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IMPACTS OF THE RESIDENTIAL
CONSERVATION SERVICE PROGRAM ON
RESIDENTIAL SOLAR DEVELOPMENTS

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**IMPACTS OF THE RESIDENTIAL CONSERVATION SERVICE PROGRAM ON
RESIDENTIAL SOLAR DEVELOPMENTS**

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ABSTRACT

This paper examines the roles of the various participants in the Residential Conservation Service (RCS) program, with special attention to their potential influence on the program's effectiveness in accelerating solar commercialization. Cooperation and support of the participants will be necessary for the information and implementation assistance goals of the program to be achieved, but resistance and obstructions are noted.

I. INTRODUCTION

The RCS program is part of the National Energy Conservation Policy Act of November 1978, Public Law 95-619, Title II, Part I. The Act required that all large utilities offer energy audits to each of their eligible residential customers, with a later provision that the direct charge for the audit could not exceed \$15. RCS was designed as part of the National Energy Plan to help achieve two national objectives: (1) the installation of energy conservation measures in 90% of existing American homes, and (2) the increased use of renewable energy in homes. Notification of Proposed Rule-Making for RCS occurred in the 19 March 1979 Federal Register, with the Final Rule published 7 November 1979. Several subsequent volumes of the Federal Register have clarified the initial legislation.

The RCS program has involved many participants during its development and implementation. From its inception, it has helped utilities develop and expand conservation methods for their customers; and the program has also forced utilities to accelerate conservation and renewable energy technologies development. This paper will examine the roles of the program participants who are responsible for implementing the program as defined for each state by the state RCS lead agency. We will also briefly sketch the activities that could result from an RCS energy audit request.

2. THE PARTICIPANTS

2.1 Homeowner

A review of existing literature (1) suggests a number of key factors that affect people's willingness to adopt innovations such as solar energy systems. Some of these key factors are: (1) perception of the energy situation; (2) awareness of solar technologies; (3) socially supportive opinions of neighbors, friends, and leaders; (4) perception of feasibility and availability; (5) concern about the risk of adoption; and (6) perception of relative advantage of adoption, with both economic and noneconomic benefits considered.

The RCS energy audit and accompanying standards and services directly address these decision factors.

1. Although not affecting the perception of the energy situation directly, a requested energy audit is indicative of at least an economic concern about the energy situation.
2. Awareness of solar technologies applicable to residences is a direct product of the RCS audit, through information left with each audited customer.
3. Supportive opinions are likely to result from the widespread diffusion of the audit and associated media coverage.
4. Positive information concerning solar retrofit supplied by the auditor should correct misperceptions of infeasibility and unavailability.
5. Material and installation standards and other RCS consumer protection mechanisms should reduce adoption risk concern.
6. Economic benefits, including tax savings, will be itemized for each applicable measure; the media and word of mouth will disseminate the noneconomic benefits.

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The widespread implementation of applicable solar measures under RCS clearly require an audit. Yet, the response rate to the audit offer is not expected to exceed 10% per year, and probably will be closer to 5%. Consumers may believe that since their homes do not resemble the custom solar homes shown in the media, solar systems are not applicable to them. Until that perception changes, customers could feel that "Since I probably know most of that information already, why bother with an audit?" On the other hand, the decontrol of natural gas prices and the continued increases in the cost of other energy forms will result in considerably more consumer concern and frustration, which may trigger more audit requests.

2.2 Utility Company

Since they are required to offer an audit to all eligible customers with a maximum charge of \$15, some utilities are understandably unenthusiastic toward the RCS program. Their reluctance derives from the following factors:

- conservation and renewable retrofit will result in lower revenue with, perhaps, no offsetting reduction in gas or electric plant costs;
- the program mandates actions that may not be in the best interests of their customers;
- legal jeopardy may be increased, resulting in higher operating expenses and public relations difficulties; and
- skill and knowledge outside of the utility's historical areas of expertise and interest are now required.

Other utilities appear to welcome the opportunities provided by RCS where one or more of the following factors are present:

- plant construction or expensive new fuel supply can be offset by conservation and renewables;
- the utility regulator has expressed strong interest in effective conservation programs; and
- pressure from ratepayers, industry peers, or influential, far-sighted management.

