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A HANDBOOK
FOR THE MARKETING OF
CONSERVATION AND SOLAR-ENERGY PROGRAMS

COLIN K. MICK
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JULY 9, 1980

APPLIED COMMUNICATION RESEARCH

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FOR THE MARKETING OF
CONSERVATION AND SOLAR-ENERGY PROGRAMS

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Applied Communication Research, Inc.
Palo Alto, California

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INTRODUCTION

This report describes a process-oriented approach for encouraging community-level energy conservation and planning programs. The approach is applicable to a wide variety of situations, including community energy planning, development of community energy conservation programs, and promotion of solar energy technology.

The process-oriented approach is based on concepts drawn from a variety of disciplines including communications research, operations research, studies on the diffusion of innovation and research on agricultural, educational and medical information dissemination programs. Energy-specific concepts are based primarily on energy-related research conducted by Applied Communication Research over the past three years. This research has explored the impact of environmental, social and attitudinal factors on energy-related behavior and has tested many of the concepts that are proposed in this report.

The process-oriented approach is designed to augment existing energy programs by focusing on the the major barriers to changing current energy-related attitudes and behaviors. These barriers include:

- o awareness of energy issues and of specific actions which can be used to either reduce energy consumption or to more efficiently use energy;
- o motivation to change existing behaviors and practices and/or adopt new ones;
- o identification of personal opportunity to implement available energy actions; and
- o the support and reward for implementation of energy conserving actions.

In this report we describe a variety of concepts, tools and techniques which can be used to overcome these barriers. These include:

- o the use of a change agent;
- o the impact of human factors on energy campaigns;
- o use of participatory planning;
- o the use of community surveys to assess current energy attitudes and behaviors and to generate awareness;
- o use of media campaigns; and
- o the use of "behavior chaining" to simplify promotion of complex or low-reward energy actions.

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The report offers suggestions on how to design a community energy campaign based on the concepts, tools and techniques described. It provides some brief cases studies as examples and an annotated bibliography as a source of more detailed information.

BACKGROUND

THE ENERGY PROBLEM

Discussing "the energy problem" faced by the United States sounds like little more than restating the obvious. This would not be a totally accurate assessment. That some problem exists is almost universally accepted; the nature and scope of this problem is neither widely accepted nor well understood. We are all aware of the effects of spiraling energy costs--inflation, housing shortages, extensive economic disruption in the automobile manufacturing sector, to name a few--yet we are slow to realize just how important energy is in these traumas. As one example, the effect on inflation of the current oil price increases should be given full consideration. Consider also how America is tied by its oil dependency to an area of the world whose political climate can at best be characterized as unstable.

Oil production peaked ten years ago in this country (1). Natural gas supplies appear to be dwindling. Even given the most optimistic of estimates, nuclear contributions to our energy needs in the next twenty years will be slight. Coal seems unlikely to make as large a contribution as it might given the limited technology in place for burning it and given the incredible environmental and social costs that would be incurred with this form of energy. The arguments of industrial romanticists notwithstanding, the literature is growing which points to the necessity of coping with our energy appetite by turning to conservation, solar and other renewable forms of energy.

In any rational plan, energy included, one must consider both long and short term solutions. Conservation and solar energy are important in both ways. For those that make the traditional assumption that conventional energy supplies are virtually unlimited, conservation and solar can be seen as important short term solutions to be implemented while the search for conventional energy is intensified. (Conservation in particular is a short term solution in that it is characterized by marginal costs that will rise as the simpler techniques are implemented and only more difficult ones remain.)

For those who feel that rising energy prices are largely due to the increasing costs required to harness dwindling energy supplies, conservation and solar (and other renewable energy sources, such as biomass conversion and wind energy) represent important long-term solutions to our energy problem. Conservation in particular is a very definite form of energy, though it is subject to a law of diminishing returns. Of course, what is in dispute is how quickly the curve flattens out--how much impact conservation can have in real terms. We concur with Stobaugh and Yergin (1) when they argue that it can have a great impact: greater than the contribution of any of our conventional energy sources, reducing our energy use by 30 to 40 percent. Solar energy is both renewable and, as Keyes (2) puts it, "feasible wherever the sun shines". Its contribution can be significant and permanent.

We take it as given, then, that: (1) there is a serious and pervasive problem in the United States between energy supply and demand, a problem that has extensive social and political ramifications; (2) conservation and solar energy are to be important aspects of any comprehensive attempts to deal with this problem. We will now examine these energy options in more detail.

CONSERVATION AND SOLAR ENERGY

Reports by the Ford Foundation (3), the Harvard Business School (1) and the California Energy Commission (4,5) have all concluded that conservation and solar can be most important energy supplies, both of which could be adopted with relatively minor lifestyle changes and would have quite positive economic benefits. For instance, the California Energy Commission's Biennial Report (5) states that conservation and vigorous development of renewable energy sources will be required to meet California's energy demand by the year 2000, and that such development could save California consumers thirty billion dollars by that time. Further, statistics in this same report show that transportation and residential uses of energy account for some 67% of the state's total energy demand. Both of these sectors are ripe for conservation programs.

Solar energy, especially "small solar", includes passive (structural) and active (mechanical) means for home heating and cooling and for domestic hot water production. The technology for passive and active solar systems already exists and stands ready for application. As a renewable energy source, solar adds to domestic energy supply directly through thermal generation and indirectly by easing dependence on traditional energy sources.

It is important to remember that conservation and solar are decentralized energy sources, both in nature and in application. This is at once promising and troublesome.

It is promising in that conservation is not a single action so much as it is a way of life. One can expand the employment of conservation practices horizontally to include actions which require equal commitment; one can also expand vertically, employing actions that require greater amounts of commitment and reflect a lifestyle which conserves as an end rather than as a means. The multiplicity of possible conservation actions means that all persons can become involved and hopefully motivated toward ever increasing commitments to conservation.

At the same time, conservation's decentralized nature means that little control can be exercised, either in a concerted application of conservation measures or in an intensive regulation or motivation for this behavior. As an example, compare achieving energy policy objectives through regulation of automobile manufacturers versus motivating 222 million Americans to conserve.

Likewise, solar energy usually entails "on site" energy generation. This requires that the user (e.g., homeowner, corporation) take on the responsibility (i.e, knowledge and skills) for managing this energy. This

responsibility normally rests with the utility. Convincing people to accept it has proven difficult. Further, many consumers presently lack the knowledge necessary to size, install and maintain solar systems.

Recognizing this, much research has been done on the barriers to the acceptance of conservation behaviors. Later in this report we will examine these barriers (culled from our research findings and from those of others) in the light of a 4-stage model for adoption of innovations. This model posits that what is required for adoption is effective awareness, effective motivation, an effective decision and effective action.

WEAKNESSES OF EXISTING CONSERVATION PROGRAMS

A review of most energy conservation programs, including those sponsored by grass roots organizations, cities, utilities, DOE/state combinations and national organizations, reveals a number of major weaknesses.

- o They lack a systematic approach to energy conservation.
- o They deal in generalities and do not provide sufficient information for informed conservation decisions and actions.
- o They focus on dissemination of information and public awareness, but almost universally fail to follow up on contacts to improve the effectiveness or measure the impact of their programs.
- o Nearly all programs display a disturbing ignorance about the motivational requirements for effecting energy conservation behaviors. They concentrate on awareness rather than behavior change.
- o They fail to maintain coordination and cooperation among programs. As a result programs often compete for attention and provide contradictory information.

We feel that these problems can be corrected through the use of change agents working with local energy extension programs. By taking a process-oriented approach to energy extension and local energy planning, change agents can accomplish generic project objectives while tailoring conservation and solarization goals to the particular requirements of communities. Community support for conservation and solar applications is much more probable given this strategy for community involvement in all stages of the adoption and planning processes.

THE PROCESS-ORIENTED APPROACH

The key problem in conservation and solar campaigns is not one of developing new technologies, but rather one of changing energy-related attitudes and behaviors. Essentially, it requires getting information to people and getting them to act on it.

While easily stated, this solution is not so easily effected. Existing attitudes and behaviors are difficult to change. In addition, most conservation and solar marketing campaigns focus almost entirely on content--packaging and repackaging existing information and disseminating it to users. This approach has been adopted based on a variety of models including traditional marketing and communication models and on early diffusion models. A classic example of this approach is the Energy Extension Service, which is loosely modeled on the Agricultural Extension Service model.

Unfortunately, these efforts have almost totally ignored lessons learned in Agricultural Extension and other change models--that the key to creating change is to focus on process rather than content. The Agricultural Extension Service began to move towards a process-oriented change model in the early 1950's and an emphasis on process is implicit in the early trials of an Educational Extension Service and, later, the National Diffusion Network.

A process-oriented approach focuses on encouraging and facilitating a rational decision process by target groups. It is an active approach in that it emphasizes going out to work with target groups to help them identify and solve problems, rather than waiting for them to come and request assistance. The approach requires an understanding of human factors, group processes, planning techniques, behavior change processes, media campaigns and, above all, an understanding of the issues and barriers involved in dealing with energy-related attitudes and behavior changes.

The process-oriented approach is particularly suitable for energy-related change programs. There is a good supply of content information; the problem is diffusing it to people and motivating them to act on it. Developing and facilitating change processes can increase receptivity to energy conservation messages and can generate specific actions to reduce energy consumption.

In this section we provide brief discussions of various components of the process-oriented approach. The section is divided into three parts. The first part describes the concepts on which the process-oriented approach is based. The second part describes "the change agent," an individual who serves as facilitator for the approach. The third section describes the tools and techniques which are used in implementing the approach.

CONCEPTUAL FOUNDATIONS FOR THE PROCESS-ORIENTED APPROACH

In this section we provide a brief summary of the major concepts on which the process-oriented approach is based. The concepts presented

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include:

- o human factors;
- o barriers to conservation and solar technology;
- o perceived attributes of an innovation;
- o planning for change;
- o concepts for group planning exercises; and
- o behavior chaining.

Human Factors

An understanding of human factors is essential to the development and implementation of any energy conservation and/or solar marketing campaign. Often these campaigns are designed only to provide information on demand. This approach will by definition exclude a significant portion of the potential audience and will greatly reduce the utility of the program. Even should materials be requested, they will not have "accomplished their mission" until they have generated some form of attitude or behavior change. Any energy conservation program which counts its successes in terms of brochures distributed or presentations made is deluding itself.

