The Roles of Incentives and Information in DSM Programs

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The purpose of this paper is to assist utilities in improving the design of their rebate and audit-type programs. In preparing it, the authors assembled and reviewed documents from more than 50 sources, covering evaluation results of hundreds of utility DSM programs. These studies contain compelling information about the roles of incentives and information in program design.

For years, program planners have assumed that financial incentives (e.g., rebates) are necessary to achieve participation goals. Recent evidence supports the idea that incentives indeed have a role in attracting customers to consider energy efficiency measures. This evidence strongly suggests, however, that financial incentives alone are ineffective in moving customers to take those measures. Factual information and utility implementation methods appear far more influential in the decision-making of these customers, limiting the role of incentives to improving customer awareness or attention and perhaps accelerating their actions.

The paper documents this growing body of evidence and makes the case that program design and implementation strategies should focus more heavily on non-incentive features to achieve success. In particular, the paper suggests that a utility can operate a highly successful incentive program while offering relatively low rebates to customers, and gain greater effectiveness with its customer audit program. It provides specific recommendations on how this might be accomplished.

Introduction

For years, program planners have assumed that payback is the salient factor motivating a customer's decision about whether to participate in a DSM program. Under this assumption, significant financial incentives (e.g., rebates) were considered necessary to reduce payback time and overcome barriers to participation.

Recent evidence supports the idea that incentives indeed have a role in attracting customers to consider energy efficiency measures. This evidence strongly suggests, however, that the customer's decision-making process is far more complex than a simple payback analysis. It also incorporates factors such as risk, aesthetics, convenience, and transaction costs. Thus, financial incentives alone are ineffective in moving customers to take efficiency measures. Factual information and utility implementation methods appear far more influential in the decision-making of these customers, limiting the role of incentives to improving customer awareness or attention and perhaps accelerating their actions.

Program design and implementation strategies should focus more heavily on non-incentive features to achieve success. In particular, it appears that utilities can operate highly successful incentive programs while offering lower rebates to customers than they may have in the past and gain greater effectiveness with customer audit programs. The body of this paper provides specific recommendations on how this might be accomplished.

The Impact of Incentives on Market Penetration

Incentives have been used to motivate participation in conservation programs by reducing first costs and payback periods to levels that are acceptable by most customers' criteria. Programs that depend on incentives to attain significant market penetration implicitly assume that first costs and payback periods are the primary decision criteria for most customers. A review of the literature calls this

assumption into question (Dennis et al. 1990). Spellman points out that market penetration models based on payback "do not perform well when told the utility will pay 100% of the direct cost of all measures, and will pay for a contractor to install and service these measures. With these levels of incentives, rate of return or payback calculations no longer hold much meaning. A strict economic model would predict a 100% market penetration, but a good behavioral model would not." (Spellman 1989)

Several studies support the conclusion that the link between incentive levels and customer participation is weak (Berry 1990; Cambridge Systematic, Inc. 1990; Farhar 1991; Ignelzi 1990; Pacific Consulting Group 1990; Train 1987). Berry, in her study of market penetration, concluded that meeting a customer's economic criteria for acceptance is a necessary, but not sufficient, condition for inducing participation. Because other factors can act as a veto on the decision to participate or to make an energy-efficient investment, it is often difficult to discern the independent influence of incentives (Berry 1990). Farhar cited Craig Smith's study of the Pacific Gas and Electric "Great Rebate Program" in which he reported that rebates made the difference to install measures for two-thirds of the respondents. But she concluded by noting that there has not been a high correlation between the size of the incentive and the rate of response (Farhar 1991). Train attributed thirty percent of the kWh saved to the existence of rebates in his evaluation of Southern California Edison's commercial/industrial rebate program (Train 1987). Drawing on evaluations of several Pacific Gas and Electric non-residential programs, Ignelzi determined that providing people with information on the availability of efficiency measures was nearly as effective as providing financial incentives to encourage their implementation (Ignelzi 1990).

Perhaps the strongest case for a weak link between rebates and program participation is the Commercial Incentive Experiment conducted by Niagara Mohawk Power Corporation (Cambridge Systematic, Inc. 1990). This controlled experiment promoted the purchase of efficient fluorescent lamps to five different treatment groups: a direct mail information group, a direct mail partial rebate group, a direct mail full rebate group, an in-person full rebate group, and a supplier-based partial rebate group. The study found that the mail-based rebate offers did not increase the intention to install efficient lamps beyond the rate of the information treatment, though they did produce earlier measure implementation. Furthermore, full rebates ($0.80 per lamp) did not significantly improve participation over partial rebates ($0.40 per lamp).

