report

Behavioral science tools to strengthen energy & environmental policy

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abstract

To increase consumers' conservation of energy and other resources, government agencies, utilities, and energy-related businesses can complement regulatory and market-based policies with simple and effective behavioral interventions grounded in extensive behavioral science research. In this article, we review 13 behavioral tools that we find especially promising. Collectively, these tools help meet four behavioral objectives: getting people's attention; engaging people's desire to contribute to the social good; making complex information more accessible; and facilitating accurate assessment of risks, costs, and benefits.

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Core Findings

What is the issue?
Getting people to adopt behaviors that increase energy conservation and reduce costs for the environment requires a multipronged approach. Behavioral science research and insights can complement both market-based and regulatory policies in 13 impactful ways.

How can you act?
Rolling out a program to promote efficiency or conservation? Review this list and make sure you engage your audience as effectively as possible.
1) Reaching out with interventions and information during life transitions, such as when people buy a new house, car, or appliance
2) Choose meaningful, expanded time frames. For example, expressing gasoline costs over 100,000 miles increases preferences for more efficient cars

Who should take the lead?
Behavioral science researchers, policymakers in the environment and energy

Conserving energy and other resources is among the most powerful ways to increase sustainability, reduce pollutants, limit the buildup of greenhouse gases, and otherwise protect the environment. Here, we propose 13 practical, cost-effective, and impactful behavioral interventions, or tools, that policymakers, utilities, energy-related businesses and other organizations could use to increase conservation by consumers. The recommendations all derive from academic research in behavioral science, including several recent reviews related to energy and the environment.[1]

These tools complement regulatory or market-based policies in two ways. First, they would provide additional incentives, other than simply financial ones, to change behavior. Second, they would strengthen regulatory or market-based policies by focusing on what information to present, how to present it, when to reach out with the information, and when to remind people of it.

Broadly speaking, the behavioral tools we recommend can help meet four objectives: get people's attention; engage people's desire to contribute to the social good; make complex information more accessible; and facilitate accurate assessment of risks, costs, and benefits. As shown in Figure 1, many of the tools contribute to more than one of these objectives.

A Behavioral Tool Kit

1. Provide Timely Feedback & Reminders

Research shows that timely feedback on energy consumption can help people adjust their behavior and give priority to making energy-efficient home improvements.[2] Yet, consumers have traditionally received only sporadic, delayed feedback on their home energy use. Further, such feedback generally aggregates the entire household's energy draw, leaving people unsure about the relative energy consumption of light bulbs, refrigerators, and clothes dryers.[3]

The effectiveness of feedback varies, depending on how and how frequently it is delivered and on whether it is combined with incentives.[4] It is clear, though, that real-time feedback is one of the most effective ways to promote energy conservation.[5] Devices that provide ongoing feedback on household or workplace energy consumption have consistently led to reductions in energy use within the range of 3% to 15%.[4–7]

Even less frequent or aggregated feedback can change behavior, however.[6] In one study, providing employees with monthly energy reports and energy reduction goals reduced building-wide energy consumption 7% more than was achieved by simple appeals to conserve.[8]

As is true of feedback, well-timed reminders to conserve energy and other resources can alter behavior significantly. Even established environmental programs, such as the 30-year-old Conservation Reserve Program, can benefit from them. This federal program pays rent to farmers who pledge to enact a set of conservation measures. The government boosted participation in the program and experienced a benefit–cost ratio of more than 20 to 1 by reminding people of the program's availability during the general sign-up period rather than before the period started.[9]