To be effective, campaigns must be designed with some knowledge of the human factors involved in the acquisition and processing of information. The following discussion presents a summary of some of the human factors issues which must be considered in developing energy conservation programs. We have divided this discussion into three levels: cognitive (mental processes common to everyone); individual (environmentally-generated factors which are unique to each individual); and organizational (factors common to groups of individuals living or functioning within a common environment.)

Cognitive Factors

A new communication paradigm is now emerging, based on recent advances in neurology, physiology, psychology, anthropology, linguistics and general systems theory. It suggests that communication between organisms is far more complex than originally thought. Apparently simple exchanges of information now appear very complex. Montagu and Matson (6), for example, have pointed out that humans communicate via a variety of channels using multiple languages.

One key to the new paradigm is an understanding of bilateral brain specialization. One hemisphere (generally the right) specializes in processing visual and emotional information. It is concerned with recognition of shapes, spatial relationships, movement, emotion, and holistic concepts. The second hemisphere (generally the left) specializes in processing abstract symbols such as words and numbers. It is this left brain function that separates humans from animals by permitting the pooling

and organizing of information via abstract symbols (7,8).

The discovery of bilateral specialization and the movement towards more holistic approaches to knowledge (such as general systems theory) has lead some investigators to take a new look at how we store and disseminate knowledge. We find that for the better part of two centuries there has been an increasing reliance on left-brain, verbally encoded information (primarily in the form of text), at the expense of the more holistic, right-brain approach. Toffler (9) would call this a "second wave" approach to information. It has lead to specialization--an emphasis on dividing things into small, managable chunks which can be considered in isolation--rather than toward a more holistic approach that focuses on relationships and gestalt.

Today we have a variety of communication media available for disseminating information, each with different attributes and qualities which affect its use. Consider the differences between a face-to-face presentation and printed text.

Oral communication in a face-to face interactive mode offers great "bandwidth" by providing for the simultaneous use of a number different communication channels. Some parts of the message are encoded verbally, but other parts are encoded in non-verbal media such as phrasing and emphasis, appearance, gestures, and movement. Interaction between speakers encourages both proactive and reactive statements, generating dynamically structured content.

Printed text, on the other hand, restricts messages to linearly structured, verbally encoded information and static, two dimensional illustrations. Much of the emotional content and personal context of an oral presentation are lost and there can be no provision for reactive information. On the other hand, this medium provides the precision of language that only comes with reviewing and rewriting.

Communication is the lifeblood of energy planning and conservation programs. A process-oriented community campaign will require the communication of both gestalt (e.g., the concept of community planning, the conserving ethic) and more structured information such as descriptions of specific energy conservation actions. A general understanding of these cognitive factors can be extremely useful in planning communications--both in terms of content and in terms of packaging.

Individual Level Factors

The key to understanding individual level factors is what we (10) call "the reality window" and Boulding (11) has called the "image." In dealing with information, each individual is guided by his or her perception of the world or view of reality. This reality window is the product of accumulated experience--of what is "real" to the individual. It serves as a filter which is used to process incoming information. This processing can range from interpretation of incoming information to control of attention (i.e., selective attention/perception). The farther information is from the reality window of an individual, the more difficult it is for him

or her to attend to and process it.

The reality window can have a major effect on communications. Individuals can view the same scene or be presented with identical information at exactly the same time and still reach very different conclusions. They can have different interpretations of the meaning of the information because their reality windows differ.

When viewed from the context of a reality window, information comes in one of three sources. Intrapersonal sources contain information that the individual already has--either "in the head," in notes recording previous experiences, or in a collection of books, journals, papers, etc. Interpersonal sources are people with whom the individual can interact to obtain information. Extrapersonal sources provide information for mass use--books, journals, libraries, etc. It is important to note that these three sources represent different distances from the reality window (12).

An individual's reality window is affected by his/her state of need. Everyone has various levels of needs, starting with basic needs like food and shelter, and extending through higher-order needs such as safety, esteem and self-fulfillment. Basic needs must be fulfilled before higher level needs become operational motivators (13).

Group Processes

Individuals do not function in a vacuum. We all live and work in environments which provide us with a certain amount of structure and organization, yet also constrain us. In order to understand the effect of environments, we must look at the behavior of groups, rather than individuals.

Group behavior is far more than a simple aggregation of the behaviors of the individual group members. Because of the complex, dynamic interactions among members (each of whom is behaving according to principles of individual behavior), individuals tend to evolve toward specialized roles within the group. By recognizing these tendencies and the principles that govern group dynamics, groups can become highly effective teams for exploring and solving common problems and issues.

Three factors seem to be very important in establishing the effectiveness of groups: the type of leader (leadership style), the task undertaken (objectives), and the persons in the group. By giving attention to these factors and channeling the anticipated dynamics of the group, the group becomes an effective tool for system design and management.

Barriers to Conservation and Solar Technology

In Tables 1 and 2 we have listed some barriers to the adoption of conservation and solar technology. In trying to find a way to list these barriers (from least to most difficult to overcome) we sought a principle around which to order the plethora of barriers that had been gleaned from many sources (listed in the annotated bibliography). In analyzing these barriers, we have identified a series of stages which we

TABLE 1: BARRIERS TO THE ADOPTION OF ACTIVE SOLAR TECHNOLOGY

I. Effective Awareness

I.1 System Introduction

need information, advice
not usable all the time
cloudy days
climate, weather
not just for water

I.2 System Performance

too new, different
must be proven
await better development
unsafe
inadequate design
want wise approach
too complicated
ineffective
performance
maintenance
warranties
reliability
roof damage
retrofit problems

II. Effective Motivation

not needed
already conserving
too lazy
no interest
don't use it all that much
contented as is
like house as is
social support
questionable reinforcement
need to avoid dissonance
no control
preference for a technological fix: achieving control
back-up heat source needed
rely on booster

TABLE 1: BARRIERS TO THE ADOPTION OF ACTIVE SOLAR TECHNOLOGY-cont.

III. Effective Opportunity

utility monopoly
don't own unit
utilities (discouraging solar)
bureaucracy
political impetus
lack community inducement
other homeowners
architectural committee (condominium development)

IV. Effective Decision

cost
not cost-effective
only one person (in home)
high initial cost
total cost
long-run costs
availability of financing
not permanent home
only with new home
renter
risk ("psychic costs")
missing tax credit
aesthetics
ugly
size

TABLE 2: BARRIERS TO THE ADOPTION OF
CONSERVATION AND PASSIVE SOLAR TECHNOLOGY

I. Effective Awareness

- lack of information
- lack of public awareness
- ignorance
- image of passive solar to the consumer
- mystification of solar
- lack of a quantitative basis for the design of passive systems
- limited design tools
- lack of adequate performance data
- lack of understanding of the economics of passive solar heating
- lack of credible information on economic benefits
- lack of understanding and awareness of passive solar heating
and cooling by the building community
- lack of industry awareness and understanding

II. Effective Motivation

- bias toward high vs. low technology
- hardware fixation
- overspecialization
- bias toward architecture as art

III. Effective Opportunity

- subsidies for non-renewable energy sources
- pricing policy of conventional energy
- special interest domination of government spending
- government regulation
- on-site building/safety codes
- market failure
- lack of marketable designs and products
- lack of qualified designers

IV. Effective Decision

- higher first costs (vs. conventional energy)
- cost
- uncertain resale value
- unfavorable cash flow
- "the martyr complex" (i.e., "don't change horses in the middle
of a stream")

see as at least necessary (if not also sufficient) for decision-making in the area of conservation and solarization.

These stages include:

- o effective awareness;
- o effective motivation;
- o effective opportunity; and
- o effective decision.

"Effective" is employed as a reference to its economic meaning (14,15); namely, "actually in operation or force; functioning" (14) or "operative; potent" (15).

Effective awareness thus includes "simple" awareness; i.e., awareness that solar technology exists or that one can somehow conserve. What is critical is that it goes beyond this awareness, to include the knowledge and awareness that are necessary to make the issue sufficiently compelling and sufficiently well known to cause further action on the part of the individual.

This further action may be what we have called effective motivation. This stage is conceptual, involving largely intuitive processes based on internalized values and concepts developed by the decision maker. For instance, it is here that we expect that a person (having gained sufficient awareness of a problem) will or will not be sufficiently motivated to pursue a solution to the problem.

Included in this stage is a kind of generalized cost/benefit analysis. We again employ an economic model because our experience has been that people themselves make decisions of this sort using this same model. While precise figures cannot be assigned to such an issue as what satisfaction is to be gained from recycling glass in exchange for the effort involved, no attempt is made to do so. Simple considerations of "more" or "less" are assigned to the variables involved, and a decision is made on what is (largely psychically) most cost-effective.

Specifically, we posit that potential adopters must see some reason for pursuing a solution (either a particular solution or the action itself), and that this reason (or set of reasons) must be seen as being in the interests of the decision maker.

Interacting with this is the notion of effective opportunity. Without the opportunity for adoption, motivation will not be enough. Furthermore, perceived lack of opportunity can be a negative influence on the development of motivation. Creating the opportunities for adoption in the conservation and solar area entails establishment of a supportive environment for adoption. Specific applications of this principle might include providing financial support for those interested in solar technology and developing social support networks to encourage conservation.

The final stage is effective decision. Given that one is aware of a problem, motivated to find a solution to the problem, and has the opportunity to solve it through the adoption of some practice and/or decision, we feel a decision is made at this point either to act or not to act. Included as part of this decision process is what we call a "terminal cost/benefit analysis." This is an analysis (similar to that performed in the motivation stage) in which the costs and benefits (at this point more likely to be quantifiable) are assessed. A positive assessment is necessary for a decision to pursue the intended course of action; we cannot say for sure whether it is sufficient.

What is important to note is that one cannot be very strict about seeing these stages as following linearly. A more correct (though more cumbersome) way to view the stages is in interaction--all are involved and may or may not be able to be separated successfully for analysis and/or intervention. We have presented them in the manner in which they might normally proceed, though in any such assignment interactions must be kept in mind. Actual progressions through these stages can only be made a posteriori, which is something better left for those most interested in the academic side of the issue.

For those interested in the policy implications of the foregoing, the barriers listed in Tables 1 and 2 can be taken literally (though we advise a large dose of the proverbial salt) and should also be seen as exemplary of the type of analysis and strategy which we feel can be effective in analyzing and affecting behavior in the conservation and solar area.