Since the state agencies responsible for developing the individual state plans are usually understaffed and underfunded, the actual writing of the state plans was done mostly by the utilities. It is not surprising that an examination of state plans reveals a wide range of activities within the confines of the DOE regulation. Although DOE used its discretion to reject or require amendments to state plans, the combination of regulatory flexibility and in-field practice has resulted in the utilities offering different services state to state. A generally negative corporate attitude toward renewables may have influenced some state plans and reflected itself further by limiting services under RCS.

If RCS and other energy legislation are repealed or implementation support unfunded, many utility companies could soon have a further choice: to continue with the program (or some reasonable counterpart) or to drop it and substitute less expensive public relations announcements. Despite the apparently clear opportunity to be perceived as part of the solution to higher utility bills rather than their creators, indications are that many companies would initially take the second option, if given the chance. Because of the many variables and unknowns, a quantitative analysis of this scenario is not presented here.

2.3 Auditor

Any RCS auditor must be employed by or contracted to a covered utility. This provision allows for an arms-length utility involvement in RCS, and several firms are now supplying trained RCS auditors for entire states. To ensure at least a minimum level of auditor expertise, the following qualifications are required:

- a general understanding of heat transfer; residential construction; heating/cooling system operation; the different types of applicable measures including advantages and disadvantages of each; and applications and installation standards;
- the capability to conduct an RCS audit; and
- an understanding of solar energy and its residential applications including insolation, shading, various means of heat capture and transport, and heat transfer for hot water and space heating.

At the very least, the training and study required to meet these qualification should result in a lot of people with a more comprehensive view of how to retrofit solar energy systems.

As with utilities, a wide range of attitude and experience can be seen in the auditing force. The initial mildly-negative feeling about solar energy changes during training to a neutral feeling. Further change frequently occurs after contact with customers, who express such interest that the auditor may be converted, often becoming more well-read and knowledgeable.

This does not say that all 10,000-15,000 RCS auditors will become solar advocates; although a fair number will disprove the notion that "a utility company will never give a fair break to renewables." With a DOE projection of 20 million audits over five years, many consumers are likely to be looking a lot closer at solar retrofit possibilities for their homes.

2.4 Financial Institution

Although the regulations require that utilities arrange for the financing of applicable RCS mea-

asures, the definition of arrange has been interpreted as any assistance beyond providing a lender list. Since lenders are not interested in the small loans likely to be sought by potential implementers, the RCS program could be stifled by financing difficulties. Several programs in California and the Northwest provide financial incentives and assistance for solar retrofit with the RCS program. No one agrees at this time as to which program is most effective in encouraging implementation and in developing a quality manufacturing/installing infrastructure.

2.5 Installer

Participation in the RCS program is voluntary for installers. Although it could be a convenient marketing aid for some, others will not participate because of the controls and paperwork associated with any such regulated activity. For example, to be on the list of installers given to each customer the installer must agree to: install only materials of the standard listed by the regulation (HUD/IMPS for active solar equipment, RCS standards for wind, no standards for passive solar); install those materials only as provided by the regulation; use only installers who have been qualified by the state lead agency in several areas of knowledge and installation proficiency; participate in two levels of consumer complaint resolution; and post a bond sufficient to satisfy the state lead agency.

Besides the regulations, the installer could be called on to make many estimates not resulting in contracts; and he may be dealing with potential buyers that were given incorrect cost or savings estimates by the utility auditor.

Because of the regulatory burden intended to assure safe, effective, and enduring installations, some industry leaders refuse to participate in the RCS program. In fact, a competitive cost advantage exists for an installer who does not participate, since RCS standards and other consumer protections are eliminated. As the market for solar retrofit develops, that cost needs to be weighed against the consumer backlash directed toward the entire industry that could result from careless installation of faulty products.

2.6 Inspector

Under the RCS program, several groups could have the job of inspecting the solar installations depending on the various state plans. Most states require either the utility or the local building authority to provide the required inspections. If most installers are not familiar with the provision of the HUD/IMPS standard, employees of local building departments and utilities are even less likely.

