Why Don't People Save More Energy? Lessons in Motivation from the 1999 Residential Characterization Study of Wisconsin Households

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ABSTRACT

Household members' attitudes and beliefs about energy use can be the source of unexpected behavior that ultimately affects energy consumption in residential housing. This paper analyzes data on the energy-related attitudes and beliefs from a study of 299 Wisconsin households living in owner-occupied single-family dwellings in 1998 and 1999. The results show that, even among households that appear to be heavily biased in favor of energy conservation, there remain substantial challenges to efforts to reduce energy consumption. These challenges include lack of knowledge, erroneous beliefs about the efficacy of various energy-saving actions, and attitudes toward home comfort. A sizable minority of respondents were found to value keeping their home comfortable over saving any amount of money on their energy bills, and appeared to be unaware that they can save on lighting, heating, and the like without sacrificing comfort. The sample households tended to wildly overestimate the degree of energy savings they could expect from various common energy-saving actions and measures they could take, thus setting themselves up for disappointment should they actually undertake such measures. Very few households reported that helping the environment is a motivator for action. Suggestions are offered for how to use these results to design more effective informational campaigns and incentive programs.

Introduction

As most program managers would no doubt agree, their jobs would be simpler if it were not for the fact that the programs and systems they design and the buildings that they target for retrofitting are used by actual people. People do not fit into neat boxes: they have attitudes and beliefs about energy use that can be the source of unexpected behavior that ultimately affects the energy consumption of systems and buildings.

What can program managers do about this? Knowledge is crucial in coming to grips with unpredictable behavior and decision-making that might appear irrational. A recent study of energy use among Wisconsin households conducted by the Energy Center of Wisconsin (ECW) delved into respondents' energy-related attitudes and their beliefs about home energy use. This paper will offer findings from this study that can help energy professionals better understand the motivations of their target populations.

Theoretical Background

Beliefs About Energy Use

Relatively few studies appear to have been conducted regarding consumers' beliefs about energy consumption and their knowledge of the comparative impacts on energy use of different appliances or services. Since those researchers who have conducted such studies (e.g. Kempton 1984; Kempton et al. 1985; Kempton, Boster & Hartley 1995; Erickson 1997; Gatersleben & Vlek 1998; Diamond & Moezzi 2000) tend each to have his or her own unique area of interest, there have also been few efforts to replicate findings. The Energy Center of Wisconsin's Residential Characterization study serves as an

opportunity to test some prior findings and gauge the degree to which consumers' understanding of the efficacy of various energy-saving actions may have changed in the last decade or more.

In a study of households in Minnesota and Sweden, Erickson (1997) found that respondents most frequently reported participating in relatively low-impact energy-saving behavior that required little or no investment to implement, such as monitoring the lights and television or operating dishwashers and clothes washers only when they are full. In an earlier study of Michigan households, Kempton, Harris et al. (1985) found that respondents grossly overestimated the savings they could expect to glean from a series of low-impact energy-saving behaviors.

Wisconsin shares with the locales mentioned above climate, cultural history, and in some cases a state border. Between this and the relative lack of media attention paid to energy issues in the U.S. between the time of Kempton's study and when the Residential Characterization study was undertaken, it seems likely that the households in Wisconsin should also erroneously believe that relatively low-impact energy-saving behaviors can save them considerable energy.

Reasons for Saving Energy

Erickson (1997) also asked her Minnesotan informants why they save energy; the reason they most often gave was to save money. In her meta-analysis of the survey research, however, Farhar (1996) claims that the public is beginning to make the connection between energy use and environmental problems. If this is so, then households should be offering helping the environment as a prime reason for saving energy—and program managers should put more emphasis on advertising the environmental benefits of energy-saving programs. It is quite possible that *both* Erikson and Farhar are right—many homeowners may take energy-saving actions because they want to save money *and* help the environment. This paper will explore the Wisconsin respondents' reasons for saving energy.

Methods

Survey Design and Sampling

In an effort to characterize residential energy consumption in Wisconsin, the Energy Center of Wisconsin (ECW), a non-profit organization specializing in research and demonstration projects on energy-efficiency, conducted a survey of 299 households in the state in 1998 and 1999. The respondents were randomly selected via a multi-stage stratified sampling design, and recruited by telephone. The study was designed to yield a sample of households that are representative of the state's population of families living in single-family, owner-occupied units in Wisconsin. Each household that participated in the study filled out a written questionnaire, underwent a home energy audit, and provided a release so that ECW could obtain utility billing records for the dwelling. In addition, a randomly selected subsample of 10 percent of households participated in a semi-structured interview.

