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Seri/TP-721-1167
UC CATEGORY: UC-59c

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MOVING ENERGY-CONSERVING
DESIGN INTO THE U.S. BUILDINGS
INDUSTRY

BRUCE BACCEI

APRIL 1981

PRESENTED AT THE
1ST IEA CONFERENCE ON NEW
CONSERVATION TECHNOLOGIES AND
THEIR COMMERCIALIZATION
6-10 APRIL 1981
BERLIN, GERMANY

PREPARED UNDER TASK NO. 1146.20

Solar Energy Research Institute

A Division of Midwest Research Institute

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Prepared for the
U.S. Department of Energy
Contract No. EG-77-C-01-4042

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Printed in the United States of America
Available from:
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
Price:

Microfiche \$3.00
Printed Copy \$4.00

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MOVING ENERGY-CONSERVING DESIGN INTO THE MAINSTREAM OF THE U.S. BUILDINGS INDUSTRY

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Summary

One chance in four are the odds given by a group of U.S. building and real estate marketing experts that solar energy and conservation will make significant inroads into the U.S. buildings industry by 1985. WE'LL TAKE THAT BET. The Solar Energy Research Institute (SERI) and the U.S. Department of Energy (DOE) have two programs that are greatly accelerating the rate at which the U.S. buildings industry is moving towards mass production of energy conserving solar buildings. A third program will attempt to build on the success of these programs by addressing solar and energy conservation retrofit of existing buildings.

Introduction

These programs provide a useful model for other efforts in accelerating private industry's rate of change. The concepts on which this model is based include:

- Industry Participation in Planning
- Incremental Change
- Builders and Architects
- Technical Assistance—Not Money
- Large-Volume Builders
- Competitive Selection
- Simplified Contractual Procedures
- Public Exposure
- Sensitive, Concerned Management

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28

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These concepts and the progress of the programs are discussed here.

A popular joke suggests that the two biggest lies in the world are:

- Your check is in the mail; and
- I'm from the government, and I'm here to help you.

This joke is indicative of the pervasive public skepticism concerning any involvement with government. This makes it particularly noteworthy that SERI and DOE have initiated two programs that work directly with the U.S. buildings industry and are proving to be widely popular and very successful. They are the Passive Solar Manufactured Buildings Program and the Solar Home Builders Program in the Denver metropolitan area.

Butler Manufacturing Company, the United States' largest producer of metal buildings, is one of twenty-three participants in the manufactured buildings program. Commenting on the effectiveness of this program, Butler's Director of Research, Marvin Snyder, has stated that "... Butler would still be doodling (sketching) on the back of envelopes if it were not for this government program." Butler has, in fact, designed, constructed, and is in the process of testing a prototype passive solar building. This prototype comprehensively balances concern for passive solar heating and cooling and daylighting. According to calculations, this building is expected to use 70% less energy than conventional single-story office buildings.

Twelve builders participating in the pilot Solar Home Builders Program being conducted in Denver, Colo. are elated with the results. During a 16-day period from February 21 to March 8, over 100,000 people visited 12 solar-efficient homes. During that time, builders signed 31 sales contracts totaling more than \$2.5 million. These builders project 87 additional sales in the next six months, for a total value of \$6.3 million. This is occurring when builders throughout the United States are experiencing one of the most serious downturns in business in recent history.

As a result, many other builders throughout the Rocky Mountain region are expressing much greater interest in improving energy conservation and solar energy use than prior to the program.

Although the progress of these programs is very interesting, the concepts on which they are based deserve the most attention. It is believed that these concepts are replicable. They can and should be utilized by other organizations.

Before discussing these concepts, it is useful to understand the background and purposes of these programs. The goal of the Passive Solar and Hybrid Manufactured Buildings Program is to mass produce energy-efficient manufactured buildings for residential, commercial, industrial, and agricultural use. The program encompasses a wide range of building types: mobile, modular, panelized, precut, metal, and precast concrete. Participants in the program are encouraged and assisted in their efforts to incorporate advanced measures of energy conservation, passive and hybrid solar concepts, and solar domestic hot water systems in the buildings they are currently producing.

In the United States last year, manufactured housing accounted for approximately 39% of all residential construction. Metal buildings alone accounted for nearly 50% of all one- and two-story nonresidential construction. This, coupled with the fact that the manufactured buildings industry is characterized by large organizations with decision making concentrated with a few people makes this industry a prime target for affecting change.