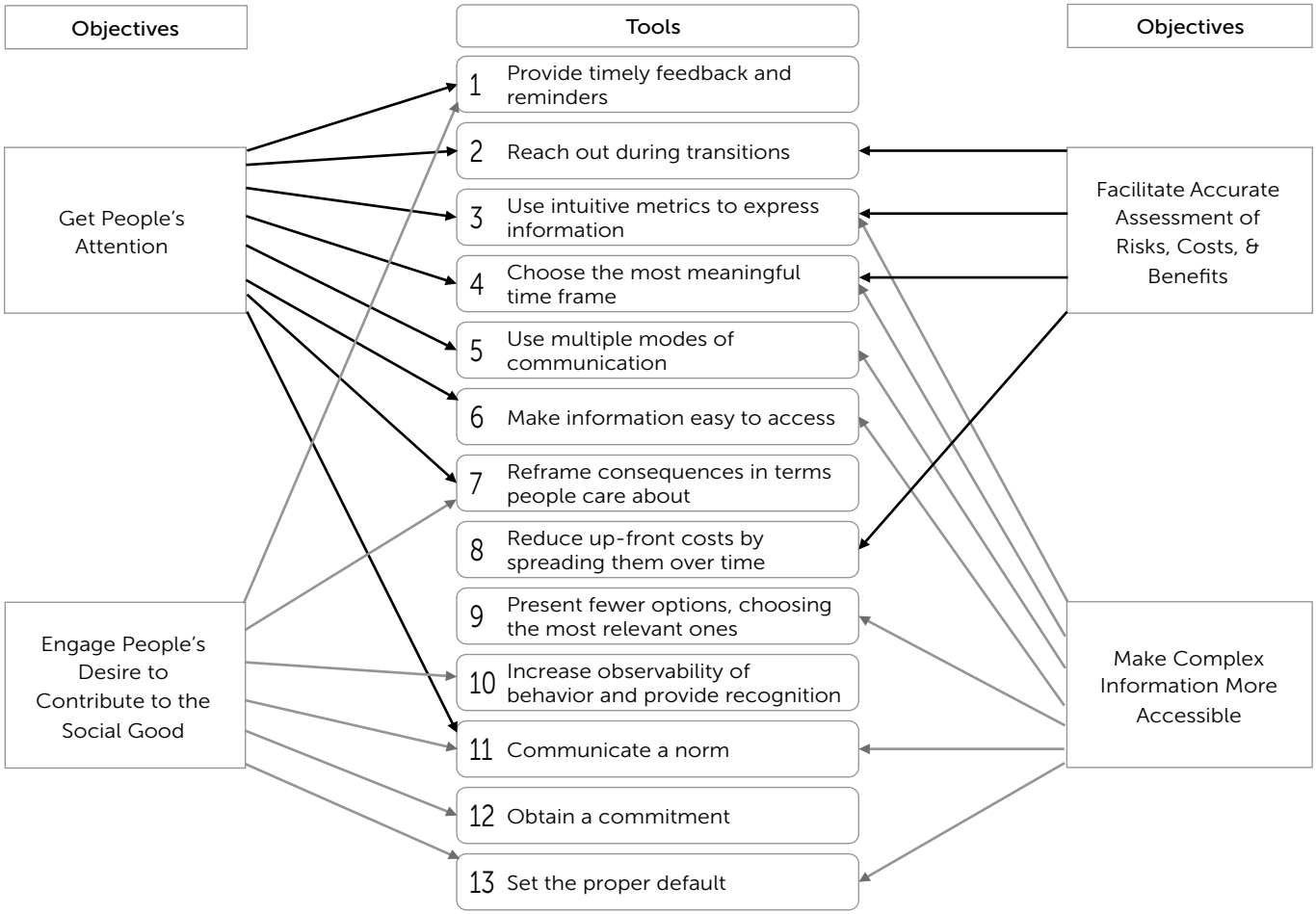
2. Reach Out During Transitions

People are busy and overloaded with information, and they can only pay attention to a limited number of appeals.[10] They are more likely to break habits[11,12] and are more responsive to opportunities to participate in energy-saving programs during home moves and other transitions in their lives, perhaps because they are already in the process of collecting new information.[13,14] The same is true when people are buying vehicles and major appliances. Information received during these periods can be crucial, because a single decision, such as which house, car, or appliance to buy, can have a large, persistent impact on energy use.[15]

Consider the following examples:

- Consumers are likely to achieve major and lasting energy savings if they replace a less energy-efficient appliance with a more

Figure 1. Several overarching objectives to be achieved by the 13 behavioral science tools described in this article



efficient one. Obtaining similarly large and persistent reductions through a repeated behavior change (for example, by turning off lights or changing thermostat settings) is more of a challenge.[15]

- Consumers reduce their vehicular emissions considerably more by buying a smaller or more fuel-efficient car than by changing their driving behavior (for example, by driving less or at a lower speed).[15]

- Homeowners may be more likely to obtain home energy audits if they are already getting a home inspection, say, at the time of a home purchase.

