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Design Principles for Carbon Emissions Reduction Programs

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Authors' Viewpoint

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The goal, articulated by President Obama in 2009, of reducing U.S. carbon emissions 17% from the 2005 level by 2020 is eminently achievable without new technology or appreciable sacrifice by energy users. However, achieving it will in part require sophisticated energy efficiency and conservation programs. To overcome institutional and behavioral barriers, these programs will need to implement six principles of effective design derived from 30 years of behavioral and social science research. We focus on the household sector, but believe our general conclusions likely apply to other sectors as well.

We recently developed an analysis for the household sector—energy use in homes and for nonbusiness travel—of what we call Reasonably Achievable Emissions Reductions (RAER) (*1*). RAER is distinct from technical potential and from economic potential—what would be achieved if all households took all energy saving actions that have positive net present value at a discount rate similar to what an investment portfolio might provide—by behavioral realism. Neither the full technical potential nor the full economically justifiable potential for energy savings has ever been achieved in practice. RAER is what could be achieved by implementing the most effective known inducements to action.

Our analysis shows that if the most effective nonregulatory programs for inducing 17 types of household energy efficiency and conservation actions were scaled to national level, carbon emissions in this sector would be reduced by about 20% in 10 years. This is equivalent to 7.4% of national emissions, or 44% of President Obama's 17% target. This analysis is based on the documented achievements of past programs; with better program designs and by adding new technologies, even greater savings could be realized. However, achieving these savings requires sophisticated program designs.

More than 30 years of behavioral research demonstrates that the existence of economically attractive technologies, even with added financial incentives, is not sufficient to induce behavioral change (*2*). The behavioral findings can be distilled into six basic principles that will enable the RAER to be achieved. These principles provide guidance on addressing the major barriers to emissions-reducing action. Some of them are well-known and often used; others are only rarely applied. The design principles are as follows:

1. Prioritize High-Impact Actions. Select target actions with the highest achievable impact on reducing carbon emissions and energy use. Achievable impact depends on both *technical potential* (the amount the action reduces emissions) and *behavioral plasticity* (the proportion of people who can be induced to act). For example, carpooling would have a major effect on carbon emissions if everyone did it (high potential), but it is difficult to bring about (low plasticity). Energy efficiency goals will not be achieved without emphasizing both technical potential and behavioral plasticity.

2. Provide Sufficient Financial Incentives. Some high-impact actions have significant up-front financial costs. For such actions, strong financial incentives help elicit action from households. For many low-cost and no-cost actions, the financial incentives from energy savings are already large enough. Whatever the size of the incentives, program success will depend critically on other design principles, such as marketing, simplicity, and quality assurance. The same financial incentive can get results that vary by a factor of 10 depending on other aspects of program design—the form of an incentive is often more important than its size (*3*). The

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important challenges here are to allocate sufficient funds and to deploy financial incentives in ways that address the nonfinancial barriers to action, which may have equal or greater effect than money.

3. Strongly Market the Program. Behavior has considerable inertia, and energy saving is not at the top of the agenda in most people's busy lives. Marketing efforts are needed to get people to notice a program and to convey to them that it is attractive enough to be worth their consideration. Sometimes expensive mass media marketing can be effective, but often it is not. Informal marketing through social networks (word of mouth through church groups, neighborhood associations, civic clubs, and word from Internet friends) can be as effective as mass marketing for getting people's attention, and more effective for getting them to believe what they hear (*4*). One strategy is to create incentives to leverage the marketing expertise and resources of industries, as was done in the Cash for Clunkers program. Another is for state and local governments to partner with civic groups.

4. Provide Valid Information from Credible Sources at the Points of Decision. It is possible to do some types of marketing very economically by targeting it to the places and times when people are making the relevant choices: buying a car or appliance, remodeling a home, moving to a new home. At those times, it is possible for salespeople and retailers to sell the program as they sell the home, car, or appliance. Home improvement contractors, real estate agents, automobile dealers, plumbers, mortgage lenders, etc., can be effective and timely sources of information—if the information provider is a credible source and the program is well designed to get the information providers to change their routines. The challenge here is the large number and variety of organizations that must have both the necessary information and the incentives to provide credible information to the household decision maker. The key is to show how providing the information yields concrete and desired benefits for the provider (e.g., increased sales, improved reputation).

5. Keep it Simple. People economize on cognitive effort, not only on money. Programs are more successful if the information they provide about how to use the program and what benefits to expect is easily accessible and actionable. It is not sufficient for information to be correct and available. It also must be easy to connect to the decision at hand. Such information may take the form of accurate and simple labels on products or homes or valid advice from trusted information sources. Similarly, the programs themselves need to be designed for convenience and simplicity. One-stop shopping and minimizing paperwork and delay for consumers can make a substantial difference. This point is often overlooked in programs directed at household energy efficiency and cannot be overstressed. For example, instant rebates are more convenient than mail-in ones; rebates are more convenient than tax credits; and tax credits are more convenient than most loan-based programs. One of the most effective ways to simplify is to allow people to take the desired action without even thinking about it, for example, by presenting choices so that they have to opt out of a program rather than opt in. Note that this principle runs counter to the frequent claim that people need to be engaged to change their behavior. Engagement can work, but people do not usually stay engaged for long.

6. Provide Quality Assurance. Before taking action, people need to be confident that they will actually get the promised benefits. For home weatherization, for example, this means certifying contractors and providing for independent inspection of at least some of their work. It means helping people find high-quality providers. A major barrier to investment in energy-saving home improvements is the transaction cost of finding a contractor who can be trusted to do the work right, on time, and without disrupting life at home. The policy challenges include the lack of sufficiently trained, capable contractors and inspectors in some areas. The institutional infrastructure for consumer protection also may need to be strengthened in the home improvement sector to increase consumer confidence.

These six principles reflect what could be called Kermit's dictum: "It's not easy being green." The main challenge to government in achieving near-term carbon emissions reduction targets in the household sector is to make it much easier. Insufficient attention to the principles of convenience and quality assurance has been a weakness in many past energy efficiency and conservation programs.

A large energy efficiency gap also exists outside the household sector. Average corporate managers require a rate of return or "hurdle rate" of over 30% on energy efficiency investments (*5*). This is far above expected return on other investments and suggests that nonfinancial factors are important for companies' investment decisions. More research will be needed on energy efficiency decisions in the commercial and industrial sectors to specify all these factors and work out the design principles for energy efficiency programs for these sectors. We believe that with well-designed interventions, these sectors will be able to carry their share of the burden of achieving near-term emissions reduction goals.

Disclaimer

This work is that of the authors as individuals, and is not a product of the National Research Council.

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