Two other models which we have found useful in the past for viewing adoptive behaviors seem compatible with the one presented above. In Rogers' simple diffusion of innovation model (16), the stages presented include awareness, attention, comprehension, test (trial and evaluation) and adoption. Awareness, attention, and comprehension fit into the effective awareness stage we have posited. While an actual trial run of a behavior change will probably not be made, conceptually this evaluation is done in both the initial and terminal cost/benefit analyses.

Innovation attributes important for adoption (17) can also be integrated into the present model. The listed attributes include: relative advantage; complexity; compatibility; communicability; and divisibility. Relative advantage would primarily be dealt with in the initial cost/benefit analysis. Complexity would be dealt with in effective awareness. Compatibility would be considered in effective motivation. Communicability would become important as a context that is part of one's effective opportunity to adopt. Divisibility is something of a moot point, as most measures (with the exception of small scale conservation measures) that would be considered in adoption (installing a solar water heater, building a passive solar home) cannot be divided and are probably "trial run" conceptually, or through some modeling (e.g., working out the costs and benefits of a solar hot water heater).

What is not important here is which model is "correct"--claims can be made for each--but rather that the model we have developed does seem to fit well with other models more conceptually rooted. What we find appealing about the model is its flexibility and utility. It can be adapted easily to most adoption decisions, and assignment of a conservation/solar measure to a stage (as in Appendix II) immediately makes clear the likely difficulty involved in adopting that measure.

This action orientation is what we find compelling about the model; we encourage others to modify it on the basis of accumulated experience with conservation and solarization behaviors. We also encourage policy makers to consider ways to ease consumers through the stages presented and to evaluate proposed measures for adoption within this framework in order to assess their likely success.

Perceived Attributes of an Innovation

It is important to view conservation and solar energy (especially domestic solar heating and cooling) as innovations which require adoption by consumers. Energy from these sources is different from traditionally produced energy since its production is decentralized. Whereas conventional energy production could be stimulated through utility regulation, here the decision to produce energy must be made by individuals who exist in poorly understood networks and who aren't subject to the same kinds or degrees of controls as other energy producers.

In this view, motivating individuals to produce energy through conservation and solar energy amounts to seeing these sources as innovations which require adoption by consumers. We thus present five perceived attributes of innovations (based on Rogers' (17) work) and their importance with respect to conservation and solar techniques.

The five attributes developed by Rogers include: relative advantage; complexity; compatibility; communicability; and divisibility. Each of these is described in turn, and related to conservation and solar energy.

Relative advantage is the degree to which the new idea is perceived as superior to the idea that it replaces. Conservation and solar must be seen as superior in order to replace the older idea of maintaining current rates of consumption. Financial, psychological, social and legal advantages all need to be developed and expanded in order to increase adoption. Conservation and solar energy presently can provide a substantial return on investment, yet this is poorly understood by most adopters. The many opportunities that exist for improving the visibility of the advantages of these energy sources relative to conventional fuels should be utilized.

Complexity is the degree to which an innovation is perceived as difficult to understand. Aside from inadequate financial incentives (both real and imagined), complexity is the biggest obstacle to solar adoption. Passive and active techniques for solar space and hot water heating are poorly understood and assumed to be complex and unreliable. While performance is uneven in the solar field (as would be expected of an immature industry) and needs to be improved, the problem of perceived complexity is

one of the few that can be solved largely through the wide-scale diffusion of information about solar techniques. Information about system configurations and operations would be quite helpful in reducing consumer uncertainty about solar.

Conservation may suffer from the opposite problem--in a nation where technological fixes and grand projects have been the rule of thumb (c.f., the synthetic fuels program, oil from shale, the space program), conservation suffers from being plain. It seems too easy to argue for energy independence through the closing of drapes or wearing of sweaters. What needs to be stressed is that these and other measures are simple, yet important. As the easier conservation techniques are utilized more sophisticated measures will be developed (especially in industrial settings); for domestic purposes, the technology of conservation needs not so much to be demystified as it needs to be detailed and diffused.

Compatibility is the degree to which a new idea is perceived as being consistent with the potential adopter's prior experience, beliefs and values. Given that people strive for consistency in their attitudes and actions, the probability of successful adoption of conservation and solar techniques will vary directly with the consistency of these behaviors with existing attitudes, experiences, values--with the total world view which guides the individual's behavior. In a generalized cost/benefit analysis done by the individual, the extent and nature of change required in one's value system will determine directly the psychic costs of adoption--the greater the changes required by the techniques, the greater the cost.

While many of the implications of conservation and solar energy (e.g., the "small is beautiful" philosophy) for value systems may be desirable, it is not essential that they be adopted along with the techniques, nor is it feasible to do so in the short term. Encouraging conservation and solar by working to change the predominating value systems is akin to catching the tiger by the tail; at any rate it would require an intensive application of resources to accomplish.

What would be far more practical for the present would be to work to align conservation and solar techniques with prevailing attitudes through manipulation of factors other than the attitudes. A simple example of this lies behind solar tax credits--they appeal to the consumer's desire to see solar as a good investment, one that will pay a reasonable amount of dividends in a fairly short time period. Financial incentives need to be improved and expanded, and media campaigns need to be conducted which convince people that conservation and solar are real options and that they (especially conservation) can be adopted with little lifestyle changes.

Communicability is the degree to which a new idea is visible to the adopters. The visibility of an innovation is important if it is to diffuse beyond initial adopters to the general population. This can be a significant problem, especially with conservation and passive solar techniques. While a roof full of solar panels is certain to attract interest, insulation hidden in the attic, closed drapes, or window awnings are far less glamorous. Many conservation and passive solar techniques involve little or no technology and so are more difficult to notice. Still, these

little or no technology and so are more difficult to notice. Still, these techniques can be communicated through a vigorous campaign publicizing their existence and benefits.

Divisibility is the degree to which a new idea can be given a small-scale trial by a potential adopter. Having made a preliminary decision to adopt an innovation, if the individual can perform a test of the innovation s/he can assess its likely costs and benefits before permanently committing resources to the innovation. Conservation practices have the greatest potential for small-scale trial, as they are often behaviors that can be practiced at will. Also, one can test them against monthly utility figures for energy consumption. This provides fast and unambiguous results of the trial. Techniques that involve alteration of property, such as installation of a solar heating system, construction of a passive solar home, or insulation are much less amenable to these sorts of trials. Still, one can (and usually does) perform another kind of trial of such innovations--a cost/benefit analysis. Calculations are made of the costs and benefits of the innovation, both in definite (payback periods, capital expenditures) and indefinite (prestige, independence) terms. At present most consumers lack the skills and/or knowledge required to perform such a thorough cost/benefit analysis.

Planning for Change: Some Basic Principles

Change agents and those involved in planning exercises must ensure that the planning process serves the ends for which it was established. The process must successfully involve those to be affected by the planning. Furthermore, the process must keep clear sight of the goals of increased solar and conservation adoptions for which it was established. With this in mind, some principles involved in the planning process are discussed below, together with their relevance to conservation and solarization campaigns.

Strive for a balance between content and process. The point to remember is that content--information--is not enough. People do need information, and lots of it, but they also need to move/be moved toward greater adoption of conservation and solar techniques. This is the goal of the planning process. One wants to maintain a balanced approach vis-a-vis providing content information and directing the process to serve the end for which it was initiated.

Develop a holistic perspective. All the principles discussed are actually applications of this idea. Utilizing anthropological investigative techniques (e.g., participant observation) will allow for a fairly comprehensive view of the group and its dynamics. This view will also influence identification of problems and consequent solutions, and help in working toward planning that is acceptable by all segments of the population.

Be sensitive to organizational barriers and constraints. Work to discover what sorts of networks people are involved with--what these are, how they work, and how they affect those targeted for behavioral change. Overcoming barriers posed by other organizations and recognizing constraints with which the planning process must cope will ensure the development of workable solutions and realistic plans for conservation and solar adoption.

Change is by nature a political act. Recognize that some or all stakeholders may feel threatened by the changes proposed during planning sessions. It will be necessary both to work both to generate programs which have wide acceptance and to minimize the threats perceived by individual actors in the process. Recognizing that the process of planning and negotiation may well get "dirty" and discovering the network of political relations extant will do much to ensure the success of the planning effort.

Focus on the ends, not the means. While involvement of stakeholders is important for the acceptance and adoption of planning objectives, it is important to remember the goal of the process--a program for the adoption of conservation and solar techniques. One should work to ensure that the details of the planning process do not assume precedence over goals. Make certain that the means work towards the ends; that the means do not become ends in themselves.

Take a dynamic approach to planning: don't choose the solution before you understand the problem. Understanding and defining the problems and barriers involved in conservation and solar adoption will have immediate implications for the selection of solutions to those problems. By making a careful assessment of the problems and by working to continually reassess the problems, appropriate and viable solutions can be found while unproductive courses of action can be avoided. This approach will minimize the negative impact of unpopular and/or unwieldy solutions. It will also maximize the probability of successfully motivating people to adopt conservation and solar techniques.

Assume the role of a change agent. Once an understanding has been gained of the nature and dynamics of the group, one can begin to play a more active role in planning. This includes development and distribution of information necessary for planning and decision making. One must not stop with making information available, but should work to see that it is disseminated and that decision makers are supported in their efforts and carefully involved in increasingly greater conservation measures and solarization decisions.

Focus on communication, education and facilitation. These activities will be part of those one would engage in as a change agent. Potential adopters will require a great deal of information to make decisions. More than information, they will require communication with the change agent to provide support for adoption decisions, as well as the facilitation of the actual adoption behaviors. The objective here is to provide the information and services that are necessary to minimize the costs to the person of the incorporation of conservation and solar techniques.

Some Guidelines for Group Planning Exercises

The overriding principle to bear in mind in group planning processes is to maintain control of the process. There are two reasons for this. First, the members of the planning team will benefit from a clear sense of direction provided by the change agent. Reducing the uncertainty in their minds as to where the process will go and how decisions will be made ensures their participation and acceptance of eventual outcomes. Second,

control of the mechanics of the process ensures that efforts can be focused on development of conservation planning and not become mired in procedural matters.

The content of the meetings will be undetermined, though its emphasis on conservation- and solar-related topics will be understood. This allows the planning to develop programs that reflect the particular needs and characteristics of the group, while the pre-established planning protocol ensures that the results are both fair and relevant.

This maxim of control over the planning process is expressed in the points explicated below.

Be aware that everyone has their own "reality window" or image of the world. Different "reality windows" means that like events and facts will be viewed differently. Identifying and understanding the various perceptions in force will aid in understanding individual views and in predicting reactions to proposed programs and goals. While changing these images is possible, it is also extremely labor-intensive. Most likely, knowledge of the predominating images can be used to map constraints within which to fashion a program for conservation and solarization.

