Free-Ridership Measurement Is Out of Sync with Program Logic… or, We've Got the Structure Built, but What's Its Foundation?

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ABSTRACT

This paper discusses a number of problems with the use of free-ridership measurement in directing energy efficiency programs and policies, and the measurement of free-riders through participant self-reported information. One, the customer decision-making model implicit in free-ridership estimation methods is appropriate only to an obsolete program design and not to current designs that use multiple methods to influence behavior. Two, psychological theories of how people explain their behaviors to themselves contraindicate the use of current free-ridership methods. Three, intentions are only modestly good predictors of behaviors prospectively and should not be relied on as a predictor of behavior retrospectively. Four, increased awareness of the hazards of global warming will likely result in substantial increases in self-reported free-ridership, yet participants' market experiences demonstrate that barriers to efficiency continue to curtail the ability of consumers with strong desires and intentions toward energy efficiency to take the energy-efficient action. The authors suggest program policy, design, and implementation decisions are better served through an analysis of market changes than through free-ridership measurements.

Introduction

Rate payer advocacy groups and public utility commissions have a legitimate interest in assuring that ratepayer dollars do not go to people who would install the efficiency measure in the absence of the program—termed "free-riders."[1] Three program conditions led the energy efficiency profession to develop methods of estimating free-ridership levels so that free-rider savings might be subtracted from gross program savings in order to ensure prudent ratepayer investment in efficiency programs: One, there have been documented instances where program representatives have walked into a facility or home, seen that the energy-user had installed measures and, at that point—after the installation—offered an incentive. Two, many energy efficiency measures have paybacks of less than two years, suggesting energy-users could easily do them on their own. Three, most early program participants (early adopters, in the terminology of diffusion of innovation theory), and even some later ones, tend to have the capacity to self-fund investments.

More recently, energy efficiency professionals have begun to discuss how the free-ridership rate could be an indicator of market transformation and to posit various rates as indicative that the market has been transformed to the degree that program intervention is no longer needed.

[1] This concept of free-riders as used in utility regulatory settings is not the same as the concept of free-riders used in economics concerning public goods. Free-riders are one of the justifications for the need for public goods, because free-riders are the people who use a service or a facility, but can shirk from paying their share. To eliminate free-riders one has a public good and uses taxation to pay for a road versus charging tolls. Thus the notion of free-riders as a regulatory concept is somewhat at odds with its use in the economic sense.

Given the concern about free-riders, a great deal of analytical effort over the past 20 years has addressed its estimation. Initial free-rider estimation methods commonly used billing analyses of participant and nonparticipant groups (Bronfman, Horowitz & Lerman 1987), yet this approach fell out of favor as analysts sought to estimate free-ridership rates at the measure level rather than the program level, in recognition that programs install multiple measures with differing paybacks and market acceptance.

Currently, most estimation methods rely on participant self-reported information, obtained during site visits or telephone surveys. Some other methods, such as qualitative choice modeling, also require some sort of survey of participant and nonparticipant behavior; however, the survey questions don't require the respondent to speculate on "what if…" the way the self-report method does. This paper addresses the self-report method.

In 1994, Windel and Peters suggested that using a decision framework would be useful in helping to ferret out how program participants came to the conclusion to invest in a measure and participate in the program. This approach has become somewhat standard practice with the Massachusetts guidelines developed by Rathburn, Sabo & Zent (2003), and the new self-report guidelines developed by the California Public Utility Commission Energy Division and the Master Evaluation Contractor Team (CPUC & MECT 2007) developed in support of the evaluation protocols (The TecMarket Works Team 2006).

Most of the analytical attention to free-ridership estimation through self-reports has focused on the potential for bias. The *Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approaches* (CPUC-Ed & MECT 2007) identify three types of bias that might lead to underestimation or overestimation of free-riders and provide detailed guidelines for minimizing these biases. These types of bias arise from the interaction between the respondent and the interviewer, as studies have demonstrated that respondents may care about the opinion the interviewer forms of them during the interview and may seek to provide the answer "the respondent thinks the interviewer wants" or seek to "put themselves in a positive light." These types of response biases are well known to students of survey methodology.