3. Use Intuitive Metrics to Express Information

Comparisons made on the basis of consumption metrics—such as gallons per 100 miles, SEER (seasonal energy efficiency ratio) ratings for air conditioners, or R-value (thermal resistance) ratings for insulation—can be clearer than those made using efficiency metrics, such as the familiar miles per gallon or kilowatt-hours. Efficiency metrics confuse consumers because they are not linearly related to the behavior in question, like driving less or buying a more efficient car. For instance, most people believe that switching from a vehicle that gets 20 miles per gallon (mpg) to one that gets 50 mpg will save more gas than going from 10 mpg to 20 mpg,

"Efficiency metrics confuse consumers because they are not linearly related to the behavior in question"

because the first improvement is larger both in absolute terms and as a percentage. However, the first trade-in saves 5 gallons every 100 miles, and the second trade-in saves only 3 gallons (as is revealed by flipping the equation and dividing the fixed distance, 100 miles, by miles per gallon). Consumption metrics, such as gallons per 100 miles, are commonly used in other countries and fix the misperceptions caused by miles-per-gallon ratings because they "do the right math" for consumers.[16] Gallons per 100 miles was added to the revised Environmental Protection Agency label for cars (the Monroney sticker) in 2013.

Another intuitive measure describes a household's consumption of energy and water relative to that of comparable neighbors, a practice used by such companies as Opower, WaterSmart, and Enertiv. This kind of comparison, which has other benefits that are discussed in the section on Tool 11 (relating to communicating norms), may be far easier for consumers to understand than technical metrics such as kilowatt-hours.

4. Choose the Most Meaningful Time Frame

When receiving energy or other resource use information, consumers respond well to placing the information in the context of expanded time frames that more meaningfully reflect the way people use a product.[17–19] For example, expressing gasoline costs over 100,000 miles of driving, rather than in terms of miles per gallon, increased people's preference for more efficient automobiles.[17] In fact, providing energy costs over a long time frame (such as 10 years) increases preferences for more efficient alternatives across a range of product categories.[18] Similarly, when presenting people with projected energy bill savings from a rooftop solar installation, it makes sense to highlight the estimated savings over the life of the panels rather than annual savings. Or, when presenting a local lender with the benefits of a community solar program, one can offer the expected reduction of default rates over the life of the loan rather than an annual rate.

Longer time horizons help improve decisions in other environmental domains, too. When selling flood insurance to a homeowner, for instance, the Federal Emergency Management Agency (FEMA) has found it effective to stretch the time horizon to make the likelihood of a future flood more salient. Rather than stating that there is a 1 in 100 chance that the house will experience a flood next year, FEMA notes that the chances of at least one flood during the next 25 years are greater than 1 in 5.[20] FEMA now tells homeowners that if they live in a 100-year floodplain, there is "a 1 in 4 chance of flooding during a 30-year mortgage."[21] The U.S. Corps of Engineers strengthened the effect of the expanded time horizon by comparing the probability of a flood with the likelihood of other disasters, observing that "during a 30-year mortgage period you are 27 times more likely to experience a flood than . . . a fire," and by making comparisons to other commonly experienced adverse events, such as being in a car accident.[22]

When companies provide insurance for environmental disasters, it makes sense to offer multiyear policies, because homeowners tend to cancel their policies after a short time if they have not had a loss. Keeping the premium constant over the length of the policy is also wise, because homeowners can budget more easily knowing that the premium will not go up. For example, offering 2-year hurricane insurance policies increased aggregate demand for disaster insurance compared with offering only 1-year policies.[23]

5. Use Multiple Modes of Communication

Consumers feel most comfortable making decisions when they receive information in their favorite mode (for example, verbal) and format (such as tables or information graphics). Risk information, however, is often communicated in numerical formats that require intimidating levels

of numeracy for some portions of the target audience. Using relative frequency information (for example, 1 in 100) rather than probabilities (for example, .01) can help people more accurately process risk information.[24,25]

Whenever possible, information should also be presented in a variety of ways to appeal to a broad audience and increase accessibility. Comprehension of information about climate-change uncertainty increases significantly, for instance, when the data are presented using both verbal and numerical descriptions—saying, for example, that a phenomenon is "likely" and also giving the odds (such as "greater than 66%")—rather than leaving out the numbers.[26,27]

6. Make Information Easy to Access

If people cannot access useful information easily, they are unlikely to act on it. Even if information is easily accessible but just seems hard to obtain, people may not bother trying to find it, or they may feel that they have an excuse to avoid trying to retrieve it. Something as simple as an e-mail with a direct link to the pertinent information can overcome these problems; people are more likely to look at and engage with an online energy information portal when they receive e-mails pointing to it.[28,29]