Develop a "common language" for planning so the same terms will mean the same thing to all participants. The "reality windows" discussed above can inhibit the planning process by effectively blocking communication. Thus, it becomes important to take these diverse images into account and develop a language for discussion which will allow all to understand and interact with one another. As communication is central to the planning process, a commonly understood language for interaction is crucial.

Make the objectives of the meeting, the anticipated output and format of the discussions, and the ultimate fate of the output all clear at the beginning. Establishing the objectives, outputs and discussion format at the outset will allow greater productivity of the meetings, as little time need be spent renegotiating these items during the course of the planning sessions. The participants will be free to engage in discussion since they will understand the protocol and since uncertainty over the disposition and conduct of the meeting will have been removed.

Explain and get consensus on the process by which the discussion will be guided. Once again, establishing the discussion format at the outset will enable the participants to understand exactly how the meetings will proceed. It will also relegate procedural questions to the opening session. The planning process will be able to concentrate exclusively on its end of establishing goals, objectives and strategies.

Separate the steps of "problem/issue identification", "alternative solution generation", "evaluation", and "decision-making/alternative selection" in the meeting. In this series, the group first comes to a consensus on defining the problems or issues facing it. It then develops alternative solutions to the problems previously decided upon. These solutions are evaluated for probability of success and for acceptability by those involved. Following this, alternative solutions are selected if the

original ones have failed to gain wide support; upon agreement of suitable solutions the group makes the decisions necessary to implement the solutions.

It is important to delineate these steps so as to proceed smoothly through the discussion. By laying out each step in the planning process, it becomes much more manageable. Each step can be discussed more clearly, and time isn't wasted trying to deal with the stages in interaction with one another. Each step is taken in turn (the gestalt of the process is preserved since the stages themselves are iterative) and resolved before proceeding to the next one. At all times the planning process runs smoothly and continuously holds the interest and acceptance of the participants.

Prevent domination by one or a few members of the group through individual exercise, Delphi-type procedures, or other protocols which minimize the inhibiting impacts of face-to-face interactions. It will be important to monitor group dynamics during the discussion in order to prevent one person or group from steering the discussion for their own ends. The process doesn't depend on participation by persons of one mind; it recognizes that there will be different groups acting to preserve their particular interests. What it does require is that the participants be willing to negotiate their positions. The goal of the group discussion leader is to maintain control of the discussion, guiding it towards a consensus on goals, objectives and implementation plans. The above techniques (as well as others) can be used to ensure that control of the planning process is held by the change agent and not usurped by others.

Behavior Chaining

Behavior chaining is a term we use to describe a technique of breaking a single behavior or attitude change into a series of smaller changes which are easier to perform. Each of these smaller changes is linked with one another, such that one change leads naturally to the next one in the chain. Using this process, what seems like an insurmountable change process can be broken down into a series of manageable steps.

Behavior chaining is an action-oriented equivalent to the multi-step model used by rural sociologists and innovation researchers to describe the processes through which an innovation is adopted. A number of such models exist. A typical one breaks the adoption process into five steps: awareness; attention; comprehension; test and evaluation; and adoption.

Behavior chaining provides a way of responding to the key issues which face any adopter. Rogers (17) defined five perceived attributes of an innovation which tend to determine how well or how quickly it will be adopted: relative advantage; complexity; compatibility; communicability; and divisibility. These attributes and their application to conservation and solar technologies has been discussed earlier in this report.

We have observed behavior chaining in a number of settings. In each case we have found that people more readily adopt a new behavior when it is linked to some previously performed (and rewarded) action or behavior. This suggests that in changing energy behaviors one should start with simple, low-cost, high-reward behaviors and gradually move to more complex, higher-cost changes which have more long-term rewards.

Two considerations are important. First, some conservation behaviors won't necessarily be linearly related; their scope will allow several to be adopted at one time, and the nature of some changes (e.g., turning down thermostats) means that they will recur. Second, we feel that there is probably a "critical mass" involved--that there is a change or a situation which will trigger the adoption of greater and/or more extensive changes. It may be that one can "get a running start" (i.e., build up momentum for a larger change) through the adoption of a series of smaller changes. An example might be adopting measures to increase home energy efficiency, aiming toward a decision to insulate the home.

"Activation energy" is defined (18) as, "the excess energy over the ground state which must be acquired by an atomic or molecular system in order that a particular process may occur." In an analogous manner, if one can build momentum towards large adoption of greater conservation measures, there will still be a large "activation energy" required to effect the change. Given this, it will be crucial to build enthusiasm for this behavior and work to minimize the obstacles to its adoption.

THE CHANGE AGENT

The change agent is the key to the process-oriented approach. S/he is responsible for developing and implementing specific change processes. This discussion of the change agent functions is drawn from a variety of sources describing change agent activities in agriculture, health, education, the forest service, and other areas.

Functions

The change agent serves as a catalyst to identify an area with high change potential, design and implement a change process, and support that process. Specific functions s/he must perform are described below.

Problem definition. The change agent must be able to identify and define problems common to either groups or individuals. Often the ability to find good solutions is rooted in correctly assessing problems.

Process design. Once a problem has been identified, the change agent must next design a process for dealing with that problem. This will require identification of the group, determining what kind of process will work best with that group, and then designing a specific process-oriented change program for that group.

We define two basic types of program designs. Participatory design (see participatory planning) depends on the group for direction and focus. The change agent helps to organize the group effort, but then serves primarily in a facilitation and support role. In a directed program the change agent retains control of the program and the process, although other individuals and groups may be invited to participate in the program.

The participatory design is best suited to groups or organizations which have a well-defined common interest. The directed program is suited to larger programs, where there may be too many stakeholders, or for

programs where it is difficult to identify sufficient common interest to maintain a participatory design.

Facilitation and support. Facilitation and support functions are required primarily in the participatory program, where the change agent is not in direct control. In such cases, the change agent must provide information and problem solving skills to keep the program moving, while still leaving control in the hands of the planning group.

Provide information. The provision of information is a key function regardless of the program model selected. Two basic kinds of information are required. The first is general information dealing with conservation practices, regulations, etc. The second is information which is used to describe conditions in the program area. Often this information must be collected directly from program participants.

This information may include descriptive information on existing energy-related attitudes and behaviors, reactions to specific behavior changes, and identification of key stakeholders in the change process. (Stakeholders are defined as those who will be affected in some way by the change process.)

Dissemination. Arranging for the dissemination of information to all stakeholders and participants is often a function which the change agent must perform. It is essential that all parties be kept informed of activities and progress.

Evaluation, feedback and control. An ongoing project requires some form of evaluation to assess progress and identify the need for modification. This function requires the process skills of the change agent.

Documentation. The change agent should ensure that some form of archival record is maintained for the program. All decision points should be well documented, including potential solutions and reasons for adopting one solution over others. This provides an audit trail and a source of information for individuals who miss meetings or are late entrants into the program.

The change agent should possess a combination of both content and process knowledge. We have emphasized the process area, because we feel it is the area that is most neglected in energy campaigns and because we feel most organizations have or have access to sufficient content resources.

Knowledge and Skill Requirements

Listed below are some the change agent content and skill areas important for success of a conservation and solar extension program. Successful mastery of these skills will be necessary for effective operation of an extension program.

Content Areas

- o knowledge of the functions of a community conservation program
- o awareness of other community energy programs
- o available sources of support
- o diffusion strategies
- o initial contact strategies (for groups and individuals)
- o strategic planning
- o groups processes
- o solar/conservation content knowledge
- o new and emerging energy trends and technologies
- o government conservation & solar policies (at all levels)
- o communication strategies
- o motivational requirements of behavior change

Skill Areas

- o the ability to sell self and program to the community
- o conducting "query negotiation" interviews
- o assembling human and other resources for information presentation
- o assessing client information needs
- o management skills
- o information research skills
- o packaging information
- o self-evaluation
- o publicity

Some other areas where particular knowledge and/or skill will be required of the change agent are discussed below. In this discussion we use the term "client" to designate any person or group which is the object of the energy extension campaign.

The Client and Resource Systems. Problems likely to be encountered in interactions of clients with the resource system (i.e., that system, at the head of which stands the change agent, which is responsible for providing clients with information or other necessary resources) include time, access, reward, need, overload and evaluation. Time is a constraint, causing interaction with the resource system to compete with other activities of the client. Access can also be a problem, especially if the resource system is physically or psychically distant from the client. Sufficient incentives must be present to induce one to use the resources. Also necessary is a prior awareness of a need for the resource system. Information overload can occur, causing the client to defer decisions or base them on information not carefully considered. Finally, the resource system must withstand an evaluation by the client, especially with regards to the credibility of the information.

The Linkage System. Two problems are common in the system which links the client with the resources: overload and marginality. In overload, too much information has been made available; it cannot be passed on as is without also passing along the burden of sorting it out. Filtering the information prior to passing it to the client prevents this but introduces the possibility of keeping useful information from the client. Second, the

marginality of the change agent can be a problem. Belonging to neither the resource system nor to the client system, s/he must work to gain acceptance by both systems, especially the latter.

The change agent basically performs three tasks: negotiating the information need with the client; linking the client with the resource system; and evaluating the acquired information to determine the degree of client satisfaction.

Initial Client Contact. Meetings with large groups generate a certain level of awareness about the energy program, but fail to produce long-term results. The dynamics of large group meetings minimize the opportunity for dialogue with individuals and inhibit clients from asking questions which might embarrass them or diminish their stature among their peers. For this reason, small meetings are best for stimulating and sustaining interest in an energy program.

Prior familiarity helps gain acceptance within the client system. Knowing any or all of the clients speeds development of trust and confidence in the change agent.

One can gloss over the program/process when first introducing it. The point is not to lay out all the details of the program/process, but rather to present it to the degree that the users will understand its existence and purpose. While generalities are of limited value, too much detail in the initial stages of program/process introduction will cause people to concern themselves with details that interest them at the expense of an understanding of the entire program/process.

The change agent will also need to spend some time determining the hierarchy of the organization s/he is addressing. In a formally structured organization, the approval and support of top administrators is necessary to proceed in presenting the program/process to subordinates. It is desirable when it adds credibility and acceptance to the program. In situations where no formal organization exists, it will be necessary to identify those persons who act as opinion leaders and work to sell the program/process to them.

