

ENERGY IN DAILY ACTIVITIES: MUDDLING TOWARD CONSERVATION*

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ABSTRACT

A person's pattern of energy use is influenced by a variety of psychological factors; the individual's attitude is only one of these. By examining the energy use patterns of individuals who are known to support energy conservation these non-attitudinal factors should be especially evident. This article discusses the results of a questionnaire dealing with the degree to which a variety of energy-conserving activities have been adopted. The sample for this study consisted of people whose concern for energy conservation was known to be relatively high, and their responses indicate that many conservation opportunities are being ignored. The most popular activities are relatively convenient and effortless, and involve familiar kinds of behavior and materials. The least popular activities are the most inconvenient and unfamiliar, as well as those where the connection between the behavior and any potential energy savings is not directly apparent. The findings of this study suggest the importance of increasing familiarity with newly-developed technologies and materials, and the value of providing imagery about the connections between specific activities and their energy-conservation potential.

There is often a substantial discrepancy between actual human behavior and the behavior that would be desirable from a public policy perspective. This is certainly the case in many areas of environmental concern. In academic circles, the assumption is often made that attitudes are at the root of the problem and hence that attitude change must be the means of solution. The issue of changing behavior to improve energy conservation, for example, has been extensively

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studied from an attitude perspective (see reference [1] for an excellent review). However, despite the intuitive appeal of this approach, the results of a number of studies have neither been consistent nor particularly promising [2-4].

It may be appropriate to look at this issue from a somewhat different perspective. Clearly, the assumption underlying the attitude change research is that once people's attitudes are appropriate, their behavior will become appropriate as well. One way to examine the linkage between attitudes and behaviors is to explore the behavior of the individuals whose attitudes are not at issue, in other words, to focus our attention on people who are already committed to the cause of energy conservation [1]. Certainly, if such individuals fail to show the desired pattern of behavior, then factors other than attitudes must be involved. Further, examination of the areas of adoption and non-adoption of energy conservation patterns might provide insight into the nature of these additional factors. A full understanding of such factors is necessary if they are to be useful in convincing others to conserve.

It should be noted, however, that the perspective taken here does not discount the role of attitudes. Attitudinal receptivity may be a necessary although insufficient condition in encouraging conservation behavior. The failure to consider behavior as determined by an interplay of numerous independent factors is unfortunate given the results of at least two recent studies. Seligman, Kriss, Darley, Fazio, Becker and Pryor suggest that pro-conservation attitudes may enhance the effects of providing feedback on energy conservation [5]. Also, Macey and Brown have demonstrated the interplay of past experience, attitudes, and subjective norms on the adoption of repetitive household energy conservation behavior [6].

METHODS

To explore the possibility that factors other than attitudes are instrumental in producing energy conserving behavior, a questionnaire was developed which sampled a wide range of behaviors that had direct or indirect energy conservation implications. In keeping with the focus on individuals who were already committed to the importance of conserving energy, participants were sought among groups with a known concern in this area. The volunteers were drawn in roughly equal numbers from two different local groups that had an interest in energy issues. One group had been formed to work on energy issues in a small city, and the other group was a long-standing conservation organization that sponsored outdoor activities and was concerned with a broad range of environmental issues.

The questionnaire consisted of two groups of items involving energy-conserving behaviors and activities. The larger group of 102 items reflected frequently repeated behaviors, such as walking to work or changing furnace filters as needed. The participants were asked to indicate how often they did

each of the activities. They had the choice of circling a number on a five point scale ranging from "never" to "virtually always," or marking an "x" to indicate that they have no opportunity to do the activity described, didn't know, or felt the item didn't apply to them. They also had the option of marking a "p" if they used to do an activity in the past, but don't do so any longer.

A second, smaller group of thirty-three items included one-time activities, primarily relating to home improvements and large purchases. For these, participants were asked to indicate whether they had already done the listed activity, have planned to do it, or were unlikely to be doing it. There was also the option of marking an "x" which had the same meaning as on the first half of the questionnaire.

Participants were asked to complete the questionnaire booklets on their own time and to mail them back in the pre-paid envelopes. Of the thirty volunteers, all but three returned the questionnaire. Names and demographic information were not requested; it is known, however, that the original sample included individuals ranging in age from their twenties to sixties. A nearly even number of males and females, as well as home owners and renters were represented.

