SMART PROGRAMS:
THE SOCIAL-PSYCHOLOGICAL FOUNDATIONS OF SUCCESSFUL ENERGY CONSERVATION DELIVERY SYSTEMS

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ABSTRACT

In spite of high potential for saving energy in U.S. buildings, adoption rates for residential conservation technologies have been modest. Research in the social and behavioral sciences helps to explain these low adoption rates, and suggests strategies for improving conservation delivery systems. A social diffusion model is proposed as a useful conceptual framework for analyzing the spread of conservation devices. This formulation stresses the importance of existing social networks, focusing on the transmission of vivid and personal information from credible sources and the modeling of the behavior of trusted others. A review is presented of successful utility, government, and community conservation programs that address the complexities of human information processing and make special efforts to overcome structural barriers to participation by all energy consumers. Exemplary "Smart Programs" are identified, and the following checklist is provided for use in conservation program planning implementation and evaluation.

I. MARKETING CONSERVATION

1) Vivid Information - Use concrete examples and demonstrations.
2) Personalized Information - Use Individually tailored recommendations.
3) Personal Appeals - Use face-to-face interactions.
4) Social Diffusion - Make use of friends and neighbors.
5) Credible Sources - Use local organizations and individuals.
6) Observability - Use highly visible local demonstrations.
7) Market Segmentation - Target information to specific clients.
8) Market Penetration - Use door-to-door canvassing.
9) Equity Concerns - Reach renters, low income, minorities, elderly.

II. DELIVERING CONSERVATION

1) Convenience - Offer simple and easy sign-up procedures.
2) Flexibility - Give consumer a choice of actions.
3) Hard Interventions - Install inexpensive conservation hardware.
4) Quick Results - Focus on rapid recognition of program benefits.
5) Active Participation - Encourage do-it-yourself actions.
6) Financial Incentives - Offer loans, grants, rebates.
7) Mix of Services - Coordinate various energy program offerings.
8) Quality Control - Conduct follow-up inspections.
9) Program Evaluation - Include evaluation in initial program design.
10) Consumption Data - Use metering or utility bills in evaluation.

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While most experts agree that the potential for saving energy in U.S. buildings is substantial, recent studies show that adoption rates for conservation measures are quite modest [1]. The limited success of informational campaigns promoting energy efficiency improvements prompted the U.S. Department of Energy to suggest that there is a "weak linkage" between the consumer's receipt of conservation information and the motivation to act on that information [2]. If we hope to realize the enormous savings inherent in existing conservation technologies, we must understand this "weak linkage", and design programs to overcome typical barriers to adoption of conservation devices.

In this paper we are primarily concerned with programs promoting physical improvements to buildings, i.e., energy efficiency, rather than behavioral changes. We briefly describe exemplary Smart Programs to illustrate how incorporating social-psychological principles into program design can substantially improve a program's effectiveness. We also highlight key administrative features to show how some programs have been able to remove structural barriers to widespread adoption of cost-effective conservation technologies. In general, we find that the most successful energy efficiency programs have implicitly relied on a social diffusion model of conservation device adoption. In explicating this model and detailing salient aspects of these Smart Programs, we hope to aid others in designing conservation delivery systems with high market penetration and improved adoption rates.

The following checklist highlights the program elements we find most effective and summarizes recommendations made in the body of the paper. This checklist is intended as a planning tool for clarifying program parameters, identifying target populations, and developing marketing strategies.

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Conservation delivery systems that have employed strategies from the Smart Programs Checklist are discussed below in the context of five general subject areas: (1) Implicit Theories of Conservation Behavior, (2) The Form of Informational Appeals, (3) Credibility of Information Sources, (4) The Diffusion of Innovations, and (5) Market Penetration and Equity.

IMPLICIT THEORIES OF CONSERVATION BEHAVIOR

Energy conservation programs have emphasized the development of accurate and reliable information and its dissemination to as many people as possible, usually through bill inserts, print advertisements, and broadcast media announcements. These large-scale information campaigns have implicitly relied on two vague theories of conservation behavior: the attitude model and the rational-economic model [3].

While the attitude model assumes that conservation behavior will follow automatically from favorable attitudes toward conservation, social science research demonstrates that there is rarely a strong, direct or consistent relationship between attitudes and subsequent action [4]. Survey research also indicates that in spite of high levels of concern about the energy crisis, no clear or direct relationship exists between energy-related attitudes and conservation behavior [5].