Query Negotiation. Five steps are necessary to determine the information needs of the client.

- o Develop sensitivity to the client's needs through listening skills. Learning to listen effectively will help to understand the real needs of the client and demonstrates genuine concern for him/her.
- o Increase personal rapport with the client. By gaining the friendship and trust of the client it will be easier to understand his/her needs and will lend credibility to the suggestions of the change agent.
- o Ask the right questions: Using reactive questions will help in gaining an accurate impression of what the client perceives as his/her needs.

- o Guide the discussion. Directing the discussion towards resolving the client's uncertainty will be efficient and signal the importance given to the client's needs.
- o Analyze the client's real concerns and motivations. By probing for unexpressed feelings or questions which stand as barriers to adoption, a response can be found which will most likely solve the client's problem.

Finding and Using Human Resources. Change agents can identify human resources by personal, prior experience; by word of mouth recommendations; by written communications and canvas; by telephone; and by using local, state and national resource directories.

These resources can be catalogued by rotary file, printed indices, key-sort systems, computer-based files, in the change agent's head and in catalogues.

It is important to find and use as many resources, especially human, as are available. Change agents should learn to look in unexpected places for additional resources.

The Team Effort. Three functions are critical for smooth intervention team functioning. First, the change agent must be able to identify independent and interdependent activities of each team member in contributing to team activities. Second, the agent must demonstrate the ability to plan a total service approach for handling client contacts and supporting activities. Third, the agent must identify basic issues, alternative procedures and communication links that must be considered in establishing separate programs.

Documenting and Evaluating Service Activities. Change agents must be able to understand documentation procedures, ways of filing records, and ways that documentation can be used for evaluation of services. The maintenance of documents and information for evaluation purposes will be quite important, as it will help determine success and resource needs of the program.

TOOL AND TECHNIQUES

In this section we describe a set of tools and techniques which can be used in developing and implementing a process-oriented approach. Tools and techniques described are all process-oriented and do not provide specific information or skills on energy per se. We feel that if anything there is an overabundance of information available on energy conservation techniques and solar technology. There is an ever-increasing number of books and publications available on energy (see the annotated bibliography in the appendices for some starter sources.) Energy information is also available from a variety of federal, state and local agencies.

Our process tools and techniques include:

- o participatory strategic planning;

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- o the community data bank;
- o community surveys;
- o the use of reactive instruments;
- o the use of mass media; and
- o program evaluation.

Participatory Planning

Participatory planning is a strategic planning technique that permits the planners to benefit from the "images" of those who will use or be affected by the proposed system or plan. Rather than focusing on the development of a specific plan, it concentrates more on the process of planning: selecting goals and discussing issues, generating objectives and developing strategies for meeting those objectives.

Although the planning process itself typically has an end point where the design is "frozen" and implementation begins, the process of planning should be continuous rather than episodic. This ensures that participants are continually assessing future conditions and are aware of the need to communicate their perceptions of the future environment and context to other participants. The continuing process is more efficient than an episodic one, since participants neither have to periodically relearn other participants' images nor renegotiate common perceptions. This is particularly important in the areas of conservation and solarization. Decisions will require frequent revisions as new developments occur and as the planning groups' knowledge increases. Given rapid changes in the group's awareness of conservation and solar energy, premature decisions, particularly when made without the benefit of an overall strategic plan, can have embarrassing, costly results.

Participatory planning initially requires the identification of key stakeholders in the system. Stakeholders are defined as all those individuals and organizations "having a stake" in the outcome of the planning process. These stakeholders participate in the process of planning through structured group discussions, providing feedback during and/or after the discussion. Information which might be crucial to the success of the planning effort is provided to all stakeholders.

This technique encourages stakeholders to take a proprietary interest in the planning process and the goals and objectives that result from it. This increases the likelihood of widespread commitment from those persons and groups who are necessary for the implementation of the plan, thus improving the probability of successfully accomplishing the objectives.

A participatory planning approach generally includes the following steps:

1. Develop generic goals;

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2. Develop program specifications;
3. Develop program objectives;
4. Develop alternative plans for meeting those objectives;
5. Evaluate the plans;
6. Select a best course of action;
7. Develop an implementation plan (specifications);
8. Develop an evaluation plan;
9. Implement the program;
10. Evaluate the program;
11. Use the evaluation data for feedback to modify the program;
and
12. Start another planning iteration with a reconsideration of goals.

Reactive rather than proactive participation should be used whenever possible. In proactive participation, stakeholders give ideas without any context or framework. An example is the change agent who asks "What do you want?". A better way to plan is to describe a prototype conservation and solarization campaign which has all the dimensions (variables) where input is needed and ask stakeholders to react to it--what they do like, what they don't like, and what would they add. This gives them a framework against which to react and a structure for responding.

The initial stages of the participatory planning process are crucial, for they set the foundation for later work. In these phases the facilitator works with the planning group to develop a common frame of reference for the planning. This includes a description of how the participatory planning process works and a discussion of the human, technical, environmental, and economic factors which will affect the planning process.

Another important part of the participatory planning process is the maintenance of an archival record of discussions and activities. This allows those who miss meetings to keep informed on progress and activities. It also provides an audit trail to document the planning process. A project control document can be maintained manually, however it may become cumbersome as the project moves through iterations and revisions. When computer support is available, one solution to the archive question is to create an online planning control document on the computer. Using the computer, the document can be updated and revised with only moderate effort and revised versions can be either inspected interactively or disseminated periodically in print format. Such a support system can easily be supplied by a word processor or by any computer system with moderate text editing and file support capacity.

The Community Data Bank

One of the most valuable tools for community energy activities is a detailed inventory of sources of information and assistance that are available in a given community. Such an inventory will be extremely valuable in planning any energy campaign. It can be used to locate potential participants for planning exercises, to find organizations and individuals with specific skills and knowledge, and to find potential sources for financial and technical assistance.

Some potential sources include city agencies, county agencies, utility companies, libraries, and local grass roots and non-profit organizations. Many cities and counties and most states now have energy conservation programs. The recently established Energy Extension Service supports state-level energy conservation programs which might be of assistance. Many industries and school districts have established energy conservation programs.

Colleges and universities offer another source of energy information and expertise. In addition to having their own energy conservation programs, many have faculty and staff who can provide technical assistance. In California, for example, the state college and university system recently published a directory listing the names, addresses and specialties of all faculty and staff members who could provide assistance to public and private organizations on energy issues.

The data bank is nothing more than an inventory of all these organizations, programs and people--who is doing what, where and how. The inventory should also include information on local, regional and state programs that can provide assistance with energy conservation programs.

The information for the data bank should be collected and organized so it is readily accessible and usable. Indexing or structuring the information may require an additional investment of time, but will probably be a valuable investment if the data bank is used extensively.

Public libraries are perhaps the best source of assistance for organizing and maintaining a data bank. Librarians have the skills to organize information and are generally willing to assist in community projects of this type. Also, as a practical matter, libraries provide readily accessible locations and often already have some of the information that would be used for the data in their files.

Community Surveys

Community surveys are an essential part of any community energy planning and conservation campaign. They are used to collect data describing current energy consumption patterns and attitudes towards energy issues. They provide a baseline against which to measure progress in the campaign and help to identify targets for specific energy conservation programs.

There are four sectors which can be studied in community surveys: residential, commercial, industrial and transportation. These can probably

best be handled by two surveys. One can cover the commercial and industrial sector and business-related transportation. A second can cover the residential sector and personal transportation.

There is nothing particularly difficult about conducting community energy surveys. There are numerous examples of such surveys available in the literature and nearly every community has individuals who can be tapped to help design and conduct them. Properly designed, community surveys can easily be conducted using volunteer labor for relatively little cost.

Specific activities involved in conducting a survey include:

- o defining the objectives of the survey;
- o identifying the areas targeted for information collection;
- o developing a data collection plan;
- o developing a sampling plan;
- o developing an analysis plan;
- o developing the questionnaire;
- o collecting the data;
- o analyzing the data; and
- o reporting the results.

The data collection, sampling and analysis plans are developed before the questionnaire because they often affect the way individual questions are asked and the way the questionnaire is designed.

Whenever possible the data should be analyzed by computer. Computers are becoming increasingly cost-effective, and there are a number of easy-to-use statistical analysis packages available. The cost of computer analysis is relatively low--most of the cost is related to coding and inputting the data into the computer--and the resulting analytic sophistication is highly desirable. It is often possible to find free time on a computer that supports appropriate statistical packages.

The following discussion of survey methodology is offered to help guide the planning and conduct of community surveys. It is conceptual rather than pragmatic in nature and assumes knowledge of or access to information about basic survey methodology. Our discussion is organized into six conceptual areas: technical design, sampling, questionnaire design, data collection, data analysis and interpretation and reporting.

Technical Design

Coherent, thoughtful technical design is vital to the performance of community surveys for a number of reasons. Improved study quality, as a

result of sound technical design, can mean an even greater utilization of study results. It can also minimize the introduction of error at each stage of the study. Finally, a good design is easy to follow and will introduce the group to proper study methodology and techniques. Some specific points concerning technical design follow.

- o Technical design quality and utility are directly related to front end investment--the more one invests in planning and design, the fewer problems one has during the data collection and analysis phases.

It is important to invest a significant portion of the total study cost in design. Approaches should be discussed in advance with consultants or potential participants to identify potential problems. This must be done before substantial design investment is undertaken.

- o Goal articulation is the key element of a survey design. It must include definition of the problem, definition of the situation in which the survey is to be conducted, specification of precisely what information is needed from the study, and a projection of how that information is to be used. Properly done, goal articulation should answer the following questions. What do we want to know? Why do we want to know it? Where will this information be used? Whom do we have to ask? When do we need this information? How much can we spend on the survey?
- o In the goal articulation process it is important to develop as broad a picture as possible. One key question to consider is the relationship of this survey to other, similar surveys. If one wishes to compare the results obtained against those of another survey, then it is important that compatible questions be asked. It is often possible to gain leverage or power by tying one survey methodologically to another.
- o Complex technical designs cause problems. Designs should be as simple as possible to get the job done with a minimum of methodological error.
- o If possible, consider using more than one data collection technique or methodology.

Whenever possible it is preferable to use two or more methodologies to collect the same data. The data collected with each methodology can be compared to provide an increased measure of reliability and internal validity. It is possible to use this approach with a single instrument by using different techniques to obtain the same data. Using different data collection techniques helps to guard against methodological bias.