Incentives are inefficient as a motivating force because payback and first cost are not the primary motivating factors in customer decision-making. Residential customers are motivated to participate by life style and convenience factors as well as potential cost savings (Mihlmester 1992). Commercial customers appear to participate in conservation programs primarily in order to reduce operating expenses (Freeman and Hamilton 199 1; Ignelzi 1990; Pacific Consulting Group 1990; Quantum Consulting, Inc. 1990). For example, Pacific Consulting Group and Quantum Consulting, in their studies of Pacific Gas and Electric's rebate programs, found that most customers decided to participate because they wanted to reduce their utility bill size, conserve energy, or lower their operating and maintenance costs. Payback period and availability of financial incentives ranked seventh and eighth on the list of reasons given for participation (Pacific Consulting Group 1990; Quantum Consulting, Inc. 1989; Quantum Consulting, Inc. 1990).

As evidence that payback is not the primary motivator for commercial customers, Michaels and Ornstein point out that "new carpet and fresh paint on the walls have no payback, yet service facilities retrofit in these areas every 5 to 10 years, Quality lighting and greater comfort are similarly in demand. " The lesson drawn is that energy efficiency should be marketed based on all its benefits, not just the economic ones. Michaels and Ornstein question the conventional wisdom that insufficient capital, lack of information, and short planning horizons drive low program participation (Michaels and Ornstein 1992). They suggest instead that customers choose not to participate because:

- conservation investment requires investment of management time that may have a high opportunity cost;
- conservation investment has risks that the new equipment will perform differently in a manner that is detrimental to operations; and
- available conservation technologies in the near future may improve, offering lower price and improved performance, providing positive value to delaying action.

Nevertheless, the presence of an incentive may be very important, even if its size is not (Farhar 1991; Vine and Harris 1988). Incentives can serve several purposes: they can catch the customer's attention (Ignelzi 1990; Nadel 1990), they can establish the credibility of a utility's conservation message (Berry 1990; Train 1987), and they can influence the timing of energy conservation measure (ECM) implementation (Cambridge Systematic, Inc.

1990; Pacific Consulting Group 1990; Warner et al. 1991). In some cases, high incentives can overcome non-economic barriers such as concerns about risk, reliability, and impacts on other aspects of the business. However, it may be more cost-effective to address these barriers directly through such strategies as guaranteed payback on investment and/or performance of equipment, or rate guarantees (to eliminate uncertainty over future electricity and fuel prices) (George 1988; Michaels and Ornstein 1992).

It must be mentioned that several authors explicitly stress the role of incentives in attaining high penetration rates. Limaye suggests that penetration as a function of the incentive level follows an S curve (Limaye et al. 1989). This appears to be mere speculation, since he offers no evidence to support his conclusions. Nadel offers more credible conclusions based on his analysis of more than 200 commercial and industrial conservation and load management programs. He determined that the highest participation rates and highest savings were achieved by comprehensive programs that combined regular contacts with eligible customers, comprehensive technical assistance, and financial incentives that pay the majority of measure installation costs (Nadel 1990). Clearly, high incentive levels alone do not achieve high penetration rates. It is less clear that the high incentives offered by these successful programs were actually necessary to satisfy customers' efficiency investment criteria or whether the incentives simply compensated for transaction costs, cost of information, and concerns about reliability and risk.

It should also be emphasized that the nature of the program should be considered when gauging the likely importance of incentives. Several authors have identified the importance of paying full incremental costs for new construction program participants (Christie et al. 1992; Hewitt et al. 1992; Fryer and Schalch 1992). Builders and architects could be expected to weigh first costs more heavily when considering energy efficient options since they would not reap the benefits of reduced operational costs .

Market segment should also be considered. Mihlmester points out that cash constraints and insufficient financing options are more likely to restrict participation among small commercial and industrial customers (Mihlmester 1992). Several authors suggest that the same would hold for low-income residential customers. Supporting evidence for the market segmentation theme can be found in Jordan and Nadel's review of industrial DSM programs (Jordan and Nadel 1992). BPA's Aluminum Smelter Conservation/ Modernization program, which targeted the northwest region's largest electricity customers, achieved a participation rate of 70% even though the incentive level was only 1/30 that offered to small industrial customers.