It is interesting to note that requiring that information be disclosed to consumers can lead firms to act in anticipation of that information's use by consumers. For example, in response to new rules making environmental disclosures mandatory, electric utilities changed their fuel mix.[30] Similarly, in response to calorie label mandates, fast food chains have increased the number of healthy menu options.[31]

7. Reframe Consequences in Terms People Care About

Reducing energy consumption is not an end in itself for most consumers. Thus, it is useful to translate energy use information into goals and objectives that people do care about. Unless they are explicitly told about a specific added benefit of an action, people may not realize that the action has implications for their health or budget,[32] and they might not think much about those implications when making a decision.[33]

"People pay disproportionate attention to immediate costs and too little to those in the future"

Consumers also can be motivated to contribute to a public good. For example, Swiss utility customers and U.S. respondents to an online survey were more likely to switch to a peak-hour added cost for electricity use if the decision was framed in terms of contributing to a public good rather than financial savings.[34] Telling people about the public health and environmental costs of electricity consumption is more effective than just reminding them of the financial costs.[5,35–36] Providing the same information in multiple formats allows users to focus on a consequence they care about; a case in point is the current Environmental Protection Agency vehicle label, which provides miles per gallon, gallons per 100 miles, average fuel costs per year, fuel costs relative to other vehicles, and anticipated greenhouse gas emissions.[32]

Framing actions as providing a public good is also expected to strengthen the effects of other interventions discussed below, such as Tools 10 and 11 (relating to increasing the observability of behaviors and communicating norms). However, such framing in the absence of other interventions can backfire,[37] perhaps because it raises doubts about the motives of the organization sending the message.

8. Reduce Up-Front Costs by Spreading Them Over Time

People pay disproportionate attention to immediate costs and too little to those in the future.[38] As a result, a high up-front cost for a program can be a deterrent, even if the program pays off in the long run. Consulting firms like McKinsey & Company have documented this phenomenon as a factor in the surprisingly low levels of investment in energy efficiency technologies.[39] One way to encourage individuals to invest in programs with high up-front costs is to provide

a long-term loan that spreads those costs over the life of the agreement. Homeowners might, for instance, decide to pay to elevate or flood-proof their house if the work lowers their flood insurance premium by so much that they end up saving money each year in spite of the loan payments. Similarly, Howard Kunreuther and Elke Weber proposed that more homeowners would invest in solar installations if they had no up-front costs but paid for a needed home-improvement loan with savings on electricity costs.[40]

the revised EPA gasoline consumption metric for cars is gallons per 100 mi.

3-15%

reductions in energy use from ongoing home or workplace feedback interventions

25%

chance of at least one flood in 100-year floodplain regions

Sometimes, even tiny up-front costs, such as effort and attention, can powerfully depress program uptake. Such costs can be eliminated or drastically reduced with a little foresight. For example, prepopulating fields on a sign-up or application form to reduce the applicant's paperwork could increase the uptake of beneficial programs. When H&R Block, a national tax preparation company, provided streamlined personal assistance for completing the eight-page, 100-question Free Application for Federal Student Aid (better known as FAFSA), the help resulted in increased student aid application rates and a 29% greater likelihood of the student attending college for 2 consecutive years.[41]

9. Present Fewer Options, Choosing the Most Relevant Ones

Sometimes when people are presented with many options, they get overwhelmed and decide against all of them or make suboptimal decisions.[42,43] Presenting fewer options by removing less effective ones from consideration not only simplifies the decision, it also helps the audience infer which option is most relevant to them, just as setting the right default does (Tool 13). For example, we recommend presenting homeowners with just the most relevant options when promoting flood insurance or offering financing for solar panels.

10. Increase Observability of Behavior & Provide Recognition

Making a person's contributions to the public good visible to others consistently increases the likelihood that the individual will decide to make altruistic choices.[44]

Consider the following examples:

- Participation in a *demand response* program—in which customers shift electricity usage away from peak periods in response to time-based rates or other forms of financial incentives—more than tripled when people joined the program via a public sign-up sheet in their community rather than anonymously.[37]
- Donations to a national park increased by 25% when a ranger asked guests for donations, rather than the park providing only an anonymous donation box.[45]
- Electricity consumption falls when people's rates of usage are made public.[46] Even telling people that they are part of a study reduces their consumption.[47]
- Industrial toxic emissions declined after corporate disclosure was required by the Emergency Planning and Community Right-to-Know Act of 1986.[48]
- Voting increased when Facebook offered badges for members to announce that they had done their civic duty.[49] In many contexts, like energy efficiency or environmental programs, the use of badges has the additional benefit of providing free advertising for a program when individuals share useful information or positive experiences within their social network.[50] User reviews may work similarly and have similar benefits.