Yet, the field of social psychology has much that is relevant to free-ridership estimation beyond methods to minimize response biases in question design: it provides us with insights into how people change from making energy-*inefficient* decisions to making energy-*efficient* ones, and how people come to understand their own decision-making processes when they subsequently reflect on them. These same theories are implicit in our advancement in program design and underpin much of our current program logic, irrespective of whether the designer is aware of the theories or intuitively or experientially recognizes what is needed to move the market.

This paper considers a social psychological understanding of customer decision-making and makes the claim that the more effective efficiency programs are in changing typical market behavior, the less accurate self-report free-ridership estimation methods are in approximating the savings that would occur in the absence of the program.

Given what is known about consumer decision-making and self-reporting on the process, the authors believe estimating free-ridership levels is an intractable problem. We propose instead that free-ridership be proxied by the market saturation rate for the efficiency action. Market saturation as a proxy for free-riders is well suited to one of the uses to which the free-rider estimate is put: indicating when a program needs to be substantially revised or terminated. Market saturation provides a lower bound to free-ridership (i.e., potentially underestimates it), as people who already want to take the action may seek out the program for its incentives. Yet, the actions from this group of customers is at least partially offset, and potentially exceeded, by spillover actions—program-induced actions that do not receive incentives for any number of reasons. As we will demonstrate, the current program designs that call into question the model underlying the free-ridership method generate high levels of spillover. Nonetheless, if the ratepayer advocates do not find this proposition satisfactory, we propose that public policy is best served by turning over program delivery, especially for programs with a market transformation component, to nonprofit public benefit organizations, where there would be no financial returns to corporate shareholders from undetected free-riders.

We offer these proposals because we strongly believe the current approaches to free-ridership estimation are harmful to program design, costly to ratepayers, aggravating for customers, and contraindicated by the state-of-the-art of social science research, all of which we discuss further below. Mostly, we are concerned about the current approach to free-ridership estimation because we believe it thwarts good program design and implementation, and the type of market-based thinking needed as we seek to take giant steps toward a climate-neutral world, rather than baby steps to a minimized investment in energy generation.

Models of Program Influences on Customers

Linear Model Implicit in Free-rider Estimation Framework

The decision framework commonly used to assess free-riders assumes a linear participation process and decision-making that is not consistent with, first, current decision-making theories and, second, program designs that seek to actively work with energy users to help them make the right decisions.

Decision-making theory describes the process in five basic stages, with different formulations of the theory using different terms or adding elaboration: *awareness* (or knowledge), *deliberation* (or persuasion), *decision*, *action* (or implementation), and *confirmation* (Rogers 2003). We can tease out the stages of decision-making implicit in the current free-ridership estimation approach by looking at the ideal program.

Ratepayer advocates want cost-effective efficiency programs, yet don't want to pay for free-riders, making the ideal program one that acquires energy savings with no free-riders; every penny acquires energy savings that would not otherwise be acquired. Thus, the model implicit in the perfect program from a ratepayer perspective assumes the program is responsible for all customer awareness, deliberation, and decision-making. If agents other than the program create awareness or, even more importantly, contribute decision-relevant information or some other persuasive element, then it cannot be said unequivocally that these other agents had absolutely no bearing on the outcome and ratepayers might end up paying the utility for savings owing to these other agents if a free-ridership adjustment is not made.

Current free-ridership methods estimate partial free-riders—those whose free-ridership score is less than 100% (a full free-rider), but is greater than 0% (a program-induced participant). Consider a participant who installed, for simplicity, a 10-horsepower NEMA premium motor, to whom the free-rider analysis assigned a 75% free-rider score. The underlying premise of partial free-ridership scores is *not* that, in the absence of the program, this energy-user would have installed one NEMA premium 7.5 horsepower motor and one 2.5 standard motor. Rather, the partial free-ridership score proxies the result of a probability distribution in a universe where there are hundreds of participants just like the participant in question. In this corresponding universe, one-quarter of the participants would install a ten horsepower NEMA premium motor as a direct consequence of the program and three-quarters of the participants would install the same motor in the absence of any program.

Evaluators sample a subset of participants, and partial free-ridership scores are derived to describe the net effects of the program on the population. In the case of a participant who has installed multiple units of a single measure (such as multiple NEMA premium motors or multiple T-8 fluorescent light fixtures), the participant determined to be a partial free-rider may well have installed a portion of these units in the absence of the program, although standard free-rider question-sets do not include consistency questions as to whether a partial installation makes sense in terms of the spatial or functional relationship of the equipment, or whether the respondent is taking into account possible costs or other consequences of different equipment or phased installations (e.g., increased operations and maintenance costs or disruptions).