Non-Incentive Components of a Successful Conservation Program

The above discussion shows that financial incentives, even at high levels, may be incapable of attracting large percentages of the target market. Perhaps a tendency to rely heavily on incentives is because of their conceptual simplicity—just about anyone can be convinced to be conservation-conscious if the price is right. But a review of the literature turns up an extensive list of steps a utility can take to improve program performance without offering high financial incentives. These steps fall into the general categories of communication, program flexibility, timeliness, program simplicity, relations with trade allies and vendors, and other program design features.

Communication

- Direct contact is particularly effective at motivating participation (Christie et al. 1992; Freeman and Hamilton 1991; George 1988; Jordan and Nadel 1992; Nadel 1990; Quantum Consulting, Inc. 1989; Quantum Consulting, Inc. 1990). It may be less expensive than direct mail, as well (Berry 1990).

- Promote different DSM technologies through different channels, including vendors and trade allies (Freeman and Hamilton 1991; George 1988; Nadel 1990).

- Target mailings to arrive at the right desk (Jenkins and Hobbie 1991; Jordan and Nadel 1992).

- Target program approaches and marketing efforts to the different audiences (Fryer and Schalch 1992; Hewitt et al. 1992; Jordan and Nadel 1992; Quantum Consulting, Inc. 1989). Target audiences should be involved in program planning so the final program design truly meets their needs (Nadel 1990). Pretest external communications materials (Schuck and Van Liere 1991). In choosing a market segmenting approach, select a method that takes into account non-economic factors in decision-making as well as economic factors.

- Develop communications tools that rely on personalized, vivid information rather than comprehensive data summaries (Berry 1990; Peters 1988). Focus on testimonials from satisfied customers, direct contact with field representatives, and promotion through trade allies and vendors. Word of mouth is also a potentially effective channel.

- Emphasize multiple benefits of DSM such as improved safety, reliability, quality control, environmental benefits, ease of maintenance, profitability, or

productivity (Mihlmester 1992; Newcomb 1990; Peters 1988; Schuck and Van Liere 1991).

- Stress avoidance of loss of money. People are more sensitive to current loss than to future gain (Berry 1990).

- Satisfaction is closely related to whether a customer's expectations are met or exceeded. Be specific in setting customers' expectations (Schuck and Van Liere 1991). Provide a clear statement to customers of the costs and timeline for projects (Jamieson and Keating 1988). Make incentive levels known up front (Fuller 1992) .

- Stress competency and professionalism among the customer representative staff (Schuck and Van Liere 199 1). Their contact with the customer can be the deciding factor in establishing customer confidence in the utility and in motivating the customer to participate. Make sure customer representatives are well versed on the purpose and value of DSM programs as well as program and technology details (Cambridge Systematic, Inc. 1990). Designate principal and backup personnel for responding to customer questions. Consider employee incentives as a means of motivating staff (George 1988). Make sure field staff receive adequate support from management (Freeman and Hamilton 1991).

- Establish two-way communication with customers by incorporating methods for gathering input from front-line customer service staff (Schuck and Van Liere 1991).

- Report results of the energy audit and financial analysis in terms the customer can understand (Jamieson and Keating 1988).

- Maintain consistent customer contact: repeat contacts should be handled by the same representative who handled the initial contact (Jenkins and Hobbie 1991). This appears to be especially important for supplier-based rebate programs (Cambridge Systematic, Inc. 1990).

- Explain to customers the utility's motivation for offering the program (Mihlmester 1992).

Program Flexibility

- Offer a diversity of services and incentive structures (George 1988; Hewitt et al. 1992; Jamieson and Keating 1988; Nadel 1990; Peters 1988). Allowing a choice increases the commitment to the chosen action.

- Design program with enough flexibility to allow incremental participation. Ongoing commitments can be obtained from people by first soliciting a smaller commitment (Dennis et al. 1990; Pacific Consulting Group 1990).

- Be flexible on timing to allow corporations to install measures during their slow periods. A conservation project, like any capital investment, should be ready for implementation at the beginning of the customer's fiscal year in order to assure that the project can be accomplished (Fuller 1992; Peters 1988).

Timeliness

- Customer satisfaction declines as the number of times the customer contacts the utility increases (Schuck and Van Liere 1991).