Response Rates and Representativeness

Recruiting was conducted via a CATI system using typical RDD protocol. The task of recruiting households that were willing to participate and could make themselves available for an energy audit (which required a household member to be home for two to three hours during the day) proved challenging, despite ECW's offering generous incentives.[1] The recruitment script was completed with

[1] Incentives were either $50 or $100, depending on which subgroup the respondent fell into.

34 percent of households that were within the scope of the study, and about one out of every three of these households agreed to participate.

Case weights were developed for each observation to make the final study sample as representative as possible of the overall population. These weights were based on a combination of the 1990 Census and ECW's 1999 Appliance Sales Tracking (AST) study (ECW 2000), a large RDD telephone survey which collected demographic data on a sample of 2,214 Wisconsin households in single-family, owner-occupied units.

While the effective response rate is low (10.6 percent of qualified households actually participated in the study), when the weighted study sample was compared with the AST data, the study sample was found to be reasonably representative of the larger population of households living in single-family, owner-occupied homes in the state, with comparable basic demographic and individual characteristic data such as age, education, income, etc. A number of known biases exist in the data and should be kept in mind when generalizing the study's results. The weighted sample appears to somewhat over-represent households with more family members and householders who have lived at their current address for less than a year. It also appears to under-represent householders who say they are never at home during the day on weekdays. In addition, two questions from a four-item scale of conservation-orientation that was developed for this study were included in the AST study; a comparison of the results suggests that this sample may be considerably more favorably inclined toward energy conservation than the AST sample. However, because the data-gathering methods and the order in which the questions were asked differed—which can affect the distribution of results from attitudinal questions (Ajzen & Fishbein 1980)—this indicator of bias is not conclusive. Overall, the high response burden and low response rate points to a strong likelihood that the households in the study sample are biased both toward being interested in energy conservation and toward wanting a home energy audit. Data from the semi-structured interviews suggest that the households in this sample may be more inclined to be helpful and to express a willingness to contribute toward the public good than the average homeowner living in Wisconsin (Nevius 2001).

Results

Beliefs About Energy Use

The Residential Characterization study offers considerable data on which to base an analysis of beliefs about energy use. Among the questions on this topic were the open-ended item, "What is the most effective thing you could do to save energy in your home?" Table 1 shows the frequency distribution of categorized responses. The most frequently offered action was replacing windows or doors (22 percent). These save little energy compared to the items offered next most frequently, turning off unused lights and appliances (16 percent), turning down the thermostat (14 percent), and insulating (14 percent). While it is possible that those who did not offer insulation may have already insulated their houses, Pigg and Nevius (2000, 5) found that over one-quarter of the respondents in this sample who either believed that their house was adequately insulated or did not know how much insulation they had were actually living in houses that were significantly underinsulated[2]—almost twice as many as offered insulation in answer to this question. Another possibility is that the households that offered replacing doors or windows and turning off unused lights or appliances do so because their homes are already energy efficient, so they have few energy-saving options left. For turning off unused lights and appliances, this appears to be the case: households living in construction built after the introduction of more stringent state energy-efficiency codes in 1978 offered this at nearly twice the rate of households

[2] I.e., wall areas insulated to less than R-11 or ceiling areas insulated to less than R-19.

Table 1. "What is the Most Effective Thing You Could Do to Save Energy in Your Home?"

	Overall (n=272)	Low Income (n=40)	New Construction (n=42)
		(percent)	
Improve/replace windows or doors	22.2	26.6	11.3
Turn off lights/appliances	16.1	25.1	22.2
Turn down thermostat	14.4	4.3	27.7
Insulate	14.2	23.4	2.7
Install more efficient lighting	8.8	6.6	17.3
Replace appliances	8.2	4.2	0.0
Can't do anything more	6.3	5.2	6.4
Reduce infiltration	6.3	8.7	12.5
Don't know what to do	5.5	8.2	2.8
Make physical changes to water heater	4.3	0.0	1.9
Other	3.5	1.8	5.4
Switch fuel source of an appliance or use renewables	2.9	2.6	2.7
Abandon/reduce use of appliances	2.2	1.7	3.4
Change behavior to use less hot water	1.9	1.7	1.7

Since respondents were allowed to give more than one answer, totals may exceed 100 percent. Question was asked open-ended and was back-coded.