The rational-economic model assumes that people will perform conservation behaviors which are economically advantageous. Most government and utility conservation programs are based on the assumption that complete information is necessary to make rational decisions in the energy market since new technologies and fluctuating energy prices have rendered older information and decision making patterns obsolete. In short, people are viewed as potential expert energy investors and programs are constructed as if consumers will automatically use accurate information in decisions to purchase conservation devices. Unfortunately, even when people act as investors, the communication process is not this simple. In order to take advantage of economic incentives, one must first understand the technical aspects of the incentive, and then act to maximize economic self-interest.

While recent surveys indicate that a majority of U.S. households cite payback as a barrier to adoption of solar technologies, other studies show that three out of four U.S. homeowners are unable to offer even a range of costs for solar equipment, much less a precise figure [6]. Researchers also find a significant gap between claimed awareness of energy programs such as tax credits and actual knowledge of provisions [3]. As Stern and Aronson note, "for inforation to be effective in a decision process, making it available is not enough" [7].

THE FORM OF INFORMATIONAL APPEALS

Utility and government efforts to promote conservation have relied on traditional marketing techniques with generally poor results. Even though direct mailings and bill inserts have been used extensively, these techniques typically generate response rates of under 5% for conservation programs. Evaluation of these programs typically reveals that clients heard about the program through word-of-mouth and only secondarily through traditional media channels [8].

Some energy programs have been able to increase their effectiveness by presenting conservation information in a vivid and personal form. Cognitive psychologists suggest that people will assign disproportionate weight to vivid information which is highly concrete and personalized [9]. In other words, an impersonal summary table of kilowatts or therms saved is less likely to convince someone to install insulation than personally relevant information transmitted via face-to-face interaction.

For example, some Pacific Gas and Electric (P.G.and E.) home energy

auditors describe the impact of air infiltration around doors, windows, and fixtures as equivalent to a hole the size of a basketball in your living room wall. Such vivid examples are often more effective at getting clients to caulk and weatherstrip their homes than pages of computer-printed heat-loss calculations. Yates and Aronson [10] describe additional ways to increase the vividness and personal relevance of information in a home energy audit, including (1) using the customer's own bill to illustrate points about energy consumption, (2) providing normative information about similar people who have saved money by adopting energy-conserving devices, and (3) providing consumers with case studies of "superconservers" who have been exceptionally successful at conserving energy.

According to a recent study by the Oak Ridge National Laboratory, basic characteristics of effective educational programs can be applied to conservation, including basic notions such as: (1) Use clear, concise, and simple language; (2) Personalize information; (3) Make concrete recommendations; (4) Use credible and authoritative sources; and (5) Tailor information to specific users [11]. Making use of these recommendations requires a working knowledge of a program's target population.

For example, the California Energy Extension Service (CEES) found that conservation programs for businesses were most successful when they utilized profit/loss terminology [12]. Similarly, some multi-unit energy conservation programs have worked best when the marketing strategy is geared toward the business concerns of apartment owners. A Southern California Association of Governments and CEES program sells energy efficiency to apartment owners through its "Return on Investment" program by stressing the increased profitability and salability of their buildings. Workshops are offered through existing apartment owners associations and include a number of marketing techniques suggested above, including (1) Exemplary case studies (details of how association members obtained energy savings), (2) Concrete suggestions (how to pass-through costs under rent control or how to claim tax credits), and (3) Vivid presentation of conservation technologies (display boards with energy efficient devices which are detached and passed around the room for inspection) [13]. A key to the program's success was the contribution of a local property owner with high credibility, substantial knowledge of the market, and good public speaking abilities.

Others have found that it is even more effective to tailor multi-unit conservation programs to meet the individual concerns of apartment managers rather than owners. Several housing programs address the concerns of managers by offering to give separate workshops to tenants on how to use energy more efficiently and better maintain their apartments [14]. Similarly, some utility auditors and energy service companies have had success generating clients for their multi-unit conservation programs by showing apartment managers how they can impress owners with energy savings and tenants with improved comfort [15]. In each of these cases, the key has been to realistically address the personal concerns of the target population in a vivid and understandable way.