Besides knowing the HUD/IMPS standard, RCS active solar system inspectors must know residential construction methods; design, installation, operation, and degradation of residential water and space heating systems; and interconnection and testing of solar devices with existing systems. A workbook intended to assist in disseminating information in these study areas has been assembled by SERI. It is titled RCS Installers/Inspectors Qualifications Workbook: Renewable Resources (2) and will be available in June from the Government Printing Office.

3. THE PROCEDURE

The utility informs each customer about the availability of an RCS audit. The customer then requests an energy audit of his house. When the auditor arrives, he or she asks some pertinent lifestyle questions of the customer and makes various measurements and observations inside and outside the structure. If systems are being considered,* the auditor first determines whether there is any major obstruction** to the sun near the southmost wall or roof area. Several commercially available devices exist that approximate a site's solar access by subdividing the known yearly sunpaths into equally weighted segments, which can then be easily translated into a seasonal or yearly solar access decimal fraction. The value depends on the number of segments occluded. That number, defined as PSF, is then used with tabular regional insolation data to arrive at a site-specific estimate of solar gain available. This can then be used with system performance data to produce an estimate of energy delivered for a system with a certain collector size, or, when used with offset fuel cost data, the estimated fuel cost savings.

*A matrix published in the RCS Final Regulation defines the applicability of Water Heating, Space Heating and Combined Water/Space Heating Systems for each of the HUD degree day zones 1-8 in each state versus four energy sources (gas, electricity, oil, electric heat pump). The matrix was derived from 20-year lifecycle costing analyses with 1980 prices and 1980-2000 fuel price escalators. Both prices and escalators were projected from 1978-base Energy Information Agency reports. Passive solar measures are not included in the matrix since RCS requires a passive audit universally.

**Major obstruction is undefined by the regulation. The DOE/SERI model audit for renewables provided varying economic cut-off values of the Prime Solar Fraction (PSF) for each of the active measures in each of the 144 HUD/State regions. In that procedure, any value lower than the economic cutoff minimum PSF listed, defined the shading effect corresponding to a major obstruction to solar access.

When compared to the system cost and installation estimate, obtained locally, the basis for a cost-benefit analysis exists. The auditor is required to inform the customer that these estimates may not reflect the true cost or savings. Tax credit information and a list of RCS installers is provided, and the utility may assist in bid solicitation. A list of RCS lenders is also provided, and again the utility may provide further assistance in obtaining financing.

Besides the audit, installation and financing assistance, and random inspection, the program allows for repayment of the loan on the monthly utility bill, with lender approval, and a conciliation conference or redress proceeding for resolving conflicts that arise between any affected parties.

4. RESULTS

Projecting the energy savings as a result of installing renewable resource measures under the RCS program is difficult. DOE has attempted this task in the Regulatory Analysis volume of the documentation on the RCS Program (3). The analysis assumes a 7% response rate to the audit and a 75% purchase rate by homeowners whose houses require a given measure. These projections are based on data for specific energy conservation measures in the Washington, D.C., area only. As pointed out in the analysis, this assumption does not consider regional variations in demand, fuel prices, or climate. Also, no renewable resource measures were included in the demand survey data.

Based on its analysis, DOE projects that during the period 1980-1985 the number of households that will install active, passive, and wind systems as a

result of the National Energy Act overall* are 1,500,000, 50,000, and 152,000, respectively. The corresponding quads displaced during the same period in these three categories are projected to be 0.0288, 0.0103, and 0.0025. Over their useful lives, these installed systems would displace 0.229, 0.0818, and 0.0198 quads, for a total displacement of 0.331 quads.

5. CONCLUSIONS

As this summary of participants and action components shows, the RCS program is complex, and its effects on solar retrofit implementation is unknown at this time. What is clear is that major changes in attitude and behavior of leading participants will be necessary to achieve the large potential benefits.

6. REFERENCES

- (1) Farhar-Pilgrim, Barbara; Unseld, Charles T. National Study of the Residential Solar Consumer, Solar Energy Research Institute, Golden, CO., (1981).
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- (3) U.S. Department of Energy. Residential Conservation Service Program—Regulatory Analysis. U.S. Department of Energy, Washington, D.C., (1979).

*Separate estimates specifically for RCS renewable measures are not presented in the Regulatory Analysis.