The program consists of three phases, (I) design development, (II) prototype constructing and testing, and (III) test marketing.

Twenty-three manufacturers were selected to participate in the program. These participants include six of the top twenty-five home producers and the largest metal building manufacturer in the United States.

Most participating manufacturers are now completing Phase I, a few have moved into Phase II, and one has actively begun marketing.

The Solar Home Builders Program was initiated as a pilot program in the Denver metropolitan area to assist and encourage builders to construct and market energy conserving passive solar homes. The conservative goal of this program is for 50% of all new homes to incorporate improved energy conservation and passive solar features by 1984. This program uses experience gained in the Manufacturer Buildings

Program and uses many of the same concepts. Program refinements have resulted in a much more streamlined program. Since this program has proven to be very successful, SERI will be conducting a series of one-day seminars to encourage other organizations to initiate similar programs.

DOE's Bonneville Power Administration and Western Solar Utilization Network (Western Sun) have already initiated a similar program in Portland, Ore. Six hundred attendees at a seminar that introduced the program were enthusiastic.

A similar program that addresses retrofitting existing homes is currently being planned for initiation in June. This program will also be a pilot, and, if it is successful, it will be replicated.

Industry Participation in Planning

The first step in both of these programs was to include industry associations in the planning. These associations have an intimate knowledge of each segment of the buildings industry. It is extremely valuable to incorporate their perspective, sensitivities, and concerns in the initial formulation of the program. With the Solar Home Builders Program, representatives of the Denver Metro Home Builders Association pointed out that although the builders would have time to participate in the proposed program because construction was down, they would have difficulty obtaining construction loans for a speculative venture. These risks were reduced by allowing SERI to reimburse the builders in exchange for access to their homes to monitor thermal performance. These reimbursements are set up on a declining scale for a period of up to seven months, or until the home is sold. This aspect of the program was developed specifically in response to the industry associations recommendation.

Incremental Change

To participate in these programs, builders were required only to make incremental changes in buildings they are currently producing. Widespread adoption of incremental changes in currently produced buildings can result in much greater energy savings than a small number of buildings each with dramatic savings. Furthermore,

if the degree of change is modest, builders will be more confident about producing and selling these homes. Although this low-key approach was taken, some of the more aggressive program participants developed designs that incorporated substantial changes and will achieve as much as 70% reduction in energy consumption.

Builders and Architects

In the United States, the majority of home builders do not work with architects. This is also true of building manufacturers. They know their market very well and do not normally need a designer's assistance. However, to design energy-conserving solar buildings, builders need technical assistance from knowledgeable, experienced architects and engineers. Most often, the assistance needed does not include the total redesign of a building. The designer is needed more as a technical consultant. Builders, architects, and engineers each have valuable expertise. To develop marketable, energy-efficient, solar buildings, their combined expertise must be integrated carefully.

To participate in either of these programs, builders and manufacturers had to use an architect and/or engineer with knowledge and experience in solar-efficient design. In this way, the programs forced both professions to develop a new working relationship. Because of human dynamics, this was one of the most interesting and challenging aspects of the program. Where this integration of professional expertise worked, it worked very well. All appear to have benefitted from the experience, and even where there were serious difficulties, those builders continued to work with their designers or immediately chose another one.

Technical Assistance - Not Money

As these programs progress, and as participants are asked about what government assistance is most useful to them, it is becoming more clear that they need technical assistance and encouragement—not money. In the Manufactured Buildings Program, the average DOE contract for the design phase was only \$50,000. In the Solar Home Builders Program, the total cost per builder/designer team for design and construction was only \$7,000. The market has changed, and the need for major government investments to encourage participation is no longer necessary.

Large-Volume Builders

In each program, emphasis was placed on the participation of large-volume builders and manufacturers. However, small- to moderate-volume builders or manufacturers were not excluded. If one or two large producers change and begin to exploit a market advantage, everyone else will follow—large and small.

The converse is not true. Several small- to moderate-volume builders and manufacturers around the United States are experiencing a distinct market advantage with energy-conserving solar homes, yet major builders and manufacturers continue with the same designs and marketing approaches.