Many programs report that a particularly effective strategy has been to focus on energy saving measures which promise to be immediate and quantifiable. Making energy visible through in-house metering accomplishes this very vividly by providing instant feedback to the energy consumer. In the absence of costly metering, programs have also attempted to demonstrate quick results using detailed billing information. For schools, local governments, and businesses, energy management activities that could be tied to immediate cost avoidance were most likely to be undertaken. [16]. For residential consumers, focusing on how much the household was presently losing, rather than on how much they might save, seemed to be more effective. As social-psychologists have suggested, communication of information that stresses current loss is more vivid and compelling than information that stresses possible future gain [17].

Addressing the individual concerns of residential customers is another way to personalize program information. For instance, the Tennessee Valley Authority

[18] found that when auditors took the time to address elderly clients' concerns over indoor air quality, program participation and device installation increased. Similarly, some California energy auditors report that when customers are able to choose which devices they want installed, or to select the style or color of certain devices, participation rates increase [19].

CREDIBILITY OF INFORMATION SOURCES

Even when energy information is presented in a vivid and personal form, energy consumers may not act on it if they don't trust the program's sponsor. Social-psychological research shows that the effectiveness of a given message depends directly on the credibility of the source of the message. That is, a message attributed to a highly credible source produces greater attitude change than the same message attributed to a less credible source [20].

Information about energy use can be obtained from a variety of sources including government agencies, electric and gas utilities, oil companies, building contractors, conservation groups, and personal acquaintances. In the absence of clear and simple information concerning the costs and benefits of various energy options, consumers are likely to rely on sources they consider to be the most credible. One study found that households receiving conservation pamphlets believed to be distributed by a state regulatory agency used much less electricity during the following month than did households receiving identical pamphlets believed to be distributed by the area's electric utility company [21].

Stern and Aronson [7] suggest several strategies for overcoming the credibility problems that plague providers of conservation information. These strategies include the following: creating partnerships between low and high credibility sources (e.g., by making the resources and skills of utility companies available to non-profit community groups), utilizing grass-roots organizations and pre-existing neighborhood groups, creating new organizations that would not be marred by conflicts of interest, and by stricter regulation of new and existing providers of information and services. Examples of such approaches abound, and have been found to be highly effective.

Recent studies of utility conservation efforts have found that for programs dealing with low income or difficult-to-reach groups, the sharing of program planning and implementation with community groups is on the rise. For instance, Pacific Gas and Electric (P.G.and E.) funds free direct weatherization of owner-occupied single family homes if residents meet federal low-income guidelines. Customer selection and arranging for installation of the basic weatherization measures is carried out by a consortium of community-based low income assistance groups distributed throughout the P.G.and E. service area. Relying on local community groups for outreach and screening limits the utility's involvement in eligibility controversies and increases the number of low income people served by the program [22].

The California Energy Extension Service has found that marketing conservation programs through local community groups is particularly effective in reaching minority groups and the elderly. For example, Spanish speakers in San Jose California were drastically underserved until local Hispanic groups were utilized in conservation outreach efforts. Other CEES projects have had success in reaching low income and elderly clients through regular meetings of both rural and urban organizations. Meeting individually with the leaders of multiple community organizations before making presentations to their membership has been a particularly effective strategy [12].

Almost any organization that has the trust of the intended target population can add credibility to energy conservation efforts. CEES programs for businesses and apartment owners have found that marketing conservation programs through Chambers of Commerce, apartment owners associations, and local boards of realtors have increased their program's credibility. For residential programs,

churches, civic groups, neighborhood associations, and senior's centers have been helpful in reaching people who might not otherwise have attended energy workshops. Most programs find that combining energy conservation presentations with other regularly scheduled items works best, since by themselves energy conservation presentations tend to draw few people.

Some of the projects sponsored by CEES have moved beyond informational appeals in an attempt to spark the interest and curiosity of potential clients. When the Chinatown Energy Conservation Project was having trouble recruiting people for home energy audits, they decided to use a raffle at the community-wide Hop Jok fair. To enter the raffle, the resident had to consent to an audit and answer three questions about energy. With much needed furniture offered as a prize, many people signed up. Once the P.G.and E. energy auditor and project interpreter were in the person's home, residents were receptive and anxious to learn how to save on their utility bills [12]. Similarly, Senior citizens who were bored and confused by a utility presentation perked up when new and very basic facts were presented by Berkeley Planning Associates in the form of a bingo game. Another CEES program, the Senior Energy Project, produced "The Energy Quiz Show" which helped over seven thousand California seniors learn about new conservation technologies and save energy in 1981. [16].