The implicit program model underlying the free-ridership estimation methods is a linear one, not a bad approximation of energy efficiency “in the early days,” when programs had one of two primary designs. In one variant, the energy-user had a problem, typically a high bill complaint. The energy-user contacted the utility, received an audit, and was told, “We can help you solve this problem. Do these things.” Perhaps the auditor added, “We have incentives to help you do it.” In another variant, the energy-user had a need, typically for a new piece of equipment. The energy-user recalled program advertising received from the utility about rebates and talked to the vendor about qualifying equipment. Or, less likely, the vendor said, “You need a blah. Have you considered a high efficiency blah? It will save you money on your energy bills and, with the rebate the utility is offering, I can get it for you at not much more than the price you are already looking at.”

In both of these variants, the energy-user quickly passes through the stages of *awareness*, *deliberation, decision,* and *action*. The participation process is linear: the participant seeks the solution to a problem or to purchase a piece of equipment, learns of the efficient opportunity promoted by the program, and decides to take the efficient action.

In these very early programs, the offer of information and incentives were considered sufficient to attract participants. Yet utilities and researchers observed that the majority of the customers reached by the program became aware and deliberated to varying degrees, but decided against the energy efficiency action, or took an action once and decided not to do so again. This observation led to market research aimed at identifying the participation barriers that continued to exist with this linear program intervention system (George 1988). The research offered recommendations do such things as simplify program processes, streamline paperwork, improve information delivery—recommendations primarily aimed at modifying facets of program implementation and, to a lesser degree, program design.

Savvy programs addressed these barriers and market research identified still others—barriers external to program processes. These barriers included lack of supply from the manufacturer, inadequate distribution channels, poorly informed sales staff or design/specifying professionals, poor product performance, lack of product warranties, poor quality installations, lack of experienced service professionals, lack of in-house ability to operate or maintain the equipment, and so on.

Nonlinear Approach in Current Generation of Programs

Program staff have begun to design comprehensive programs and program portfolios to address the barriers external to program processes: upstream programs target manufacturers and suppliers; educational and training programs target energy-users, as well as building design and operations professionals; nationwide energy efficiency labeling with a prominent logo reduces search costs; one-stop-shopping programs (such as Home Performance with ENERGY STAR® and comprehensive new construction and retrofit programs) assist customers with all stages, from needs identification through installation and commissioning.

These new program designs are absolutely critical for addressing barriers that otherwise limit energy efficiency to a relative few diehards. And yet, the route by which the program reaches the energy-user is no longer linear. Energy-users continue to learn about efficiency options from the utility or public benefits organization (the program administrator), but are just as likely to also learn about them from the architects that now have specialties in energy-efficient design (likely stimulated or supported by a program administrator-sponsored training program or a positive experience with a new construction efficiency program), or from the manufacturer's advertising of its high efficiency equipment, or from noticing the ENERGY STAR® logo on their computer monitors, or from their company's decision to become an ENERGY STAR® partner, or from their neighbors who learned from their book group friend, who became an efficiency convert after their son installed a PV system through a program in another state. And once the energy-users are aware and have deliberated on the merits of energy efficiency, they contact their program administrator (perhaps its website) to see whether the offered incentive is sufficient to make the contemplated purchase financially attractive. The route is no longer linear because multiple agents contribute to a decision-maker's awareness and deliberation; these agents are diffused throughout the community and are themselves subject to numerous influences, including program administrator efforts.

The new program designs include education, social marketing, and upstream price buy-downs. They are essential and, as Friedmann (2007) argues, utility program administrators' efforts are jeopardized by utility compensation mechanisms that penalize free-riders. Friedmann gives three examples of program designs that would be effective in accelerating the deployment of energy efficiency technologies and behaviors, yet are very risky for the utility that does not get cost recovery or shareholder incentives for savings attributed to free-riders: (1) "an upstream/midstream market program that offers about $2/CFL to manufacturers and distributors and retailers," in an effort to capture the estimated 50% of home light bulbs that are still incandescent; (2) "establishing long-term relationships at various levels of both the utility and the large office building manager or owner that will enhance [efficiency] uptake by the customers…[largely through efforts] at non-rebated aspects of the business decision;" and (3) addressing data centers with "a variety of measures in a synergistic fashion, including the promotion of standards and metrics for data center equipment, and promotion of improved data center designs and operation schemes" (Friedmann 2007, 553-54).