living in older construction (24 percent versus 13 percent, $p<0.05$). This is not the case, however, for replacing doors and windows: since their doors and windows are newer and presumably better, households living in dwellings built after the introduction of the code reported this at less than half the rate of the rest of the sample (11 percent versus 27 percent, $p<0.05$). A further analysis was conducted of the relationship between offering the replacement of doors and windows as the most effective thing the household can do to save energy and physical characteristics of the building for those dwellings built before the introduction of the codes. The analysis reveals that households that live in buildings with substantially underinsulated walls[3] are much more likely to cite replacing doors and windows as the most important thing they can do to save energy than are households living in houses with adequate wall insulation (44 percent versus 22 percent, respectively; $p<0.05$). A substantial proportion of households that need insulation, then, mistakenly attribute their discomfort and energy loss to drafts from leaky doors and windows.

Table 2 shows the reasons offered by respondents for why they had not taken the action that they felt would save them the most energy. (Again, the question was open-ended). The most frequent response was that the household could not afford the action (31 percent). The second most frequent response was that the household did not think that the energy savings would be enough to justify the

[3] I.e., wall areas that are insulated to less than R-11.

Table 2. "What Are the Reasons You Haven't Done This?"

	Overall (n=285)	Low Income (n=42)	New Construction (n=42)
		(percent)	
Can't afford/too costly	31.1	58.9	11.3
Don't think the energy savings will be enough	17.0	15.2	8.3
Don't know what to do	16.5	16.4	25.2
Putting it off (too busy)	12.7	2.1	25.1
Maxed out/already doing/done/done enough	6.8	6.4	8.0
Plan to move soon	6.4	2.4	0.0
Family issues (lack of control, keep peace, children)	6.3	12.6	8.5
Not important	5.1	1.6	1.6
Comfort issues	2.9	0.0	12.0
Other	2.0	0.0	3.5
Did not realize it needed doing	1.8	2.1	2.3
Equipment still works; won't replace until broken	1.7	0.0	0.0
Need to find help	0.6	2.1	0.0
Waiting to do as part of remodeling	0.3	0.0	0.0

Since respondents were allowed to give more than one response, totals may exceed 100 percent. Question was asked open-ended and then back-coded.

action (17 percent), followed by that they did not know what to do in order to take the action (17 percent), and that they were too busy or were putting it off (13 percent). These responses suggest that for many households, the cost of retrofitting continues to present a substantial barrier to increasing home energy efficiency, as does perceived lack of easily available information about payback times, qualified contractors, instructions for do-it-yourselfers, etc.

Households were also asked in the questionnaire "What percentage savings would you have to see on your energy bills before you would take the actions listed below?" These actions included keeping their home three degrees cooler, cutting their hot water use by 10 percent, and cutting their lighting use by 25 percent. Table 3 shows the distribution of responses. For each of the three energy-saving actions, a sizable percentage (between 30 and 42 percent) would not take the action regardless of how much cost savings they could accrue from it. The greatest percentage of dissenters (42 percent) say that no cost savings would be enough to get them to keep their home three degrees cooler, followed by cutting hot water use by 10 percent (38 percent would not), and lighting use by 25 percent (31 percent would not). Unfortunately, because of the way the question was worded, it is impossible to know if those who would not cut hot water or lighting use are aware that they could do so by installing more energy-efficient appliances, rather than by sacrificing the quantity or temperature of their hot water or the intensity of their light. These results suggest at the very least that there is a sizable minority in the

Table 3. Percentage Savings Required Before Taking Selected Energy-Saving Actions

"What percent savings would you have to see on your energy bills before you would take the actions listed below?"

	n	Percent Agreeing with Statement	Mean Percent Reduction Needed
Keep my home 3 degrees cooler:	266		
Mean cost reduction needed	171	58.0	15.0
No cost savings would be enough	95	42.0	n/a
Cut my hot water use by 10 percent;	263		
Mean cost reduction needed	178	61.7	13.6
No cost savings would be enough	85	38.3	n/a
Cut my lighting use by 25 percent:	265		
Mean cost reduction needed	194	69.4	15.1
No cost savings would be enough	71	30.6	n/a

sample who value keeping their home comfortable over any cost savings they might be able to achieve. They also lend credence to the findings of Kempton, Boster and Hartley (1995) that, despite decades of effort by organizations such as ACEEE, the public continues to confound energy efficiency and energy conservation. As was mentioned earlier, the Residential Characterization study sample appears to be biased in favor of respondents who are interested in energy conservation and are inclined to be helpful and to "do their part" on behalf of the environment and society. If such a receptive segment of the population still does not appear to be getting the message that increasing energy efficiency does not require them to freeze in the dark, then perhaps the efforts to broadcast that message should be re-evaluated. Further research could help to determine if the message needs to be broadcast more broadly, if the content of the message needs to be adjusted, or if the approach needs to change.