- Pace staff and program marketing so that phones are answered promptly (Schuck and Van Liere 1991).

- Schedule appointments within a few days and at the customer's convenience (Schuck and Van Liere 1991).

- Avoid waiting lists (Schuck and Van Liere 1991).

- Streamline application and approval processes (Freeman and Hamilton 199 1; George 1988; Schuck and Van Liere 1991).

- Make efforts to arrive on time, every time (Schuck and Van Liere 1991).

- Meet promises made to customers regarding time (Schuck and Van Liere 1991).

- Promptly pay invoices and allow for an "inspect and pay as you go" approach to project management (Jamieson and Keating 1988).

Program Simplicity

- Keep communication simple. Don't overwhelm the customer with excessive detail (George 1988; Schuck and Van Liere 1991). Find out how much information the customer really wants and how technical it needs to be.

- Similar DSM programs should be bundled together as one major program and clearly differentiated from other major programs offered by the utility (Nadel 1990; Schuck and Van Liere 1991).

- Simplify program procedures and materials. One-step application procedures, assistance in filling out forms,

and simple marketing materials and forms increase the likelihood of participation (George 1988; Nadel 1990; Peters 1988).

Relations with Trade Allies and Vendors

Good relations with trade allies and vendors are crucial to maximize market penetration (Pacific Consulting Group 1990; Stout and Sanders 1990). Trade allies and vendors influence customer purchase decisions through changes in stocking practices and through person-to-person promotion (Freeman and Hamilton 1991; George 1988). Start building good relations from the beginning of the program by inviting trade allies to participate in program design and promotion. For utilities lacking in customer confidence, cooperative marketing with trade allies, community organizations and local governments can provide the program with an important degree of credibility. Several sources identified customer confidence in the utility as a significant factor differentiating participants from non-participants (Pacific Consulting Group 1990).

Other Program Design Features

- Address risk directly whenever possible. Suggestions on how to accomplish this include using guaranteed payback on investment and/or performance of equipment, instead of large up-front subsidies (George 1988). Peters found that most industrial firms consider energy conservation to be a high risk investment (Peters 1988; Michaels and Ornstein 1992).

- Consider rate guarantees as an alternative to subsidies (to eliminate uncertainty over future electricity and fuel prices) (George 1988; Michaels and Ornstein 1992).

- Promote new technologies that are not widely adopted in the marketplace. Free-rider percentages are higher when rebates are provided for technologies that are already being purchased by many customers. By promoting advanced energy-saving technologies, greater savings can be achieved than with first-generation technologies alone. On the other hand, initial participation rates may be lower and substantial marketing efforts may be required to promote these technologies (Nadel 1990).

- Direct assistance gets results (either through direct installation or by assisting customers in identifying and selecting vendors and contractors) (George 1988).

- Offer technical assistance to help target audience identify and implement conservation and load management opportunities (Christie et al. 1992; Freeman and Hamilton 1991; Peters 1988). Depth of assistance should be matched to the type of customer and to the other services offered. Small customers generally require simple analysis and extensive assistance implementing measures, If the ratio of recommended ECMs to installed ECMs is low, avoid doing detailed technical audits (Jamieson and Keating 1988; Nadel 1990).

Guidelines for Setting Incentives

The success and failure of various programs suggest the following guidelines in choosing an incentive mechanism and in setting incentive levels:

- Caution should be exercised in using payback as a mechanism for setting incentive levels because payback means different things to the customer than to the utility (Peters 1988). It is also somewhat ambiguous in that several methods are used to calculate it. Michaels and Ornstein conclude that payback and avoided cost are appropriate criteria for initially screening measures but do not relate to customers' decision-making criteria when used to determine incentives (Michaels and Ornstein 1992). They recommend that incentives instead be based on measure cost discounts. Total cost, whether borne by the customer or the utility in any combination, should be considered.

- Most commercial/industrial customers do not need loans (Farhar 1991; George 1988; Nadel 1990). Do not spend program resources on this type of incentive.

- In choosing the most appropriate variable for calculating incentives (savings, measure costs, etc.) select the variable in which you have the most confidence (Jamieson and Keating 1988).

- Incentives can be money well spent. In several cases, simple rebates have been more effective than demand-bidding at achieving significant market penetration cost-effectively (Hicks 1989; Nadel 1990).

