle: Rethinking the Way We Make Things*. New York: North Point Press.
- Meier, Alan, Wolfgang Huber, and Karen Rosen (1998), "Reducing Leaking Electricity to 1 Watt," paper presented at the ACEEE Summer Study on Energy Efficiency in Buildings in Pacific Grove, CA (August 28). (Also released as Lawrence Berkeley National Laboratory Report No. 42108, (accessed March 23, 2008), [available at <http://eetd.lbl.gov/EA/Reports/42108/>].)
- Meyers-Levy, Joan and Alice M. Tybout (1989), "Schema Congruity as a Basis for Product Evaluation," *Journal of Consumer Research*, 16 (June), 39–54.
- Miller, Daniel (1998), *A Theory of Shopping*. Ithaca, NY: Cornell University Press.
- Naughton, Jonathan (2008), personal communication with professor and director of BP Wind Laboratory, University of Wyoming (March 2008).
- Pacific Northwest National Laboratory (2007), *GridWise Demonstration Project Fast Facts*. Richmond, WA: Pacific Northwest National Laboratory.
- Pillar, Charles (1993), *The Fail-Safe Society: Community Defiance and the End of American Technological Optimism*. Berkeley: University of California Press.
- Roe, Brian, Mario F. Teisl, Alan Levy, and Matthew Russell (2001), "U.S. Consumers' Willingness to Pay for Green Electricity," *Energy Policy*, 29 (September), 917–25.
- Rose, Alex (2008), *Who Killed the Grand Banks? The Untold Story Behind the Decimation of One of the World's Greatest Natural Resources*. New York: John Wiley & Sons.
- Ross, Jerry and Barry M. Staw (1993), "Organizational Escalation and Exit: Lessons from the Shoreham Nuclear Power Plant," *Academy of Management Journal*, 36 (August), 701–732.
- Ross, Marc (1980) "Efficient Use of Energy Revisited," *Physics Today*, 33 (February), 24–31.
- Scammon, Debra L. and Marlys J. Mason (2007), "Marketing and Society: What Has Marketing Thought Contributed and What Does the Future Hold?" in *Explorations of Marketing in Society*, Gregory T. Gundlach, Lauren G. Block, and William L. Wilkie, eds. Mason, OH: Thomson/South-Western, 89–103.
- Scott, Linda M. (2006), *Fresh Lipstick: Redressing Fashion and Feminism*. New York: Palgrave Macmillan.
- Shapiro, Stanley J. (1978), "Marketing in a Conserver Society," *Business Horizons*, 21 (April), 3–13.
- Shipchandler, Zoher E. (1976), "Inflation and Life Styles: The Marketing Impact," *Business Horizons*, 19 (February), 90–96.
- Shultz, Clifford J., II, and Morris B. Holbrook (1999), "Marketing and the Tragedy of the Commons: A Synthesis, Commentary, and Analysis for Action," *Journal of Public Policy & Marketing*, 18 (Fall), 218–29.
- Siever, David (2008), "Where Is the Money? Capital Markets for Energy Development," paper presented at Finding the Balance: Governors Conference on Energy and Climate, Jackson, WY (October 8–10).
- Sivanathan, Niro, Daniel C. Molden, Adam D. Galinsky, and Gillian Ku (2008), "The Promise and Peril of Self-Affirmation in De-escalation of Commitment," *Organizational Behavior & Human Decision Processes*, 107 (September), 1–14.
- Smith, Rebecca (2008), "A Little Knowledge ...," *The Wall Street Journal*, (June 30), R4.
- Snider, Laura (2008), "Xcel Debuts First 'Smart' Home in Boulder: Chancellor's House Unveils New Technology," *Daily Camera*, (August 27), (accessed October 9, 2008), [available at <http://www.dailycamera.com/news/2008/aug/27/xcel-debuts-first-smart-home-boulder/>].
- SolarBuzz (2008), *Marketbuzz 2008*, (accessed January 30, 2009), [available at <http://www.solarbuzz.com/Marketbuzz2008-intro.htm>].
- Stade, Robert (2008), "TransWest Express and Gateway South," paper presented at Roping the Wind Conference, Douglas, WY (January 7–8), (accessed April 28, 2008), [available at <http://www.ropingthewind.net/>].