Unlike the large bureaucracies that normally administer conservation programs, these small community organizations have been able to develop innovative and flexible energy programs with the capacity to reach many different types of energy consumers. By combining the financial resources of utilities and government agencies with the grass-roots skills of local groups, these programs have achieved very high market penetration rates. The long-term potential for energy conservation also increases when credible community organizations are involved in administering weatherization programs since they maintain a high profile in the community even when cyclical funding for conservation programs is low. They are usually able to offer a mix of program types by combining funding sources, and can serve as the single local contact for access to coordinated energy services. Researchers have pointed out that "one stop shopping" in conservation programs may be unrealistic since most households implement energy efficiency measures incrementally over a period of years [23]. The staying power of stable community groups helps local residents to maintain a long term commitment to conservation by monitoring on-going efforts, and allows clients to return for additional conservation efforts when they are ready.

THE DIFFUSION OF INNOVATIONS

Efficiency measures are commonplace to those in the energy sector or building trades, but most people view vapor barriers, heat pumps, and R-26 insulation with some skepticism. Consequently, social scientists have suggested that the spread of conservation devices can best be conceptualized as an instance of the diffusion of innovations. Everett Rogers suggested that demonstration or "observability" is the key to an innovative technology's widespread adoption [24]. Thus a new technology is more likely to be adopted by an individual or a group if there is sufficient opportunity to see the innovation in action and to witness its results. This process is similar to a typical agricultural extension project in which one farmer uses a new seed and substantially increases his crop yield. His neighbors are likely to discuss his actions with him, see the results, and may subsequently plant the new seed [25].

Some energy conservation programs, like the Canadian Energy Information/Action Centres in British Columbia, were explicitly modeled on diffusion of innovation theory. The Canadian Centres were designed to be local demonstrations of energy-efficient renovations and new home construction techniques. Centre staff use marketing, community development, and educational tools to show consumers, builders, and municipalities that new conservation

technologies make sense. Retrofit measures such as stand-off wall truss systems, super insulation, multiple glazing, vapor barriers, furnace improvements, and ventilation controls demonstrate that these buildings' energy requirements can be reduced by over 80%. Specially designed cut-away walls and other displays afford Centre visitors a first hand look at the conservation technologies employed. Activities at each of five British Columbia Centres are designed to meet local needs, and include additional services such as workshops, heat-loss analysis, consultations, energy libraries, inspection of work in progress, residential audits, subtrade seminars, new building design, and municipal energy management [26]. While the Canadian Energy Centres are relatively young, it appears that their diffusion of innovations approach is an effective means of promoting new and underused conservation technologies. An early evaluation of the Centres showed that over half (57%) of centre consultation clients had adopted conservation measures, and that a full 91% reported either taking action or planning conservation action in the next 12 months [26].

Promoting technologies less expensive and more commonplace than stand-off truss systems or triple glazing, some U.S. programs have focused on observability by marketing conservation programs through local retail outlets such as food co-ops [12], or hardware stores [27]. In addition to observability, most formulations of diffusion of innovations theory stress the crucial and potent impact of social reference groups. [28]. These social diffusion theories recognize that the process of new technology adoption tends to occur through existing social networks and that most people adopt innovations only after their effectiveness has been demonstrated through the experience of friends and acquaintances. In other words, social diffusion involves the transmission of vivid and personal information from trusted sources along with the modeling of the behavior of trusted others. Social-psychologists have shown that modeling energy behavior has a much greater impact than merely presenting conservation information. [29]. Thus, the motivation to install attic insulation or a solar water heater is seen as stemming less from media ads or cost-benefit calculations than from first-hand exposure to friends or neighbors who have installed such measures.

Evidence of the effectiveness of social diffusion for energy conservation programs is clear and compelling. For example, Leonard-Barton [30] found that the best predictor of intention to purchase solar equipment was the number of acquaintances who owned such equipment, and Darley [28] found that adoption of a newly developed clock thermostat diffused through existing communications networks. Programs utilizing social diffusion, such as the Minneapolis Neighborhood Energy Workshop Program [31], are among the most successful and cost-effective conservation delivery systems in use today. As suggested above, low-income households are most likely to participate in energy conservation programs promoted by credible community groups, and middle- and upper-income households are most likely to have heard about conservation programs from friends, neighbors or relatives. Both situations reflect the potent impact of social diffusion on program participation and conservation adoption.