RESULTS AND DISCUSSION

Table 1 lists the results of the first portion of the questionnaire, covering the frequently-repeated energy-saving behaviors. The table reflects the mean frequency for each item for those participants who rated it. Several of the items had relatively large non-response rates indicating that participants did not own particular appliances (for example, air conditioners and self-cleaning ovens). The entries in the table have been separated into three activity domains: House Maintenance, Daily Habits, and Lifestyle. Within each of these domains, items are listed by subcategories, and separated into high, moderate, and low-adoption levels, as reflected by the average ratings.

A review of the pattern of activities common among the participants reveals that numerous activities have been widely adopted, but that even with this sample of relatively committed energy-conservers, many activities are not being pursued. In comparing those activities showing high adoption levels with those reflecting low adoption levels, one theme is particularly apparent: *activities which involve little personal inconvenience or effort* are adopted more often than activities involving a significant increase in time and effort. In general, more energy efficient appliances are purchased, but manual refrigerators, although efficient, are not common. The popular pattern of limiting purchases by buying goods that are durable and have lasting value may in the long run require less time and effort than would alternative patterns. The participants are careful to cook and store food efficiently, but they do not grow their own food, or switch to less familiar cooking methods, such as using a pressure cooker. Transportation is made more efficient by combining errands and trying to

Table 1. Frequencies of Energy Conservation Practices^a

Category	High Frequency	Moderate Frequency	Low Frequency
HOME MAINTENANCE			
Heating-Cooling	4.9 use fireplace damper ^b	3.9 use fans, even if have A/C ^b	1.7 use woodstove for heat ^b
	4.8 separate A/C thermostat from hot spots ^b	3.8 use extra blankets, turn heat down	
	4.6 keep windows near thermostat closed	3.7 use hot equipment only in summer cool hours	
	4.5 keep A/C set at 78 ^b	3.6 use setback thermostat	
	4.4 use less energy for heating/cooling	3.1 don't heat all rooms	
	4.4 avoid dressing light in winter	3.0 avoid peak electrical use	
Maintenance-Cleaning	4.7 turn off unused appliances	3.8 keep radiators clean	2.9 clean refrigerator coils
	4.3 fix leaky faucets	3.7 ventilate moist areas in summer	2.5 use push mower, not power
	4.2 change furnace filters regularly	3.6 bypass TV instant-on	1.9 use carpet sweeper, not vacuum
		3.6 don't use oven self-cleaning option	
Windows	4.5 use storm windows	3.3 keep bulbs and fixtures clean	
	4.1 close drapes at night to keep heat in	3.3 use hand tools etc., not electric	
Lights	4.5 turn lights off when leave room	3.2 turn off water heater when away	
	4.4 use lights only when needed	3.7 use blinds to control solar loss/gain	
		3.9 use lower of 3-way bulb settings	2.3 use fluorescents
DAILY HABITS			
Bathing	4.4 don't bathe, take short shower	3.9 use low-watt bulbs	
		3.8 work near windows, don't use lights	
Clothes-Washing	4.9 keep lint screen clean	3.4 share room (lights etc.) with others	
	4.7 don't use hot water rinse		2.8 take shorter showers
	4.5 wash only full loads	3.7 don't continually run water while shaving	2.5 use on/off valve showerhead
	4.4 dry in consecutive loads	3.1 wash hands in cool water	2.6 separate light/heavy in dryer
Dish-Washing	4.2 wash in warm water		2.5 use clothesline, not dryer
	4.3 do by hand, not dishwasher	3.8 do full loads in dishwasher ^b	2.7 turn off dry cycle on washer ^b
	4.0 do in dishpan, no running water		