Comparing the percentages offered by respondents to the average savings that one could actually expect to see from taking these actions is also revealing. The mean reduction offered as necessary by respondents to compel them to keep their homes three degrees cooler was 15 percent. By comparison, the average expected savings in heating energy from a 3 degree, 24 hour per day winter setback is 9 percent (DOE 1980), and since heating energy use represents only 38 percent of the total home energy bills of the Residential Characterization study sample, respondents could actually expect to save only 9 percent of 38 percent of their bills, or about 3 percent. The mean reduction respondents reported needing to compel them to cut their hot water use by 10 percent was 14, while the average expected savings from taking this action is less than 1 percent (Pigg 2000). Finally, the mean reduction respondents say that they would need to see in their energy bills to induce them to cut their lighting use by one quarter is 15 percent; in reality, respondents could actually expect to save a little over 1 percent of their total home energy bill by reducing their lighting by this amount (Pigg 2000). These results support the findings of Kempton et al. (1985), and show that more than a decade later, households still

grossly overestimate the savings they could expect to glean from taking low-impact energy-saving measures. These results also strongly suggest that Wisconsin homeowners who install energy-saving devices or reduce their energy consumption through various behavioral changes are destined to be sorely disappointed when they see how little their energy bills are actually reduced. Those who design programs to reduce residential energy consumption need to take this into account. One way to turn this information liability into a strength might be to target promotional campaigns around the kind of activities that could actually reap such substantial savings for households. For example, if the typical savings that residential households expect from undertaking an energy-saving measure is about 15 percent, then program designers might want to focus their publicity dollars on promoting actions that could provide such substantial savings, like replacing aging furnaces. In Wisconsin, however, almost 80 percent of furnaces purchased are ENERGY STAR®-qualified (i.e., 90 percent or more efficient) and few people will replace a working furnace just to save energy (ECW 2000, 33), so this would not be a good publicity approach for this state. Another possibility is to emphasize the bundling of activities that in aggregate could produce double-digit savings, such as in a 'whole house' approach. A third possibility, of course, is to work on correcting households' expectations regarding the actual savings they could expect to reap from taking various energy-saving measures. While this might discourage some from taking measures because they would not see the savings as being worth the effort, it could also serve to refocus households' attention away from less energy-saving activities toward those that have more impact. The non-savings benefits of energy efficient products, such as comfort advantages, improved safety, convenience, etc., could also be emphasized.

Reasons for Saving Energy

For each of the energy-saving actions and behaviors asked about in the questionnaire, respondents were asked to give the most important reason that they took the action. Figure 1 is a histogram showing the frequency of all responses for those energy-saving behaviors that do not require investments of time or money to undertake, and that do not yield durable results, such as turning off lights and appliances or turning down the thermostat (i.e., energy-saving "curtailments"). Based on Figure 1, it appears that by far the most common reason that respondents practice curtailments is in order to save money. Not liking to waste is a distant second, with only a few cases citing helping the environment.

Figure 2 shows the most important reason that respondents have made energy efficiency improvements to their homes. (These include durable changes that require investments of time or money, such as installing insulation or caulking and weatherstripping.) In Figure 2, saving money again leads as the most popular reason for undertaking these improvements. Note, however, that when the improvement has to do with insulating walls or windows or reducing infiltration, home comfort emerges as being at least as important a reason for making the improvement as is saving money. Not liking to waste emerges as a strong third reason for making most of these improvements, with helping the environment only a distant fourth.

These results indicate that the primary motivation for respondents to take energy-saving actions is to save money. For energy efficiency improvements that respondents see as directly affecting how cold or drafty a house will feel, increasing home comfort appears to be an equally important motivator. Clearly, when it comes to providing reasons for targeted households to implement energy efficiency improvements or curtail behavior, saving money and making the home a more comfortable place to be are more likely to have results than are pleas on behalf of the environment—even among households that would be expected to be more than usually altruistic, such as those the participated in the Residential Characterization study.