- Measures with long paybacks that meet the screening requirements may only need incentives sufficient to buy down the customer payback period to four years. This conclusion is based on Warner et al.'s finding that implementation of measures recommended during commercial audits was not strongly affected by payback until payback exceeded five years (Warner et al. 1991). This finding is entirely consistent with studies referred to earlier in which customers were found to participate in efficiency programs primarily to cut operating costs. It should also be noted that this conclusion is consistent with results from the Niagara Mohawk experiment since, in that experiment, the only measures under consideration were lighting

measures. Since these measures have a payback of less than one year, the Niagara experiment would not accurately gauge the impact of incentives on the penetration of ECMs with long paybacks.

- For measures having a short, nonsubsidized payback, offer at least a token rebate to bolster credibility, get the customer's attention, and accelerate the timetable for measure implementation.

Some Notes on Free-Riders

Several studies commented on the effects of program design on free-ridership. Two studies in particular noted that supplier-based rebate plans primarily resulted in free-riding (Cambridge Systematic, Inc. 1990; Nadel 1988). But several studies raised concerns about free-ridership estimation techniques that call virtually all estimates into question. For example, Freeman and Hamilton and others found significant differences between participant and non-participant attitudes toward the utility and toward their energy consumption practices (Freeman and Hamilton 1991; Pacific Consulting Group 1990; Quantum Consulting, Inc. 1989; Quantum Consulting, Inc. 1990). This suggests that care must be exercised in estimating naturally occurring conservation among participants based on reported naturally occurring conservation among non-participants. Train has developed a methodology based on qualitative choice analysis that enables researchers to control for systematic differences when comparing participants and control groups (Parikh et al. 1993; Train 1986; Train 1993).

Rathbun et al. found that estimates based on self-reports from participants and non-participants indicated free-ridership on the order of 55-75% for a Wisconsin Public Service air conditioner incentive program (Rathbun et al. 1990). Yet prior to the program, efficient air conditioners made up only 17% of purchased stock. Rathbun explained the discrepancy by noting results from a trade ally survey indicating that the direct rebate program had a strong impact on dealer stocking and promotion practices. If such was indeed the case, then both participant and non-participant self-reporting would systematically overestimate the proportion of free-riders and underestimate the proportion of free-drivers.

Another potential source of systematic error is highlighted in Pacific Consulting Group's study of the Pacific Gas and Electric Customized Gas and Electric Financial Incentives Program (Pacific Consulting Group 1990). This study found that customers took additional conservation actions on their own as a result of having participated in the incentive program. An accurate free-ridership estimate would need to credit the utility with energy conserved as a result of these free-driver practices.

The above experiences indicate that accurately measuring free-ridership and free-drivership is problematic. Some of the problem results from ambiguity in the definition of free-rider. An example of a pitfall stemming from free-rider definition is Kreitler's claim that "as incentive size increases, the level of free-ridership will decrease" (presumably as a percentage of the total participation) (Kreitler 1991). This conclusion is based on the assumption that participation goes up with increased incentive levels. Setting aside objections to the assumption concerning the link between incentive levels and participation rates, the conclusion remains meaningless due to the vagueness and rigidity in the definition of free-ridership. The definition implies that the absolute number of free-riders is constant for all incentive levels above zero. But for any given incentive level, a certain number of the program participants would still have participated for a fraction of the incentive. As the incentive level goes up, the number of customers who would have participated at a lower incentive level also goes up. These participants could thus also be considered free-riders in the sense that they were paid more than necessary to motivate their participation.

Consider also the case, which occurs quite frequently (Cambridge Systematic, Inc. 1990; Pacific Consulting Group 1990; Quantum Consulting, Inc. 1989; Warner et al. 1991), where the customer who claims he would have taken the action sometime anyway is induced by the program to take the action sooner. This customer is not a true free-rider, though he is often counted as one.

Clearly, any definition that tries to label a customer as either entirely influenced by the program or purely a free-rider suffers from unacceptable rigidity. There are too many cases when a customer is not entirely one or the other under such a simple definition. The first step in assessing free-ridership is to define it adequately.

Conclusion

There are many important components to a DSM program. The evidence of the studies cited throughout this paper, based on several hundred program reviews, strongly supports the case that incentives indeed have a role to play in programs but that their role may be less important and quite different than formerly thought. A successful program must contain well-constructed non-incentive components; high on this list of components is effective customer education.

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