The Neighborhood Energy Workshop (N.E.W.) Program, funded by the local utility and the City of Minneapolis, relies on existing neighborhood social networks to promote conservation. High levels of program participation are achieved by the use of neighborhood volunteers, careful creation of project areas, and standardized workshop procedures. The program utilizes "network leaders" such as city council members, ministers, and leaders of existing school and civic organizations to locate and recruit potential "block inviter volunteers." These volunteers receive training from project staff and make face-to-face contact with someone from every household on their block. The block inviters make verbal commitments to the Energy Office to secure a 50% turnout of block residents for a Saturday workday at a local church, school, or park. Weeknight educational meetings are also held in the neighborhood where participants learn about ways to cut losses from building inefficiency, and see

a slide show demonstrating how to locate bypasses and other sources of air infiltration. At the Saturday workday, participants complete home energy surveys, receive free conservation devices, and watch vivid demonstrations of device installations using scale models. Follow-up inspection of owner-installed conservation measures insures quality work, and staff or volunteers are available to help those who cannot do their own work [31].

Nearly 40% of all residents have attemded the energy efficiency workshops, as opposed to the 3-5% average participation rates of most RCS programs. Since 1980, over 23,000 households have received information, training, and weatherization for $80, less than the cost of a typical RCS audit [31]. While complete evaluation of installation rates for additional conservation measures has not been conducted, the N.E.W. low-cost do-it-yourself weatherization approach may increase subsequent conservation efforts. Social scientists have found that once someone has made a small commitment in a given area, that person will subsequently be more likely to make a larger commitment in the same area.

Pilot programs in Massachusetts [23] have also demonstrated the effectiveness of community-based conservation delivery systems for achieving high penetration rates at low cost. Working in conjunction with several local utilities, Massachusetts Fair Share and a coalition of community groups have used door-to-door canvassing and existing communication networks such as community or neighborhood newsletters to market energy workshops, home energy workshops, free weatherization materials, and loans and grants for major conservation work. Follow-up studies reveal that the quality of work for installed measures is quite high, and that work is accomplished at about 20% below the bids of private contractors. While costs for outreach were one fourth as much as for a similar utility program, these community-based programs were able to serve significantly more low and moderate income households.

Programs relying on social diffusion have been successful throughout the United States. In Memphis, Tennessee the Hyde Park Innovative Energy Project used door-to-door canvassing, lowest bill contests, and neighborhood workshops where the host's home was insulated free of charge. In Rochester, New York, the 19th Ward Community Association and the Urban league promoted a variety of programs through block meetings, flyers, public presentations, and door-to-door canvassing [32]. In California, the Energy Extension Service sponsored projects throughout the state that utilized a "tupperware party" approach to marketing conservation. Weatherization workshops conducted in this setting were not only warm and friendly, but turnouts were high, and participation in actual hands-on conservation work spurred others to weatherize their homes [33].

Cleveland, Ohio's community based energy conservation programs [34] provide another example of the effectiveness of programs that rely on social diffusion for outreach. Through a variety of funding sources, two community organizations (Citizens Bring Broadway Back and Tremont West Development Corporation) offer weatherization workshops, free RCS audits, and information and assistance in obtaining financing for neighborhood residents. The two groups have good reputations in the community and most staff live in the neighborhoods. Marketing is accomplished through word-of-mouth, block meetings, and door-to-door canvassing, and over half of the residents receiving services have installed major weatherization measures. These efforts are unique in that they were able to combine a number of different grant, loan, audit, and CETA employment programs to serve both low and middle income clients in their neighborhoods.

The Cleveland community-based programs are also excellent examples of the effectiveness of providing a mix of services from one credible source. Many of the projects reviewed have indicated that adoption rates can be improved if the client can sign up for a variety of energy related services from one source. Typically, a utility conducts energy audits, low-cost weatherization is available through a community program, financing is available for major conservation through a utility/bank loan program, and rehabilitation work or major direct

weatherization is offered through a federal government program. Potential clients for these programs can easily get confused and fail to participate. Even if people want to participate, the burden of contacting multiple agencies, filling out separate application forms, or selecting contractors can be enough to dissuade someone from acting on their best intentions. By simplifying program eligibility criteria and sign-up procedures, some programs have been able to maximize market penetration. For instance, the Canadian Home Insulation Program was able to serve substantial numbers of lower income households by minimizing paperwork and not requiring energy audits [35].