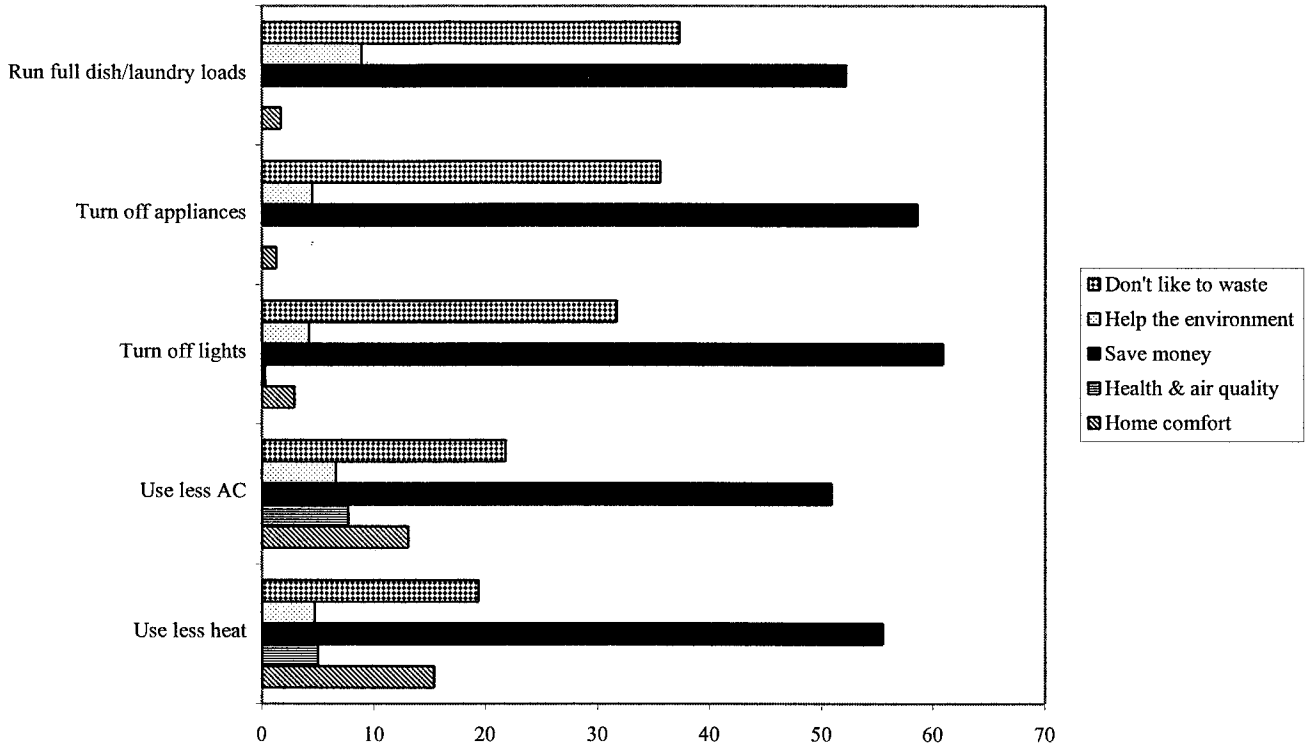

Figure 1. Single Most Important Reason for Practicing Energy Saving Curtailments, by Percent