Food	4.1 cover liquids in refrigerator 4.0 boil with pots covered 4.0 thaw foods before cooking	3.9 cool foods before refrigerating 3.8 preheat oven only for baking 3.7 select quickly from refrigerator 3.6 eat low on the food chain 3.5 bake several dishes at once 3.4 pack refrigerator loosely 3.3 use leftover heat for warming bread 3.3 cook one-pot meals 3.2 buy locally-grown food 3.1 buy bulk food 3.1 use leftover heat to finish baking	2.9 avoid opening oven 2.7 grow your own food 2.4 use pressure cooker/microwave
LIFESTYLE			
Transportation	4.3 combine car errands 4.1 minimize car miles	3.7 keep vehicles in tune 3.5 walk/bike, don't drive 3.4 avoid flying (drive instead) 3.2 use alternative transit 3.1 don't use A/C in car	1.8 carpool to work ^b
Purchases	4.3 buy durable, longlasting goods 4.4 buy durable goods even if more costly 4.1 limit frivolous purchases 4.1 buy pump sprays, not aerosols	3.5 buy locally made goods	2.3 make things for family/gifts
Recreation	4.5 avoid hi-energy recreation 4.0 read or play, don't watch TV	3.4 use black and white TV, not color 3.1 use library, don't buy books	2.3 vacation within 100 miles
Recycle-Reuse	4.6 pass on unwanted clothes 4.2 recycle newspapers 4.2 buy reusables, not disposables 4.1 reuse old clothes as rags 4.1 recycle cans	3.9 save containers for storage 3.9 reuse paper for notes 3.8 salvage or reuse things 3.6 save leftover materials 3.5 reuse aluminum foil 3.5 buy in refillable containers	2.9 borrow/rent, don't buy 2.8 use cloth towels, not paper

^a Frequencies were rated on a five-point scale where 1 = never or rarely do, 5 = virtually always do. Respondents were asked to rate only those items reflecting their own lifestyle. Non-response rates ranged from 0% to as high as 84% for a few items which were not owned or used by most of the respondents (for example, air conditioners and self-cleaning ovens).

^b Indicates items that 40% or more of the participants felt that they had no opportunity to do, weren't sure about, or felt were not applicable to them.

minimize miles driven, but people do not join car pools. Similarly, turning off lights and appliances when not in use is another popular activity which involves little effort or inconvenience. Thus, both the adoption of some activities and the failure to adopt others seems to follow a simple least-effort principle. Apparently, while people are generally willing to be more conscientious in their use of energy for everyday activities, they are reluctant to abandon conveniences just for the sake of saving energy.

Table 2 lists items from the second portion of the questionnaire, relating to whether the individual had taken specific one-time actions, where energy savings can result from a single change such as installing an efficient furnace. As the table shows, the majority of these items were relatively unpopular, with most falling on the low-adoption side of the scale. Reviewing these items suggests two additional themes as differentiating between those actions which are more- and less-frequently adopted.

The first of these themes involves technologies with relatively direct linkages to commonly known factors that affect energy use, such as windows or furnaces. The pattern of response suggests that the more popular activities involve *familiar materials or activities, rather than unfamiliar, newly-available approaches*. Storm windows are installed, but window quilts, awnings and heat-mirror coatings are not. Water heaters are adjusted and blanketed, but newer water-heating technologies are generally ignored.

A second theme which is evident in reviewing Table 2 is that activities which are related to *more obscure parts of the energy systems are less frequently adopted*. This may be because the participants do not have sufficient knowledge of the interconnections between parts of energy systems in a house, and therefore the connection between an action and any resultant energy savings is weaker. Landscaping for energy savings is not highly popular, and the connection to energy savings is not readily apparent. Similarly, the regulation of the furnace has a clear connection to energy use, and installing setback thermostats and new furnaces is popular. However, the reasons for insulating basement ducts, hot water pipes and electrical outlets, along with lowering blower thermostat settings, are not as clear. Adoption of these technologies is not widespread, and may require a more thorough knowledge of how energy is used in the home.

CONCLUSIONS

An overview of the findings of this survey, as illustrated in both tables, suggests that even people committed to energy conservation are selecting convenient and familiar methods of conserving, rather than embracing new technologies or new and different patterns of behavior. The kinds of energy conservation practices most frequently adopted are well established facets of a frugal and deliberate lifestyle — avoiding waste, buying carefully, maintaining what one owns, and disposing of things properly.