Sensitivity to the limits of a client's desire or capacity to make complex decisions about an unfamiliar subject can substantially improve a program's effectiveness. Providing lists of approved conservation contractors at the conclusion of an audit has sometimes worked, but auditors report that clients are easily overwhelmed by a long and unfamiliar list. For many clients, providing a short list of three names, or just the first name on a rotating list of approved contractors has been the most effective strategy [15]. Some utilities have tried other marketing innovations to simplify program sign-up procedures. For instance, the Bonneville Power Administration (B.P.A.) instituted an experimental program at the Elmhurst Mutual Utility near Tacoma, Washington that eventually included direct contractor marketing of a homeowner rebate program [36]. Instead of having to go to the utility, pick up forms, return them, discuss the job with the utility, locate an eligible contractor, etc., consumers were given the opportunity of dealing directly with the installers and shifting the burden of the application and other paperwork to the installer and the utility. Program evaluation revealed that few consumers felt that installers had "convinced" them to weatherize, but that this approach provided them the opportunity to conveniently sign up for the program. B.P.A. concluded that direct contacts by installers can increase completion rates in small utilies among residents who had requested program services. While the program was no less expensive than more traditional alternatives, the innovative method gave the small utility control over installers and over the rate at which residences were weatherized.

MARKET PENETRATION AND EQUITY

To date, most conservation programs have tended to serve those who are on the average wealthier, better educated, and more likely to own their homes than the population at large [37]. While these households typically reside in larger homes and use more energy than others, they also tend to have a greater interest in energy conservation to begin with, and as "early adopters" may eventually have taken conservation action on their own. Some researchers have highlighted the windfall nature of incentives for such households, and have called for equal subsidies for the poor [38]. Often windfalls are considered an inherent cost of committed efforts to speed the pace of energy conservation and to maximize market penetration. Rather than invoking the "no losers" rule to justify curtailing energy conservation efforts, most experts favor expanding and redesigning early conservation programs to serve more low income households [39].

Even though low income households use 25% less energy than the average household, their energy costs constitute a much larger percentage of their total incomes [40]. Not only are low income households more energy-needy in a financial sense, they are also more likely to live in older houses and substandard units which, while they have the highest conservation potential, often require major renovation rather than simple caulking and weatherstripping. Even when they own their own homes, lower income residents typically have little disposable income, inflexible cash flow, and poor credit ratings which make it impossible for them to take advantage of many utility loan and rebate programs. For lower income homeowners to realize the conservation savings available to them, they need subsidies for direct weatherization and housing rehabilitation.

Even when grant programs are available, the majority of low-income families are not served because they tend to reside in rental units. Most conservation programs have had little success in serving rental housing. Even when tenants have above average incomes, they are reluctant to make improvements to buildings which they do not own. Landlords are also hesitant to make major conservation improvements to buildings they will own for a relatively short period of time, and are faced with a shortage of capital since investment organizations are generally reluctant to provide loans for conservation investments [13]. If tenants pay utilities directly, landlords may not realize the benefits of weatherization efforts, and unless high vacancy rates exist, are unmotivated to offer energy efficiency as an amenity. Landlord-tenant animosity may also act as a disincentive to conservation efforts, with both sides ignoring the concerns of the other. Finally, on-site property managers may discourage energy improvements since their concerns may be with minimizing tenant complaints rather than improving energy efficiency [41].

Some of these disincentives have been overcome by the multi-unit programs discussed above. Marketing through apartment owner associations and directly addressing the concerns of owners, managers, and tenants have proven to be especially effective strategies. The California Energy Commission found that it could increase participation rates for small property owners (under 10 units) by offering an energy consultation service that "handheld" owners and tenants alike through the entire process of audits, financing, contractor bids, installations, and energy savings monitoring. Working with nonprofit and private organizations, the Commission also experimented with "pooled" financing in which several owners could jointly apply for loans with attractive rates and terms [13].