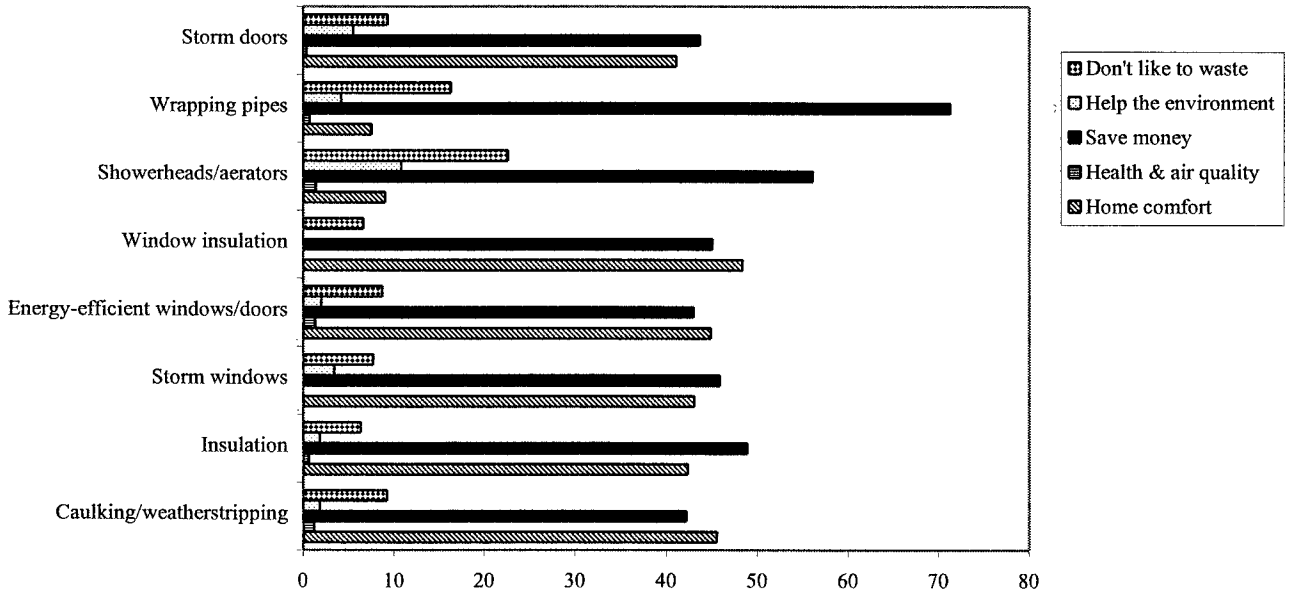

Figure 2. Single Most Important Reason for Making Energy Efficiency Improvements, by Percent

Discussion and Relevant Earlier Findings

In addition to the analysis above, some previously reported findings from these data offer insights for program managers who aim to reduce residential energy consumption and for evaluators planning on measuring the effectiveness of programs designed to save energy in residential housing. For example, respondents' erroneous beliefs regarding energy savings extend beyond the relatively abstract questions reported above. As was mentioned earlier, Pigg and Nevius (2000) reported that almost one-fifth of the respondents who live in a dwelling that is underinsulated believe that their housing is adequately or well-insulated. Another 6 percent live in an underinsulated dwelling and do not know the level of insulation they have. Together, these two groups account for more than one-quarter of the sample. This result poses a conundrum for program managers: If a large percentage of the target households for a home retrofit program think that they cannot benefit from what the program is offering because they already have one of the major benefits (insulation), then how can they be reached?

The attitudinal findings from the Residential Characterization study that were reported in Nevius (2000) can help program managers to target home retrofit programs to households that may be more receptive, or tailor conservation messages for particular audiences. For instance, Nevius found that respondents' attitudes toward turning down the thermostat in winter were related to the frequency with which they reported making energy efficiency improvements ($r=-0.154$, $p<.05$). Those who were less willing to turn down the thermostat reported undertaking energy efficiency retrofits with somewhat greater frequency than those who were more willing to turn down the thermostat. This result suggests that the driver behind these respondents' higher rates of participation in retrofits is comfort, and supports the finding reported earlier in this paper regarding the importance of home comfort as a motivator for installing such measures.

Conclusions

The analysis above showed that a considerable proportion of households that need wall insulation mistakenly attribute their discomfort and energy loss to drafts from leaky doors and windows. It also showed that the cost of retrofitting continues to present a substantial barrier to increasing home energy efficiency, as does perceived lack of easily available information about payback times, qualified contractors, etc. A sizable minority of the sampled households were found to value keeping their home comfortable over any cost savings they might be able to achieve. In addition, it was found that the message that increasing energy efficiency does not require households to freeze in the dark appears not to be reaching these households. It was also found that households continue to grossly overestimate the savings they could expect to achieve from taking low-impact energy-saving measures. Finally, the analysis showed that the primary motivation for respondents to take energy-saving actions appears to be saving money. For certain energy efficiency improvements, increasing home comfort was also shown to be an important motivator.

Clearly, lack of knowledge, erroneous beliefs about the efficacy of various energy-saving actions, and attitudes toward home comfort remain substantial challenges to efforts to reduce residential energy consumption. That this seems to be the case even for this sample, which appears to be quite favorably biased toward energy conservation and inclined toward "doing their part" for the public good, suggests that the challenges are even more substantial than they first appear. Despite these findings, program managers and evaluators should take heart: the phrase "knowledge is power" applies as much to identifying ways to motivate consumers as to anything else. By gaining a better understanding of the beliefs and attitudes that keep households from implementing energy efficiency measures, we will be able to make more effective plans to overcome them.

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