In addition to these illustrative examples, consider that, in order for a utility to reduce the risk of disallowed program costs, program planners need to assume a conservative free-ridership rate of 20% or more. All other program costs—including incentives and promotion—must therefore be scaled to total less than the remaining 80% of installed program savings. Thus, the assumed free-ridership rate exerts a downward influence on the level of incentives that can be offered and, perhaps more importantly, the amount of promotion or infrastructure development (e.g., website design) that can be undertaken.

In order for the U.S. to take giant steps toward a climate-neutral world, utilities and efficiency professionals need to make energy efficiency normative; in common parlance, energy efficiency needs to become a "no brainer." Energy efficiency needs to be the compelling action, the action that makes the most sense to most people, from manufacturers to energy users and the professionals that support them. Yet each market actor for whom energy efficiency is on the way to becoming normative decreases the likelihood dramatically that an energy-user will report he or she was not at all likely to have taken the efficiency action without the program (or that out of hundreds of parallel universes, none of the decision-makers would have taken the action in the absence of the program). Social network theory shows us the accelerating transmission of ideas through a group of people. The more an efficiency program increases the number of people who are *always* deliberating whether the energy-efficient alternative is the right choice in any given situation, the more its net savings and the utility sponsor's compensation are lowered.

Psychological Theories Pertinent to Free-Rider Methods

Attribution Theory Contraindicates Current Free-Rider Methods

Surveys that inquire about the reasons for program participation ask respondents to answer why they did what they did—that is, to attribute the motivations for their participation to something. Clearly, attribution theory is particularly pertinent to the self-report free-rider inquiry, yet attribution theory has not been brought to bear on the estimation approach.

Attribution theory suggests that the very act of making decisions changes people's mental framework. No longer are they in a situation of deciding, they have become deciders and, as people who have made decisions, they feel a need to attribute their decision to pre-existing conditions.

Attribution theory tells us that in the process of taking an energy efficiency action, the person acquires the attribute of being someone who takes such action. As someone who takes such action, when asked to reflect on why they took the action, they say, "I'm just that sort of person." And that "sort of person" would take the action in the absence of the program.

This phenomenon becomes more pronounced the more positive the program experience, as another aspect of attribution theory is that the likely direction of the attribution reflects one's experience. If the experience is positive, one tends to attribute motivation to oneself (as in the aphorism "success has a hundred parents," each person attributing it to him or herself); if the experience is negative, one tends to attribute motivation to external influences (hence the expression, "The devil made me do it!").

People often seek to create continuity between their perceptions of themselves before and after taking the action. If I were to tell someone I would not have considered installing the energy-efficient lighting system without the program, I would be characterizing myself as being different then than I am now. I would be saying that, without the program, I would be a person with a different mindset, making different decisions that flow from that mindset. That's a stretch for some people.

Attribution theory suggests some people will be inclined to say they would have taken the action in the absence of the program, even if some facet of the program was instrumental in the persuasion phases and resulted in the decision and action. *Attribution theory suggests we are overestimating free-riders.*

Cognitive Dissonance Theory Contraindicates Current Free-Rider Methods

Cognitive dissonance is aroused whenever one does something that is inconsistent with stated beliefs or intentions. The psychological condition is uncomfortable and people seek to ameliorate their feelings by engaging in behaviors more consistent with their stated beliefs. An experiment in the early 1990s demonstrated how dissonance can be aroused in individuals and get them to subsequently engage in the more environmentally-friendly behavior of taking shorter showers (Dickerson et al. 1992).

It follows from the theory that cognitive dissonance would be aroused when someone needs to explain they took an action that they had not intended. Applied to free-ridership, that means cognitive dissonance would be aroused for a participant to say, “Yes, I took this action, but no, I didn’t intend to and only did so because of the program.” Those participants feeling the discomfort of cognitive dissonance most acutely would change their motivation during recall (since they can’t change the fact of their action). This after-the-fact re-crafting of their motivations happens internally, when they reflect back on their actions, whether they are reflecting silently or aloud. *Cognitive dissonance theory suggests we are overestimating free-riders.*

The processes described in both attribution and cognitive dissonance theory are internal cognitive processes and are not an artifact of the surveyor-respondent relationship. We turn to the surveyor-respondent relationship next.