Making socially desirable behavior visible probably increases such behavior in part because the display makes it easier for others to acknowledge the action and reward it in subsequent interactions. The effect is strongest when contributors to the social good highly value their relationship with the observers.[37]

11. Communicate a Norm

People are more likely to engage in a behavior, especially one that is costly to them but contributes to a social good, when told that this

behavior is the social norm.[44,51] Norms can be *injunctive*, describing what one ought to do,[52] or *descriptive*, announcing what others are doing. As a case in point, towel reuse increased 9% when, instead of just making a standard environmental appeal, such as "Help save the environment," hotels also informed guests that 75% of previous guests had reused their towels.[53] Likewise, energy and water conservation were increased by companies such as OPower, WaterSmart, and Enertiv when they let customers know how their household's consumption rate compared with that of their neighbors.[54–56] Of importance for environmental goals, such social comparisons can induce long-term behavioral changes (that is, changes that last more than 1 year).[57,58]

Conveying a norm is expected to have the greatest impact on behavior when people are unclear on what the norm is. Descriptive norms work particularly well when combined with injunctive norms.[52,56,59–62] Of course, it is not recommended to use a descriptive norm when the desired behavior is not already widespread or when the existing behavior is counterproductive. For example, signs at national parks should avoid implying that visitors regularly break the rules.[61]

Making deviations from norms readily observable (that is, combining Tools 10 and 11) allows norm followers to sanction norm violators. The social sanctioning of violators will increase as the share of followers grows, creating virtuous cycles.[63]

12. Obtain a Commitment

Asking people to commit to changing their behavior (for example, to reduce emissions), particularly in public (for example, by signing a public pledge), can increase the likelihood that they will engage in the desired behavior.[6,64] Even when not binding, public commitments can work, for many reasons. They make it easier to see whether people are contributing to the public good. They also help to establish a norm. Once others have committed, it is costly for an individual to shirk that behavior, because observers now know that the person was made aware of the opportunity to contribute and avoided it.

"set the default to be the option that most benefits the individual or the environment"

13. Set the Proper Default

When consumers have many choices, it is best, when possible, to set the default to be the option that most benefits the individual or the environment so that, by doing nothing, the consumer will end up with the most desirable option.[65] Defaults that benefit the environment (known as *green defaults*) enjoy widespread approval across the political spectrum in America.[66]

Strategies that make participation in a program the default and require potential participants to remove themselves if they do not like the default are known as *opt-out approaches*; they contrast with *opt-in strategies*, in which people must sign up if they want to participate. Possibilities for and examples of environmentally friendly opt-out strategies abound. Among them are the following:

- Public utility commissions could mandate that households be automatically enrolled in certain demand response or green power programs or require that new appliances be shipped with energy savings settings turned on by default. Such policies preserve all options for the individual but nudge consumers toward an individually or socially optimal decision.[67]

- A randomized, controlled trial conducted in Germany found that setting the default choice to automatic enrollment in a green power contract but allowing households to opt out resulted in a 10-fold increase in green power contracts.[68]

- To increase the number of home energy audits performed, policymakers could require that an energy audit and a Home Energy Score be provided whenever a home is purchased unless the home buyers opt out of the audit.

- A utility that allows consumers to choose the proportion of energy to be offset using renewable energy certificates (RECs)—purchases of power from renewable sources—could set the default to, say, a state's REC target of 15%, rather than 0%.

- An infrastructure rating system called ENVISION that allows engineers and architects to earn certificates for energy-efficient and otherwise sustainable design decisions raised the default in its software from current industry practice to the second most ambitious design level. The sustainability index of designs created with the software increased by 24%.[69]

Defaults work for several reasons. They can establish a norm, are often interpreted as implicit endorsements, and simplify decisions. A caveat: Consumers sometimes perceive the default as reducing their freedom to choose. Asking individuals if they would like to be assigned to the default option can help reduce negative reactions to the default without any reduction in the effectiveness of the default condition.[70]

Moving Forward

This collection of practical, cost-effective tools can boost energy and environmental conservation, serving as a useful complement or alternative to taxes, subsidies, and cap-and-trade or command-and-control regulations. We encourage policymakers and business leaders who wish to explore these ideas to contact us at appliedcooperationteam@gmail.com.

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