Sampling

Any community survey requires some form of sampling. We define two generic types of sampling: active and passive. An active sample is one composed of individuals who have selected themselves through some action, such as visiting a demonstration project. Passive samples, on the other hand, are composed of individuals that are selected through no action of their own; i.e., they might reside in a block which has been chosen as part of a sample.

Most survey designs emphasize random samples (a form of passive sample) to ensure that the sample is representative of the sampling universe. For studies where one is trying to develop an accurate picture of that universe this is quite correct. Active sampling techniques are preferable where one is looking for people with a common characteristic such as attendance at a particular event.

Some points specific to sampling follow.

- o In accordance with the theme of design simplicity, sample plans should be as simple as possible and still provide the required representation and precision.

When survey data are used to develop or support policy decisions it is essential that they be robust enough to withstand criticism. As survey designs get more complex, they become difficult to use and become more vulnerable to attack. It is important, however, that the data present an accurate picture of the characteristics of the defined study population. The balance between precision and simplicity is extremely important--particularly when the designer may not be in control of the actual study.

- o Active sample plans provide maximum cost effectiveness.

While it is true that active samples may not provide an accurate picture of the population as a whole, they do provide an efficient way to study those people who actually come in contact with some specific project or program. They are most cost effective because the respondents select themselves.

- o Passive samples are the best way to collect data that is representative of the population as a whole. The most effective sampling technique for passive surveys is generally some form of stratified random sample.

In collecting data to describe an entire population, it is important that all segments be well represented. In developing a stratified random sample it is important that all essential population segments be defined and that these data be used in developing the stratification scheme. Often some population segments are quite small and must be over-sampled to ensure both reliability and internal validity. We normally specify a minimum cell size in stratified designs.

- o The combination of active and passive sampling techniques can be quite effective when developing policy in controversial areas. The passive sample ensures that all elements of the population are represented and the active sample ensures that everyone who wishes to can register their opinion.

We have found this combination to be particularly effective for political issues. Safeguards are required to prevent "ballot box stuffing" in the active sample, but these are not difficult to apply. We have found that these combination studies can be easily administered at relatively low cost.

Questionnaire Design

Questionnaire design is one of the more creative aspects of survey design. Questionnaires can be designed to respond to a number of problems in addition to data collection. The following principles have been developed from our experience with survey-based studies.

- o Questionnaires (like sample plans) should be as short and simple as possible.

With some exceptions, it has been our experience that response rates are inversely related to instrument length. Unless a great deal of in-depth information is required, we try to design our questionnaires so they can be completed in about five and never more than fifteen minutes. The increasing number of surveys has made response burden (the input required by the the respondent) a major issue in instrument design.

We find that people will generally give five or ten minutes of their time to a study but often refuse to participate in longer ones. Non-response represents a major threat to the reliability and validity of survey results and short instruments seem to be the best way to deal with this problem.

We find that short questionnaires are much easier to administer and require less staff training. In cases where more data are required we sometimes find it easier to use two questionnaires, each collecting demographic data and half of the study-specific data required. This increases the total number of respondents required, but lowers the response burden per respondent.

- o Standardized questions should be used whenever possible.

We prefer to use standardized questions whenever possible, particularly for demographics. This allows us to compare our data against other studies which have used the same questions. If the same group plans to conduct more than one survey, the use of standardized questions allows for comparison of data over time.

An added advantage of standardized questions is that data can be aggregated across instruments to develop a broader picture and increase the external validity of results.

- o Whenever possible, forced-choice questions should be used.

We prefer questionnaires which require as little writing as possible. Hand writing takes more time for recording, takes more time for coding, and generates more errors. We prefer to use close-ended questions (e.g. multiple choice) whenever possible. Forced-choice questions need not reduce response complexity.

- o Questionnaires should provide motivation to respondents. As we have noted earlier, we feel non-response is a major problem in all survey studies. We feel it is important that some form of motivation be designed into questionnaires to deal with this problem.
- o Questionnaires should be adaptable to different sampling plans and data collection techniques.

Throughout this section we have expressed our preference for "multiple operationalism"--using multiple data collection techniques to increase reliability and internal validity. We have found this approach to be extremely powerful and very effective for community assesment. We feel it is extremely important that flexible questionnaire designs be used, designs which can be readily adapted for use in a variety of situations and with different data collection methodologies.

Data Collection

Data collection represents the most tedious and often the most expensive aspect of survey work. Precision sampling and long, detailed questionnaires require sophisticated data collection techniques and highly motivated respondents. Increased precision and detail are useful, but they are extremely expensive. When adding precision and detail one quickly confronts the law of diminishing returns--a slight increase in precision means a substantial increase in price.

We feel multiple operationalism is extremely important and should be used whenever possible. Where possible, we like to mix data collection techniques to obtain the proper mixture or depth and breadth. We might, for example, combine a telephone survey of randomly selected homes with a "storefront survey" asking the same questions of people moving through a shopping center or through a particular event, such as a county fair.

Data Analysis and Interpretation

Policy-oriented community surveys often do not require complex statistical analysis techniques. Such techniques often are far more sophisticated than the data on which they are used and generally are not useful in policy analysis.

- o Data analysis for community surveys should use sturdy, easily understood statistical techniques. Complex statistical techniques have no place in community studies; findings must be clear and unambiguous. If a result must be "teased out" with sophisticated analysis, then it often lacks the power required to support policy decisions.
- o The persons using the data for decisions should understand how the analysis was performed.
- o We prefer to use simple, intuitive statistical techniques that can be easily explained and defined. These generally include measures of central tendency, dispersion and co-relation.

Reporting

Reports should be clear, easy to read, and unambiguous. They should explain in detail how the data were obtained. Any caveats attached to the data must be explicitly defined. Findings should include a measure of reliability and validity.

The results of these analyses should be displayed for easy viewing and comprehension. Where possible, results should be displayed graphically.

Some Points for Community Survey Design

The following eight points summarize our discussion of community survey design.

1. The goals of the survey should be well explicated in advance.
2. The survey design should be as simple and methodologically robust as possible.
3. The design should, if possible, provide for and encourage the use of multiple operationalism.
4. Questionnaires should be short, simple to complete, and should be usable in a variety of situations.
5. All basic questions (e.g. demographics, cost categories) should be standardized.
6. Forced-choice questions should be used whenever possible. All standardized questions should be forced-choice.
7. Questionnaires should be designed to generate respondent motivation and interest.
8. The data analysis plan should be developed in conjunction with the data collection plan. It should focus on providing answers which will meet the goals of the survey.

Reactive Instruments

Questionnaires and data collection programs offer an opportunity not only to collect data on local behaviors, attitudes and problems but also to raise the consciousness and awareness of individuals towards their own energy-related attitudes and behaviors.

In a recent study (10), we found that most of the people we surveyed considered themselves to be quite well informed on energy issues and quite energy conscious--much more so than their neighbors. Respondents seemed to hold this attitude regardless of their actual knowledge of energy issues and their personal energy behaviors. Data from other studies tend to reinforce this observation and suggest that most people think they have little additional opportunity for energy conservation practices. As a result, they "tune out" generic energy conservation messages, particularly those which tell them what to do.

In our study, we found that once people had been asked to respond to a general series of questions about their particular energy-related attitudes and behaviors, they began to examine those attitudes and behaviors more closely. Many indicated that they had found that there was room for additional knowledge and behavior change. In essence, the questionnaires had a reactive effect--they forced the respondents to confront their behaviors and attitudes. The result was that they became more receptive to conservation messages and many reported adopting new energy behaviors.

The impact of data collection activities on the respondents has long been a topic of debate in social science circles. There is great concern that questions generate immediate reactions which might somehow color the responses. In this case, the reactive effects of the questions appeared to be longer-range. They were not noticed during the interviews and only surfaced one to two months later during followup interviews.

This suggests that data collection efforts can serve two purposes if properly conducted. The first is to get a picture of respondents' attitudes and behaviors. The second is to force the respondents to confront those attitudes and behaviors. The results of this confrontation are to increase awareness of these issues and to make the respondents more receptive to information describing additional changes. Using the information gained in the questionnaires to tailor followup messages could significantly increase the probability of attitude and behavior change.

In designing community survey programs one should be aware of this reactive potential and use it to help eliminate barriers to energy conservation. Energy behavior questions (e.g., "Which of the following energy conservation actions do you regularly practice?") will help to generate awareness. Energy economics questions (e.g., "Do you know how much you can save in our area by turning down your thermostat two degrees?") will help to generate motivation. Brochures describing potential energy conservation actions can be given to the respondent at the end of the interview to provide opportunity. Properly designed, the survey can add significant impact to the energy conservation campaign while providing the change agent with data to help plan it.

Using Mass Media to Promote Energy Conservation

The mass media (newspapers, radio, television and films) provide a cost-effective way both to publicize energy campaigns and to provide information to directly deal with energy conservation barriers. Although the mass media have been and are being used extensively to promote energy conservation, we feel that most media campaigns have little impact because they are selectively "tuned out" by their audiences. To be effective mass media messages must reach their intended audiences.

In a recent study (10) Applied Communication Research explored the use of mass media to promote energy conservation. Based on our experience with this project, we developed a series of recommendations to guide the use of mass media for energy conservation campaigns. These recommendations are summarized below.

1. Messages must be short, concise and direct. They should last no longer than 5 or 10 minutes.
2. Messages should not try to present too much information or cover too many subjects.
3. Additional written information should be available on request to back up the mass media messages.
4. Campaigns should exploit "captive audiences" rather than trying to draw an audience on their own merit.
5. Campaigns should use a visible spokesperson. The same individual should be used across the campaign to build identification and awareness.
6. Campaigns should have built-in evaluation components and should provide followup capacity whenever possible.
7. Messages should be aimed to reduce to the maximum extent possible the barriers between the audience and some simple, minimum action.
8. When possible, campaigns should be tied to local programs. Any material sent out should be tied to local programs.

Based on these recommendations, we suggest four approaches for using mass media to promote energy conservation: the use of television talk shows; the use of radio talk shows; preparation of a how-to energy column for newspapers; and the development of a series of film "shorts" for use by local television stations and/or motion picture theaters.

All four of these approaches feature "captive audiences"--audiences which have already gathered for some other event. This by itself ensures a much larger audience than most energy conservation messages can draw by themselves. They also provide an economy of scale--a single segment or presentation can be used many times with little or no change.