- Swezey, Blair and Lori Bird (2000), *Green Power Marketing in the United States: A Status Report*, 5th ed. Golden, CO: National Renewable Energy Laboratory.
- Ula, A.H.M. Sadrul (2008), personal communication with Professor of Electrical Energy, University of Wyoming (March).
- United Nations General Assembly (1987), "Report of the World Commission on Environment and Development," No. A/RES/42/187, (accessed March 29, 2008), [available at <http://www.un.org/documents/ga/res/42/ares42-187.htm>].
- U.S. DOE (2008), "States with Renewable Portfolio Standards," (accessed September 10, 2008), [available at http://apps1.eere.energy.gov/states/maps/renewable_portfolio_states.cfm#chart].
- U.S. EPA (2008a), *ENERGY STAR Overview of 2007 Achievements*. Washington, DC: U.S. Environmental Protection Agency, Office of Air and Radiation, Climate Protection Partnerships Division, (accessed August 27, 2008), [available at <https://www.energystar.gov/ia/partners/publications/pubdocs/2007%20CPPD%204pg.pdf>].
- (2008b), *National Awareness of ENERGY STAR for 2007: Analysis of 2007 CEE Household Survey*. Washington, DC: U.S. Environmental Protection Agency, Office of Air and Radiation, Climate Protection Partnerships Division.
- Valocchi, Michael, Allan Schurr, John Juliano, and Ekow Nelson (2007), *Plugging in the Consumer*. Somers, NY: IBM Global Business Services/IBM Institute for Business Value.
- Venkatraman, Gita, Durairaj Maheswaran, and Laura A. Peracchio (2006), "Mapping the Frontiers: Theoretical Advances in Consumer Research on Memory, Affect, and Persuasion," *Journal of Consumer Research*, 33 (June), 139–49.
- Vietor, Richard (2008), *Cape Wind*. Boston: Harvard Business School Publishing.
- Wald, Matthew (2008), "Wind Energy Bumps into Power Grid's Limits," *The New York Times*, (August 27), (accessed August 27, 2008), [available at http://www.nytimes.com/2008/08/27/business/27grid.html?_r=1&hp&oref=slogin].
- Walje, Richard (2008), remarks to panel on energy and sustainability by the president of Rocky Mountain Power, University of Wyoming Energy Summit (September 4).
- Wal-Mart (2007), "Sustainability Progress Report," (accessed September 10, 2008), [available at <http://walmartfacts.com/>].

- reports/2006/sustainability/documents/SustainabilityProgressToDate2007-2008.pdf].
- Watts, Duncan J. and Peter Sheridan Dodds (2007), "Influentials, Networks, and Public Opinion Formation," *Journal of Consumer Research*, 34 (December), 441–58.
- Whyte, Glen (1993), "Escalating Commitment in Individual and Group Decision Making: A Prospect Theory Approach," *Organizational Behavior and Human Decision Processes*, 54 (April), 430–56.
- and Neil E. Fassina (2007), "Escalating Commitment in Group Decision Making," in *Academy of Management Proceedings*, George T. Solomon, ed. Briarcliff Manor, NY: Academy of Management, 1–6.
- Wiser, Ryan, Mark Bolinger, Edward Holt, and Blair Swezey (2001), *Forecasting the Growth of Green Power Markets in the United States*. Golden, CO: National Renewable Energy Laboratory.
- Wong, Kin Fai Ellick, Jessica Yuk Yee Kwong, and Carmen K. Ng (2008), "When Thinking Rationally Increases Biases: The Role of Rational Thinking Style in Escalation of Commitment," *Applied Psychology: An International Review*, 57 (2), 246–71.
- Wüstenhagen, Rolf and Michael Bilharz (2006), "Green Energy Market Development in Germany: Effective Public Policy and Emerging Customer Demand," *Energy Policy*, 34 (September), 1681–96.
- , Maarten Wolsink, and Mary Jean Burer (2007), "Social Acceptance of Renewable Energy Innovation: An Introduction to the Concept," *Energy Policy*, 35 (May), 2683–91.
- Wyoming Infrastructure Authority (2008), "Pioneering New Transmission Expansion in the West," paper presented at Roping the Wind Conference, Douglas, WY (January 7–8), (accessed April 28, 2008), [available at <http://www.ropingthewind.net/>].