One of the most effective strategies to promote energy conservation in rental housing has been to give away low-cost conservation devices in conjunction with door-to-door energy audits. One such project, the Santa Monica Energy Fitness Program, was specifically designed to increase overall participation rates and to serve difficult to reach target groups such as renters, low-income households, and senior citizens. Key program elements included door-to-door canvassing, streamlined "generic" audits for typical building types, and immediate installation of free low-cost conservation devices such as water heater insulation jackets, hot water pipe insulation, low-flow shower heads, and doorsweep weatherstripping. The Energy Fitness Program served its primary target groups well, with a full 75% of all audits delivered to renters, and other groups served in almost equal proportion to their representation in the population. Penetration rates have consistently been over 33%, with 97% of all audited households installing at least one device. Final per audit costs were $86.87, including all administrative, equipment, installation, publicity, and evaluation costs [42]. These per audit costs are less than the costs of a typical informational RCS home energy audit, but since low cost conservation devices are installed, consumers immediately realize energy savings, and may be more likely to take future conservation actions.

The Santa Monica Energy Fitness Program is also exemplary for its incorporation of program evaluation into program design and implementation. Every participating client was asked to sign a form releasing utility billing information for a year prior to and one year subsequent to the audit. The use of such actual consumption data has been found to be essential in evaluating program effectiveness. The alternate, and much more common use of self-reported energy data is far less reliable, and often results in inflated savings estimates [43]. One study of this phenomenon concluded that "no correlation existed between reported household conservation actions and amount of energy actually saved in the households" [44]. Such findings underscore the need to collect detailed and accurate consumption data from representative households in order to assess program effectiveness.

Another example of excellent program evaluation is provided by the

Bonneville Power Administration's Hood River Conservation Project [45]. This $21 million 3-year project aims to discover how much electricity a community can save under almost ideal conditions. B.P.A. pays homeowners for the full cost of weatherization measures which go beyond most home conservation programs. These measures include 16 inches of ceiling insulation, 13 inches of floor insulation, up to the equivalent of 6 inches of wall insulation, triple glazing of windows, caulking, weatherstripping, dehumidifiers and heat exchangers where necessary, switchplate gaskets, electric water heater wraps, water flow regulators, and flow-restricting shower heads. Using a variety of metering devices and consumption data, B.P.A. hopes to answer many important questions about residential weatherization. For instance, what is the maximum market penetration of home insulation when all economic barriers are removed? What effect will such programs have on the electrical use of the community? Could such programs help to avoid new transmission construction? What effect will such programs have on the conservation awareness, attitudes, and behavior of the community? [45].

One of the most effective mechanisms used by the Hood River Project to maximize participation was Community Assessment. By identifying major cultural sub-groups, and by outlining the value orientation of these groups, the Project was able to overcome past factionalism and design delivery systems that achieved a participation rate of over 90% for eligible homes. While this ambitious project will undoubtedly provide valuable information on the mechanics and outcomes of conservation delivery systems, it also stands as an example of what is possible when a utility demonstrates a firm commitment to conservation efforts.

DISCUSSION

In spite of commitments on the part of utilities, regulatory agencies, and various levels of government, we have not yet achieved energy-efficiency in easy-to-reach markets, and are only now beginning to reach small percentages of the hard-to-reach markets. In order to speed this process, some governments have moved beyond information and demonstration projects to mandatory energy efficiency standards for existing as well as new buildings. State Legislatures in Minnesota and Wisconsin have enacted multi-unit energy codes, although enforcement has been difficult due to ambiguities in the codes and a lack of staff to enforce the new regulations [15].

In California, some local governments have instituted mandatory energy conservation retrofit codes for all residential buildings. For instance, Santa Clara County, San Francisco, and Berkeley require buyers and/or sellers of residential property to sign agreements at the time of sale guaranteeing conservation retrofits for their building within one year. According to building inspectors and energy contractors, the mandatory retrofit codes are working well and providing direct energy savings to more renters than would have been reached through any type of voluntary program [15]. It is important to note, however, that the existence of attractive financing through existing P.G.and E. programs enables most landlords to upgrade their buildings at reduced capital expense. Here again we can see the value of providing a mix of program types, in this case regulatory controls coupled with financial incentives.

As the above examples illustrate, successful conservation delivery systems combine a variety of program elements to achieve high penetration rates. The most important of these are summarized in the Smart Programs Checklist presented in the beginning of the paper. In order to solve the high potential/low adoption paradox, Smart Programs address the social-psychological complexities of information processing and make special efforts to overcome structural barriers to participation by all energy consumers. The social diffusion model suggested above provides a useful framework for designing and implementing programs that can successfully promote the spread of conservation technologies.

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