Messages should focus on local campaigns, issues and problems. They must be designed to help their audiences relate to them, rather than to tune them out. They should focus on a single topic and they should focus on the conservation barriers we have discussed earlier. They should provide a statement of the problem, justification or motivation for dealing with it, an achievable solution to the problem, and some mechanism for providing reward, such as self-evaluation, typical local energy savings, or payback.

The messages can easily be tied to backup print programs that can provide supplemental information on request. These backup programs can be coupled with a feedback program to collect impact data and data to be used in modifying both the mass media messages and the followup materials. Additional impact assessment can be obtained from standard audience statistics which are readily available for most mass media channels.

While these media messages will be short, they should not be developed as advertisements; this is because advertising cannot address the range of barriers associated with conservation and solar adoption. They fail to develop audience identification; they do not provide specific actions; and they do not provide rewards for conservation behaviors. We have found that people need someone they can trust when getting information about energy. They also need to be supplied with specific actions once they have made a decision to conserve, and the actions they take need to be rewarded. Advertising cannot provide the time and depth necessary to address problems of identification and action suggestions. While media cannot provide financial incentives for conservation, certain rewards can be built in to messages to encourage people to conserve.

Program Evaluation

The major reason to conduct an evaluation of the change program should be to improve it. A conscious, structured review of program activities can often identify hidden problems and/or opportunities for additional activities. More specifically, an evaluation can be used to provide feedback and control information for management. This information is useful, sometimes to assess the cost/utility of services, sometimes to justify existing programs, and sometimes to support prevailing opinions.

Recent work by Cronbach (19) and others (20) has begun to emphasize the political nature of evaluation. This approach stresses the need to identify program stakeholders, identify their goals and concerns, and use these data to guide the evaluation. The evaluation is then tied to the political reality of the program and can focus on providing information which can be used for management and/or policy purposes. This approach produces data with high utility--data which can be used by the stakeholders in their work related to the evaluated program.

Emphasis on utility and impact as the key performance measures for the program mandates a pragmatic approach to evaluation. It means that the evaluation must stress timeliness, internal validity, flexibility, accurate interpretation of results and the provision of decision-relevant recommendations.

Types of Evaluation

There are a number of different types of evaluation. We normally talk about three kinds of evaluation: formative evaluation, which is concerned with internal operations; summative evaluation, which is concerned with the degree to which programs meet their goals (generally explicated in terms of programs and services) and impact evaluation, which is concerned with the overall impact of the evaluated program.

Formative evaluation is concerned with assessing what is happening and with allocating costs to specific operations. We prefer to consider these two areas as separate functions that occur within formative evaluation.

The purpose of the descriptive function of formative analysis is to assess how well the project runs, with the goal of improving the performance either of the evaluated project itself or of subsequent projects. The evaluator observes the conduct of the project from close range and collects data to provide input for his/her study. The approach is generally flexible so the evaluator can modify his/her focus during the project. As "outcroppings" of effect are identified, the evaluator can move in and examine them in closer detail.

One of the most important policy functions of descriptive formative evaluation is to provide feedback and control data which can be used by the project management to "tune" or modify operations. This requires the timely analysis, interpretation and reporting of these data so they can be used by project management.

The second function deals with program efficiency. This approach stresses management and is concerned with the cost/utility of internal operations. An efficiency analysis is concerned with collecting data on staff costs for specific services and products.

The final output from a formative evaluation is not highly structured, since it depends to a large extent on what actually takes place during the project. It is essentially a dynamic evaluation. To be successful, a formative evaluation must have a relatively sophisticated data collection plan which is readily adaptable to changing circumstance and focus. It requires fairly close contact between the evaluator and the project.

Summative evaluation is concerned primarily with measuring the project or program against some predefined set of goals or criteria. Summative evaluation is both more rigorous and more static than formative evaluation. Since it is concerned with determining how well goals were met, it must also be concerned with the issue of causality--were changes in the goal variables caused by the project, rather than by some external factors.

Summative evaluation requires detailed planning, including the development of a well defined program goals, explication of measurable variables, identification of possible intervening variables, and plans for collecting and analyzing data to measure changes in criterion (goal) variables.

The key to summative evaluation is the development of reasonable, measurable program goals. Ideally, the goals for information programs and services should be defined in terms of programs and services to be provided, and in the quality of those services. While actual program goals may be more abstract (e.g., shifting to renewable forms of energy), it is important for summative evaluation that realistic, measurable goals be articulated. The volume of program activity and the quality of that activity provide real, measurable variables which are subject to a minimum of external influences.

The third type of evaluation is concerned with assessing the impact of the program on the intended user community and on the problems it was created to help solve. It takes a more policy-oriented focus to consider whether, in fact, that program was the most effective way to deal with this specific problem, or if some other mechanism might have been more effective.

This level of evaluation is often more impressionistic than either formative or summative evaluation. It focuses on identifying actions which can be attributed to the project intervention. Impact evaluation relies on "outcroppings" of effects detected through formative data collection techniques. Such outcroppings may include changes in behavior, "spinoff programs" or policy decisions. Impact evaluation lacks the rigor of summative evaluation. It is based on the premise that it is impossible to control external variables in a field setting and therefore impossible to prove causality with statistical precision. The impacts identified are usually serendipitous and require an extremely flexible approach to observation and data collection. In such evaluations we have found that if one looks across a large sample, enough of these outcroppings will emerge to give some indication of the general effectiveness or impact of the project intervention.

A Pragmatic Approach to Evaluation

Methodological approaches to evaluation are usually specific to situations. Critical factors include the type of project to be evaluated, the scope of the project, and the required output from the evaluation.

The first step is to determine what the goals for the evaluation are. Some possible goals include:

- o document program activities;
- o demonstrate program impact;
- o analyze program cost;
- o identify problem areas; and
- o identify successes which can be promoted and/or packaged for more widespread use.

Once goals have been established, the next step is to look for data which can help to measure these goals. Some goals require data which

are internal to the program (e.g. program activity records, accounting records) while others require the collection of new data.

There are a number of data collection techniques which are useful for evaluation studies. Basically they can be divided into three types: direct data collection, in which one collects data directly from respondents; indirect data collection, in which one asks a respondent to make observations on the behavior of others; and archival data collection, where one uses data that has already been collected, usually for some other purpose. The second two types of data collection fall under the heading of "unobstrusive measures"--data collection techniques used so the respondent is not aware of being observed and thus does not "react" to being measured.

Examples of direct measures include self-administered questionnaires, interviews and direct observation. Examples of indirect measures include the use of "expert informants" and panels. Examples of archival data sources include library checkout records, patient records, monthly statistical summaries and newspaper articles.

Data for some evaluation goals can be collected with simple modifications of standard program management procedures.

- o Accurate accounting records can allocate staff time and other expenses to specific projects to help establish their actual cost.
- o Maintaining records of program contacts (e.g., attendance at meetings, number of information packages sent out, number of people surveyed) can help to document outreach activities.
- o Requiring periodic reports on a project-by-project basis will ensure that most of the information required for formative evaluation and program documentation is collected.

Most evaluations will require collection of some data from outside the program itself. Again, with careful planning it is possible to reduce the cost and effort required.

- o Look for sources of archival information. If the campaign is trying to reduce automobile use, look for archival measures that reflect that use. See if gasoline sales figures are available from service stations in your area. Check to see if your city has a regular traffic count program and, if so see if there are changes in traffic densities.
- o Replicate the community survey using the same instrument to look for changes in attitudes and behaviors.
- o Decals and stickers help to publicize the projects and provide an easy way to measure their diffusion through a community. Hand them out to project participants and periodically count them. An auto maintenance project might hand out bumper stickers to all

those who participate. A home weatherization project might hand out window decals so residents can show they have weatherized their home.

A less formal and more subjective technique is to use "expert informants"--people who are familiar with community patterns in specific project areas. Service station attendants can assess the degree to which people check tire inflation. Hardware and building supply companies can generally tell you about the demand for weatherization and insulation materials. Solar firms can tell you how their market is going.

The main point is that program evaluation is not a terribly difficult or complex undertaking. It merely requires identification of goals, identification of data which measure achievement of those goals, collection of the data, and some form of analysis or reporting. Evaluation's value is in improving programs. If it fails to cause improvements, then it has been unsuccessful.

Goals for an Evaluation

Since we identified goal articulation as a major factor in any evaluation, we offer the following points to guide design. These draw on our previous discussion of evaluation and community surveys.

- o The goals for the evaluation must be well explicated in advance.
- o If summative evaluation is required, then the goals of the program to be evaluated must be both well defined and amenable to measurement.
- o The evaluation should be designed to meet established goals. The emphasis should be on utility--on getting the information needed to document and improve the operation of the program.
- o The study design should be as simple and methodologically robust as possible.
- o The design should, if possible, provide for and encourage the use of multiple operationalism.
- o Where possible, evaluation should be performed as a continuous rather than a discrete program.
- o When direct data collection is used, follow the suggestions contained in the section on community surveys.
- o Great emphasis should be placed on interpretation. The data and the results of the analysis must be interpreted within the context and the realities of the political situation.
- o Those who will implement the recommendations of the study should be involved in the conduct of the evaluation.

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- o Those who operate the program which is to be evaluated should be involved at some level in the evaluation.
- o If external evaluators (e.g. consultants, a contract research firm) are to be used, the preceding two points should receive even more emphasis.

PUTTING IT ALL TOGETHER

So far we have focused on providing the "building blocks" for the process-oriented approach. Those who have read and understood the materials presented in the previous section should have most of the tools and concepts they need to develop their own energy planning and conservation programs. Every program will have to be tailored to the specific community and its needs. The following outline is provided as a guide rather than a firm plan, and it is offered with the understanding that each user will want to adapt it to his or her particular circumstances.

GETTING STARTED

Find out if there already is a comprehensive energy planning and conservation program in the community. If so, join it and introduce the concepts described in this report as appropriate.

If no such program currently exists, then develop an initial set of goals of what one should entail and discuss them with members of the community. At this stage there is no need to contact a large number of people, but try to reach a representative sample of people. Select people who can provide leverage, people who can contact another community segments. Contact city officials, industrial and business leaders, members of local civic, service and social organizations, local energy programs and the public library. At this stage focus not on developing a planning organization but rather on developing a constituency for the study.

COLLECT INITIAL PLANNING INFORMATION

Conduct an initial inventory of community energy programs and develop an initial community energy data bank. The purpose of this initial effort is primarily to help identify these organizations, establish liaison with them and invite them to participate.