Social Desirability in Survey Responses May Contraindicate Current Free-Rider Methods

As previously noted, the *Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approaches* (CPUC-Ed & MECT 2007) go to great length to identify solutions to reduce the risk of bias in question response. One of these types of bias concerns social desirability.

Among ratepayer advocates and evaluators it is common to consider the greatest risk from using self-reports is underestimation. The very initial attempts to estimate free-ridership were undertaken to correct the historical underestimation of ignoring the issue—the equivalent of a zero free-ridership rate. But within a few years of that correction and with the growing sophistication of our methods, evaluators questioned whether free-ridership rates were underestimated because respondents might seek to provide socially-desirable answers to questions about their reasons for participation.

Much has been written about the possibility that participants, when interacting with the surveyor, may try to please the surveyor, cast themselves in a favorable light, or seek to provide the answer “the respondent thinks the interviewer wants.” Yet most of the free-rider bias discussion assumes the likely response bias favors the program. The reasoning is that the participants know they are discussing the program with someone calling “on behalf of the program administrator” and they want to “make nice” by saying, “This is a great program; it’s the reason I did what I did,” or will want to encourage the program administrator to keep handing out the money.

Yet the assumption that the respondent and the evaluator have the same perception of what is socially desirable—“the program made me do it”—has gone unquestioned.

We contend that this is an erroneous assumption about the respondents' likely perception of what is socially desirable. From the respondents' viewpoint, it is socially desirable that they should care about the environment and take actions consistent with that concern.

Over 600 polls reviewed between 1973 and 1993 by Barbara Farhar (1993) showed that increasing majorities of individuals support the environment, energy efficiency, and renewable energy. Since 1980, environmental protection consistently ranked more important than exploring for adequate energy, if that exploration risks spoiling the environment. More recently, a 2007 CBS News/New York Times poll (Teixeira 2007) showed that 68% of respondents supported encouraging conservation over increased production of energy from fossil fuels. These poll findings suggest that respondents who invest in energy efficiency measures are likely to think it is socially desirable for them to have been willing to invest in energy efficiency on their own, without program assistance.

We think it likely that the social desirability bias works to overestimate free-ridership rates, with participants giving socially-desirable responses when they say that they were planning on making the investments on their own.

Free Ridership Estimation Necessitates Predicting Behavior

What Factors Strongly Predict Behavior? Not Many

Psychological studies throughout the past century have sought to explain the reasons for behaviors and how behaviors might be influenced to be different.

A key area of investigation in psychology is the relationship between attitudes and behavior. In 1969, Wicker reviewed studies conducted during the preceding century on the relationship between attitudes and behaviors and concluded, "It is considerably more likely that attitudes will be unrelated or only slightly related to overt behaviors than that attitudes will be closely related to actions."

The past 25 years in our profession have shown that programs relying largely on informational efforts to persuade energy-users to change their behavior, or to make energy-efficient investments, rarely have much success (Ester & Winett 1982; Mckenzie-Mohr 1999). It is only when multiple strategies are used that participation tends to grow (for example, see the *Residential Lighting Best Practices Report*, Itron et al. 2004).

Fishbein & Ajzen (1975) and Ajzen (1991) developed a theory of behavior change that adds values, beliefs, norms, and intentions along with attitudes. Their "theory of planned behavior" is the most commonly used framework driving efforts to promote behavior change in fields such as health behaviors, and it has had some success in explaining behavior choices made by energy users (Peters 1990; Peters et. al. 1998).

Health behavior studies suggest there are additional intervening factors: self-efficacy seems to affect a person's ability to respond at different stages of the behavior adoption process, influencing the establishment of the intention to perform a behavior, as well as the intention to maintain a behavior (Schwarzer 2008; Velicer & Prochaska 2008).

Stern et al. (1999) explored personal values to explain environmentalism and behaviors associated with environmental values. His research resulted in the Values-Beliefs-Norms (VBN) theory: "Anyone who holds these [environmental] values and beliefs experiences a sense of personal moral obligation to take appropriate action. The specific actions they take, however—including pro-environmental consumer behavior—are strongly influenced by factors outside their personal domain" (Stern et al. 1999, 463). Someone with strong VBN motivations would not follow the logic of Ajzen's theory of planned behavior, because the moral component would be greater than the expected utility of the behavior necessary to drive action in Ajzen's theory.