The participation of three of Denver's largest builders in the Solar Home Builders Program has borne this out. In informal discussions, many other builders, including several large-volume ones, are initiating serious efforts to become more involved in energy conservation and solar design.

Competitive Selection

A competitive selection has two distinct advantages. First, it removes or minimizes any criticisms of the sponsoring organization for favoring any particular organization. Second, it encourages interaction among professionals. As previously stated, builders and manufacturers were required to team themselves with an architect or engineer experienced in solar-efficient design. Many builders sought out designers for the first time. Also, many architects and engineers took the initiative and contacted builders and manufacturers in an effort to form these teams. A dialogue was created between these professionals far beyond any that had previously existed. When selections were announced, several teams decided to work together even though they weren't selected for participation in the program.

Solicitations for the competitive selection were intended to be as straight forward as possible. In the Solar Home Builders Program, the solicitation included a few simple forms to fill out that constituted the builders proposal. This simple proposal with its emphasis on brevity made it easier for builders to respond to the solicitation. It also made it much easier to review the proposal and select program participants. Interested builders were given only three weeks to submit proposals. Even with such short notice, 47 were received. The proposals were reviewed, and selected in six working days.

Simplified Contractor Procedures

The most important improvement incorporated in the Solar Home Builders Program that distinguished it from the Manufactured Buildings Program is simplified contractual relationships. Although builders were required to identify a designer to work with, these teams were then split for contractual purposes.

A consultant agreement was formed between SERI and the designer. The scope of work in that agreement required the designer to support the builder assigned to him. Since the only financial support in the design and construction phase was to cover the expenses of the designer, no money was exchanged between SERI and the builder.

SERI established a no-cost agreement with the builders that was simply a statement of work listing SERI's responsibilities to the builder and the builder's responsibilities. The agreement stated that either SERI or the builder could withdraw from the agreement at any time. There were no reporting requirements beyond submitting the designs for preliminary and final review and building the solar-efficient home. Builders signed the agreement without legal counsel.

It only took from June 2-13 to receive and review proposals, select builder and designer teams, and award consultant and no-cost agreements. The builders agreement was a key to the program's success. It enabled subcontracts personnel to move much more quickly; it eliminated reporting; and, more importantly, it was unintimidating for a builder reluctant to become involved with the government.

Public Exposure

One of the greatest benefits derived by builders and manufacturers in these programs is the public exposure to their buildings. The turnout of 100,000 people and the sales generated for builders in the Solar Home Builders Program were discussed earlier. Both programs also are attracting extensive media coverage at local and national levels.

This public and media exposure is not only beneficial to the program participants, it contributes directly to the goal of the programs, mass production, by stimulating interest of the general public and competitors.

Sensitive-Concerned Management

Since businessmen are particularly skeptical of government, sensitivity to individual and organizational relationships is particularly important. Very often business executives' perceptions of a program's success or failure and decisions to remain involved or withdraw are based as much on interpersonal and interorganizational relationships as on technical matters.

According to participating builders and manufacturers, the success of these programs was largely because of the sensitive, responsive manner of all government personnel. To be responsive, government program managers must be flexible in meeting the varying needs of different program participants.

Conclusion

A debate is currently being waged in the United States regarding the appropriateness of government's role in programs like those presented here. It has been suggested that energy conservation and renewable energy programs be stopped because private industry will respond on its own to rising energy prices. Although a response can be expected, time lags and appropriateness of responses remain a serious concern.

Consider the U.S. automobile industry. The market demand for change has existed for several years. Yet American automobile manufacturers have maintained that Americans want big cars and don't care about gas mileage.

So it is with the majority of U.S. builders. It is easier to resist change and to continue with the familiar. However, these programs have demonstrated that government can act as a constructive catalyst with private industry.

Businessmen are delighted to receive technical assistance and direction. Many builders and manufacturers are aware of the changing market, but don't know which way to go.

These programs have demonstrated that the government and other organizations can work very effectively together to accelerate the rate of change in private industry. It is recommended that these programs be considered models and that the concepts they are based on be used to their best advantage wherever possible.

In view of the current world situation, and the dependence on imported petroleum, time is of the essence. All must be done to expedite constructive change; we can't afford to see if industry will respond to the changing economic situation. The risk is increasingly more serious economic decline and an end to world peace.