Table 2. Adoption Rates for One-Time Energy Saving Actions^a

Category	High Adoption	Low Adoption
Heating-Cooling	67% install setback thermostat 54% install efficient furnace ^b	46% lower blower thermostat ^b 19% use passive solar heating 38% insulate basement heat ducts ^b 32% insulate behind outlets 25% install woodstove ^b
Appliances	90% buy efficient appliances 76% separate refrigerator from heat 62% check refrigerator door seals	48% install efficient lightbulbs 32% raise refrigerator temperature 20% buy manual defrost refrigerator ^b
Water	84% lower hot water temperature 57% wrap water heater	45% use watersaving showerheads 41% install toilet dams 41% use shower flow restrictors 40% insulate hot water pipes ^b 0% install instant water heater 0% install solar water heater
Windows	87% caulk house 83% weatherstrip windows and doors 80% install storm windows ^b	10% use heat mirror coating 9% install windowquills 8% install awnings for summer ^b
Landscaping		40% plant trees for buffering ^b 35% use plants needing little water

^a Actions taken by at least 50 percent of the sample answering each question were categorized as high-frequency, and those with less than 50 percent were categorized as low frequency. Again, respondents answered specific items only when personally appropriate. As 54 percent of the sample consisted of renters, some of the items in the table do not include this portion of the sample.

^b Indicates items that 40 percent or more of the participants felt that they had no opportunity to do, weren't sure about, or felt were not applicable to them.

From the point of view of those who have long worked towards the education of an environmentally-enlightened and conserving public, these results might be surprising and disheartening. The sample is far from representative. It is made of environmentally-aware individuals drawn from a community which itself is among the more enlightened. Yet despite all of this, the conserving behavior of this group is strikingly cautious, unimaginative, and uninspired. One might infer that energy-conservation prospects on the part of the larger public are dark indeed.

There is, however, another way of looking at these findings. The failure to adopt conserving behaviors seems to stem from two distinctly different reasons. The energy conservation practices which are not adopted are ones which impose on the individual's comfort, convenience, or enjoyment. Modifying such frequently-repeated behaviors under non-emergency circumstances is admittedly a most difficult challenge. However, the barriers to adoption of the "one-time" energy saving actions seem to be based on a quite different set of issues. This is a particularly important distinction since, as Stern and Gardner have pointed out [3], it is in this domain that the major energy savings can be achieved. Not

only do these one-time actions make a far greater difference in the overall energy budget; they also do not require constant repetition to have their positive effect.

What, then, is the basis of the non-adoption of these one-time actions? First, it should be noted that this pattern of behavior — sticking to the familiar and avoiding areas where the reasons for actions are unclear — is, after all, a familiar one. These individuals are following a decision-making stance that has been called *muddling* [7, 8]. Their responses reflect a pattern of predictable cognitive biases that lead people to remain close to the domains for which they already have cognitive maps [9]. While such a pattern is a frustrating one for those who wish to share enlightenment and who are hopeful for a change, it is a reasonable and adaptive pattern nonetheless. It keeps people from straying too far from situations they know how to handle.

Not only is the pattern recognizable, it is also to some degree a hopeful one. Individuals may resist entering into patterns which they do not understand, where they do not have adequate cognitive maps. But, fortunately, new cognitive maps can be learned. It is important to realize that the problem here is not motivational. Rather there is an absence of imagery, of vivid and usable examples, of understanding how household energy systems work. The management of energy in the home is, in spite of all the attention given to it, still a relatively new knowledge area for many people. Information about energy can be transmitted in many ways: demonstration projects and examples in public facilities as well as through media, friends and neighbors.

The higher level of adoption of familiar and more obviously energy-related activities suggests that some correlation between energy conserving attitudes and related behaviors exists, but that the participants are moving slowly from what they have known in the past toward the new technologies of the future. The purpose of providing imagery about these other additional energy-conserving behaviors is not to lead people to *want* to adopt them, but to help them become comfortable with them, so that there is more potential for adoption by those who *do want* to save energy. Understanding and a sense of familiarity may not be sufficient for assuring adoption of these novel approaches, but they may well be necessary before they will be considered at all. This study supports a notion which until now has not been generally addressed: that the adoption of some of the potentially most conserving technologies depends upon their becoming more familiar. There must, in other words, be opportunities for individuals to develop a greatly enhanced level of comfort and confidence with these newly-developed procedures for saving energy.

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