Note, however, that even in the VBN theory, factors outside the personal domain are critical to whether the behavior actually occurs. Those factors include such things as knowledge of what to purchase, sufficient funds to make the purchase, different household or business conditions, etc. The most significant barrier to actually implementing new behavior thus is not necessarily the change in personal values that precede the behavior, but may well be external factors, which vary from person to person. This assertion supports the need for mixed program strategies to reach energy-users.

Lutzenhiser et al. (2002) and Janda et al (2002) formulated a heuristic for thinking through the various internal and external factors that affect energy-user's decision-making. These are the Three Cs: *concerns*, *capacities* and *conditions*. In their work with commercial energy-users responding to the 2001 California energy crisis, they found the Three Cs a convenient framework for understanding the constraints on an energy-user's ability to respond to the crisis. Kunkle et al. (2004) applied the same heuristic to residential energy-users. This framework addresses the very factors Stern posits as the limiting factors on the ability of the individual to implement a new behavior, given personal values and beliefs. The Three Cs framework demonstrates that there is a complex array of barriers that can limit behavior in the context of clear needs and desires to respond.

Intentions are Not a "Slam-Dunk"

Note that all of this research deals with one critical issue: how to predict behavior. And every model comes up short. Human behavior defies any models to date, including models linking intentions to behavior. Why then, do energy efficiency professionals believe that when participants say they *intended* to undertake the action in the absence of an efficiency program, they *indeed would have undertaken* the action in the absence of the program?

The self-report method for measuring free-ridership assumes intentions are a "slam-dunk" for behavior. If someone reports, "I would have done it anyway," they are assigned a free-ridership value of 100%. Yet any student of behavior knows that while better than attitudes and beliefs, intentions are only a weak predictor of behavior. According to Ajzen and Fishbein (2005), meta-analyses covering diverse behavioral domains have reported mean intention-behavior correlations ranging from .44 to .62; that is, intentions account for between 18% and 38% of the variance in behavior. Sheeran (2002) found an overall correlation between intention and behavior as obtained in 422 longitudinal studies of .53, or 28% of the variance in behavior. Ajzen and Fishbein continue, "However, not withstanding these encouraging findings, there is also considerable variability in the magnitude of the observed correlations, and relatively low intention-behavior correlations are sometimes obtained." Thus, even the highest of these reported correlations are not nearly as high as energy program evaluators would expect from weather, which typically accounts for around 90% of the variance. The reported intention-behavior correlations contraindicate the current use of intentions as a proxy for what would have happened in the absence of the program.

Energy Investments in the Real World

Most Energy Users Face Barriers to Efficiency

The assumption that there are potentially lots of free-riders for any program is called into question by the many barriers to energy efficiency investments. We daily increase our understanding of the barriers from our program delivery experiences and evaluation findings. And, as few programs are embraced by virtually all of their target markets or induce the entire slate of targeted behaviors, good program designers are asking the question, "How can I learn more about the barriers to energy efficiency among my customers?"

We contend that energy efficiency is actually hard to do (Peters 2007; Peters et. al 2008). The *Market Effects Scoping Study* (Eto, Prahl & Schlegel 1996) outlined a litany of barriers—11 in all—that limit end-users' ability to implement energy efficiency measures. These barriers range from hassle costs, to access to financing, to misplaced or split incentives.

Over the past 10 years, one might assume that these barriers have surely diminished and, in fact, some of them have. It is easier to find an energy-efficient appliance today because of ENERGY STAR® labeling. It is easier to find an ENERGY STAR®-labeled house and, because of LEED certification, it is even easier to find a commercial building that might be more energy-efficient than code (although LEED is no guarantee of energy efficiency beyond code, or even efficiency to code [Turner 2008], which illustrates the point of this section).

It is still *not* common for your local mechanical contractor to recommend a high efficiency furnace or air conditioner in most communities; typically, you have to ask for it. It is uncommon for a standard electrical contractor to know about photo-dimming ballasts or to know even about super-T-8s—you have to ask for them. If you are someone who wants to improve the efficiency of your chiller or your boiler, and to compare different types of packaged cooling and heating systems in performance and efficiency, it will be difficult to find someone who can do that sort of analysis. If you want to go further and improve the way your grocery store refrigeration system is operated, or your hospital is operated, it will be very difficult to find people who have the experience and capability to meet that need (Peters et al. 2008). These scenarios provide portraits of people who want to do efficiency—the quintessential free-rider—yet who do not know how; perhaps you *would* have done it without the program, if only you *could* have.

The barriers continue to be so substantial that, by and large, little energy efficiency has been installed outside of energy efficiency programs.

Market transformation program evaluations suggest that only a few markets have been transformed to the point where energy-users will ask, designers/engineers will specify, retailers or contractors will offer, and wholesalers and manufacturers will readily supply enough of a product that free-riders can truly be common. And, even so, in those transforming markets, carefully placed incentives and marketing are just as necessary to keep the market moving as it is for Coca-Cola or McDonalds to keep advertising and promoting their products, year in and out.

Rogers, the father of diffusion of innovations theory, suggests that incentives are most useful at the point when about half the population has adopted the innovation. At that point, incentives can induce adoption by people with different psychological traits than those that already adopted the innovation. If he is correct, or correct for some innovations, this contradicts the notion that efficiency programs should be delivered only during the early part of the adoption curve, and that increasing free-ridership rates provide a signal that efficiency programs should be redesigned or discontinued.

Although the diffusion of innovation model appears on the surface to be linear—as one moves from awareness to persuasion, decision, action, and confirmation—Reed, Jordan & Vine (2007) demonstrate in their development of a generic model for energy efficiency programs that each party to the market needs to make independent decisions for diffusion to occur. The various market actors—knowledge workers, policymakers, businesses, and energy-users—have different decisions to make to participate in the process of energy-efficient technology development and growth. What is obvious in looking at the logic model of this comprehensive diffusion of energy efficiency innovations is that the diffusion process can stall if any components are at any of a multitude of areas in the overall diffusion process.

Prognosis for Free-Rider Measurement

Pro-environmental values and beliefs are at their highest point in 20 years of public opinion studies, as documented by Nisbet & Myers (2007, 459). The "personal importance" of global warming rose from 27% in 1997 to 51% in 2007. Comparing responses to an open-ended question of the "single biggest environmental problem the world faces at this time," in 2006, 16% said global warming and, in 2007, 33% said global warming.

The Values-Beliefs-Norms theory suggests that these pro-environmental values are likely to translate into higher measured free-ridership as energy-users will feel a stronger moral obligation to pursue the environmentally-correct behavior. Attribution theory likewise suggests program participants will retrospectively view their motivations in light of this moral obligation.

Yet, because energy efficiency remains difficult to do, we contend these people are unlikely to be true free-riders. We expect it will be precisely energy-users that have a sense of moral obligation who will seek out efficiency programs in order to address the barriers they experience and overcome their capacities, conditions, and constraints.

Stern posits these people are precisely the types of people that programs want to have participate, because, "People who have participated meaningfully in decisions about an intervention program or who have confidence that others like them have participated in [a program] are more likely to trust information coming from the program and are more strongly motivated to work for its goals" (Stern et al. 1999, 475).

Stern's statement is consistent with diffusion theory, which tells us that marketers need very early adopters—those who already are inclined toward or interested in their products and services—in order for the product or service to be purchased and used. These people serve to demonstrate and normalize the product or service to later adopters. People with no motivation or interest in a product or service will not be readily persuaded to adopt it. Capture and retention of interested customers is the primary focus of most marketing and sales efforts on the part of the general business community. That energy efficiency businesses would distance themselves from those with high motivation solely so as to not risk increasing free-riders will severely limit the effectiveness of energy efficiency efforts.

Due to the presence of so many barriers to behavior and the multifaceted nature of the current program designs, being able to isolate how a customer was induced to take the efficiency action—and thereby prove the customer was induced by the program and not a free-rider—will be extremely difficult. Current generation programs seek to actively work with designers, vendors, other trade allies, and energy-users to help all the people involved in the transaction make the decisions that will result in energy efficiency. As a result, the energy-user's point-of-decision is less momentous (and less memorable) when the design professionals and vendors advocate the efficient decision from the outset as the option to be rejected, rather than the alternative to be embraced. Current program designs seek to make it easier for end-users to just do the right thing in the first place.

Market-Based Approach to the Free-Ridership Issue

In our view, current free-rider measurement thwarts a comprehensive approach to changing energy behaviors, as Friedmann (2007) argues, and will lead to the abandonment of energy efficiency programs too early.

We believe a better approach for policymakers would be to set market targets (e.g., a percentage of market-share) and do market studies that track the progress toward increased market-share.[2] There is no known "tipping point" percent at which any specific technology will be likely to flip to the point of majority adoption. But it is possible to make estimates of the rate of adoption, to determine whether the rate of adoption is occurring in a manner that justifies public support, and at what level. This recommendation leaves open the possibility that, as Rogers suggests, incentives may be even more important for later adopters than for early ones.

An example of this target market type of approach may be found by looking at the support for resource-efficient washing machines (Feldman, Peters & Rosenberg 2001; KEMA 2007; Pacific Energy Associates 2001). The approach taken by the Northwest Energy Efficiency Alliance (NEEA) was to track market progress as different interventions were used to stimulate market adoption of the resource-efficient washing machines. Between 1998 and 2001, incentives for consumers and for retailers were used in different configurations and amounts, along with marketing, to stimulate demand and supply. While NEEA's budget availability played a significant role in the program design decisions, eventually marketing was determined to be the only tool required for on-going market-share growth.

Key to this project, was the active involvement in decisions about how to adjust the program over time, fueled by real-time data on market progress and a clear sense of the desired direction for the market through realistic goal-setting and adjusting. Using this type of approach in the residential lighting market, NEEA recently concluded that marketing and on-going monitoring, as well as active involvement in quality and policy issues, are all that remain necessary to maintain market-share growth for many compact florescent products (KEMA). As Jump et al. (2008) note, the need to change program strategies is also apparent in the California CFL market.

If ratepayer advocates and public utility commissions are uncomfortable with such an approach, we recommend that public policy would be best served by transferring efficiency programs—especially efforts that seek true market change—from the domain of utilities to the domain of non-profit public interest groups.

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[2] The recommendation to track market effects is not new. Consider Saxonis' conclusion to a 1989 paper on free-riders: "We believe that evaluations should place greater emphasis on what is actually happening in the marketplace and less emphasis on the consumers' assessment of what appliances they *would* have purchased [emphasis in original]."

Conclusion

Currently, program design occurs with a view to minimize a number—the estimated free-ridership rate—that may be (and, in our view, is) an artifact of poor measurement and incomplete thinking about the underlying market and consumer behaviors.

In addition to the consequences for program administrators, designers, and implementers, the concern about free-riders has significant consequences for research. Estimating free-ridership rates is costly and uses a significant portion of evaluation budgets. Free-ridership estimation dominates discussion among researchers of energy-user behavioral issues, diverting attention from such important topics of energy-user behavior as how to best influence users to make the energy-efficient choice. And free-ridership estimation uses a significant portion of the evaluation resource that is perhaps the scarcest: participants' time. Most of the free-ridership question-sets in current use take between ten and twenty minutes to deploy, greatly limiting the time available to pursue with the respondent other questions of interest.

Clearly, these consequences of current approaches to free-ridership measurement are significant, impacting program design, delivery, and research, and customers and trade allies involved in the programs. Most importantly, our ability to rapidly reduce energy consumption is hobbled.

We advocate moving away from a measure-specific assessment of free-riders and instead using a market-based approach. This includes: setting aggressive market goals for adoption of energy efficiency products and services; tracking progress toward those goals; and adjusting a mix of interventions—incentives, relationships, marketing, technical support, and market support upstream and downstream—to support the product or service, and designed to address the concerns, constraints and conditions of the targeted energy-users. Improved targeting, improved messaging, and improved products and services themselves will be the only way to increase market-share in a manner sufficiently rapid to make a difference to the climate.

Meanwhile, we have a long way to go to fully understand the motivations that really drive energy-users to participate in energy efficiency programs, and to purchase energy efficiency services and products. If we hope to have a market-based response in the future, one that can function in any energy price environment, we need to focus research efforts, not on increasingly sophisticated attempts to parse motivations related to the purchase of specific measures as a way protect ratepayers, but on understanding how to rapidly induce action and increase energy savings.

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