DEVELOP A COMMUNITY PLANNING TEAM WITH A BROAD SUPPORT BASE

Recruit people who are interested and are willing to work. Concentrate on two types of qualities: people who have the skills and knowledge that will be required for the program and people who have political power and whose participation will help to ensure the support and success of the program. Ideally, try to find people who represent a mixture of the two types of qualities. Make certain the team has at least one representative from the local government who can serve as liaison and assist in obtaining any legislation that may be required.

FIND SOMEONE WHO CAN SERVE AS A CHANGE AGENT/FACILITATOR FOR THE PROGRAM

One can get a change agent/facilitator in one of three ways. First, s/he could be a volunteer--someone who is interested, has the requisite skills, and is willing to take on the task. Second, it could be someone who is already working in this area who would be willing to take on the task as part of their work. Third, if one can develop financial support

then hire a change agent, using the section on change agents to help in writing the job specifications.

DEVELOP AN ENERGY PLAN USING THE PRINCIPLES OF PARTICIPATORY PLANNING

With the assistance of the change agent, the planning committee should develop a community conservation program and campaign using the principles of participatory planning outlined in the previous section. The plan should evolve from the general to the specific. Goals should be translated into objectives and specifications for an initial campaign should be developed from the objectives.

The planning process should be an iterative one. It should not try to accomplish everything at once. It might begin with some moderate objectives and establish a plan for meeting them. Once that plan has been implemented, it should be evaluated and the results used to plan a second iteration that will deal with a new set of objectives.

DEVELOP AN IMPLEMENTATION PLAN

The implementation plan should focus generating awareness and motivation, providing realistic actions, and providing decision support and reward. Ideally, the campaign should tie together a number of energy conserving actions using the principles of behavior chaining.

The campaign should utilize the principles of behavior chaining. It should present a series of actions, each selected to link with those previously presented. The campaign should focus on one action at a time, encouraging the entire community to perform it before moving to the next. Some type of community scoreboard could be used to assess success of each action.

Some campaign topics might include:

- o Caulking and weatherstripping month. Arrangements could be made with local hardware stores to provide special displays of materials, instructions, and perhaps even demonstrations. Commercial firms providing these services should be invited to participate. Programs that provide free weatherstripping for seniors and disadvantaged groups should be publicized. Local energy audit programs should be actively promoted.
- o Maintain tire pressure month. This campaign would be coordinated with local service stations and automotive dealers. Publicity should stress the impact of tire pressure on mileage. Courtesy tire check stations might be operated in shopping centers on weekends.

Each of these two topics are relatively simple and inexpensive, but provide a relatively rapid payback. Each could serve as the start of a behavior chain which introduced successive actions in each month. Other possible actions in both residential and personal transportation sectors are shown in Appendix II.

INTEGRATE EVALUATION INTO THE PROGRAM

An evaluation component should be built into each campaign. Ideally, there should be some evaluation activity for each action promoted in the campaign. The evaluation can be used to provide managing and feedback information to the planning group. It should also provide both reward and motivation to the community.

For example, window stickers could be prepared to indicated weatherization or tire pressure maintenance. These stickers could be issued by participating service stations and hardware stores. Counts of the stickers handed out would give a measure of campaign success. Display of the stickers in home and auto windows would generate awareness and motivation to those who had not yet participated.

Properly managed, such a recognition program could generate community esprit de corps and peer pressure to participate in the community energy program.

REVIEW AND REVISE THE COMMUNITY PLAN AS NEEDED

As noted earlier, the process-oriented approach requires an interactive program plan. Once implementation and evaluation have begun, the planning group should periodically review program goals, objectives and activities in the context of the local, regional, and national situation.

The plan should be considered a dynamic document and should be revised as necessary to reflect changing energy behaviors and a changing energy situation. The evaluation program will provide valuable input for this review and revision function.

The periodic review of the community energy plan should be publicized and public input should be invited. Mechanisms should be developed to provide community members with the opportunity to participate in the review process. Properly conducted, the review process can introduce valuable new input into the plan and can help maintain community awareness and involvement.

A FINAL NOTE

The key to a successful community energy conservation and planning program is involvement. It must be designed to involve the entire community. This requires building a total context for energy conservation and planning. awareness, motivation, opportunity and decision support are all parts of this context, but each by itself is not sufficient. To be successful, a program must supply all components necessary to involve the public and to encourage energy conservation. Failure to provide any single component will seriously threaten all the remaining elements of the program.

James Krenov has argued (21) that one does not build cabinets or pieces of furniture: rather, one "composes" these objects. His choice of words is deliberate: just as a composer seeks to create a unified musical statement working with and through the various string, percussion, brass and woodwind sections of an orchestra, so also the woodworker must guide an interaction among wood, tools, design, functional requirements, artistic intent and personal capabilities in the piece s/he creates. In like manner, we have laid out the tools in our chest; the hammers and chisels, the violins and kettle drums which are necessary for planning and bringing about an extensive energy conservation and solar technology adoption process.

But a hammer is not a cabinet, any more than a violin is an orchestra. Neither is it sufficient to create the parts of an energy program without also taking care of the whole. What is needed is to create and sustain a total context for conservation and solar adoption. Awareness, financial and social incentives, behavior chaining--by themselves, none of these are enough. All must be combined into a program that brings energy consumers to the point of conservation as a second nature, and solar adoption as a real choice.

Some of the elements we have described are in place and need only some additional development; others will have to be built essentially from scratch. The challenge we place before those that will embark on this program is to develop both the specific components of an energy conservation and planning program and to pay close attention to integrating these components into a coherent and dynamic program. It is our belief that this will serve the objectives of planners and policy makers while also involving energy consumers in a fair and democratic manner, to the betterment of all.

In a previous study (10) we asked residents in Northern California to compare reactions to the energy situation with those of the recent water shortage. We found that people conserved water for two reasons. First, there were severe financial penalties for over-consumption (in many communities, continued water use beyond allocated levels was punishable by shut-off of the water); second, the problem was seen as much more immediate and short-term--in essence, closer to the "reality window" of the respondents. What was also of importance was that the majority of the populace felt that no one was being unfairly penalized or made to do more than their share. Water use quotas were developed which took into account the needs

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of the consumer as well as past water use patterns. That everyone was being affected, and that all were involved in the solution--these feelings generated a sense of community which further which made the innovation highly visible and made it more socially and psychically rewarding to conserve.

We need to create a similar feeling of shared concern and community in the conservation and solar area--that everyone is involved and contributing their share toward reducing America's dependence on foreign sources of oil and helping to convert energy supplies to renewable sources.

Americans like to be winners, to be leaders. A vigorous conservation and solarization program, such as has been outlined above, could be just the vehicle for renewing faith in the individual and his/her ability to contribute and for instilling a sense of confidence and pride in the national leadership's moves toward assuring a secure energy future.

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APPENDIX I

SAMPLE COMMUNITY PROGRAMS

SAMPLE COMMUNITY PROGRAMS

In this appendix we summarize a number of community planning and change programs which illustrate many of the concepts we have discussed in the main body of this report.

Several of the summaries describe community energy planning programs. One describes a proof of concept test of the process-oriented approach. Another describes a mass media intervention designed to stimulate conservation actions. The final summary describes an elaborate, multi-level program that used many of the principles we have described to convince an entire community to make behavior changes that would reduce the risk of heart disease.

None of these programs provides a complete example of the process-oriented approach; however, they all demonstrate various facets of the approach and offer useful lessons for those who plan to develop their own community energy conservation and planning programs.

SEATTLE, WASHINGTON

Based on a report which stated that Seattle could meet most of its projected electrical demand through conservation (and did not need nuclear energy as a source, as had originally been proposed), the City of Seattle passed four resolutions aimed at establishing a solid conservation program. These resolutions dealt with: forecasting electrical energy demand; adopting energy conservation policies; adopting electrical generation policies; and meeting unanticipated energy demands.

The first resolution passed called for adoption of a valid, reliable econometric demand forecasting model to be used for anticipating future electrical demand. An estimate was to be prepared each year, and the model and its estimates to be reviewed at least every five years. Twenty-year forecasts and short term forecasts were to be made; the former to provide an estimate of demand in sufficient time to allow for expansion of generating capacity and the latter estimate to provide data for short-term rate planning. The forecasts were to be designed to allow for sensitivity analysis and flexible enough to be applicable to a wide variety of situations. The forecasting report was to be made public each year. The contents were to include the forecasts, new data, an explicit presentation of assumptions and methodology, and an explanation of the major factors influencing the forecast.

The city had earlier established three energy goals: to reach a steady level of per capita energy consumption by 2008; to use energy efficiently in providing for Seattle's demands; and to formulate an energy policy for the city consistent regional, state or national policies which were or might be developed. Pursuant to these goals, the city adopted a resolution outlining nine actions to be taken to encourage energy conservation:

1. Promote conservation through consumer education and technical assistance programs.
2. Develop, implement and maintain a municipal energy conservation plan. The plan was to include energy audits of municipally owned buildings, life cycle costing, sharing of revenues generated from conservation and exploration of alternate energy technologies.
3. Establish an energy conservation office to carry out energy conservation policies (largely through the dissemination of information).
4. Regularly review and revise (as necessary) all existing building codes to provide maximum energy conservation, be consistent with the energy policy and to accord positive economic benefits.
5. Regularly review and revise (as necessary) utility rates in order to encourage conservation.
6. Make plans for short-term unanticipated shortages and contingency plans in the event of a predicted failure to meet energy demand.

7. Encourage and possibly enforce energy efficiency among the principal energy users.
8. Encourage research into technologies for more efficient use of energy.
9. Support regional, state and national efforts to formulate policies which reinforce the conservation goals.

The third resolution passed outlined the following eleven policies designed to govern generation of electricity.

1. The decision factors to be involved in energy planning were to include product resource use, energy conservation, sound economic principles and environmental responsibility.
2. A 20 year load forecast was to be maintained.
3. Hydroelectric power was to be preferred over other sources.
4. Natural gas and oil were to be used for meeting peak electrical generating demands; the utility was also encouraged to efficiently utilize waste heat in thermal projects.
5. Self-owned or jointly owned generation facilities were to be preferred.
6. Federal power generating sources were to be used when available.
7. Future planning was to include consideration of generating and non-generating alternatives.
8. The utility rates were to reflect the city's preference for Federal power.
9. Expenditures on generating projects were to be minimized while environmental and energy resource questions were unresolved.
10. The construction and operation of generating facilities was to be carried out so as to minimize environmental impact. Processors and extractors of fuel were to be likewise encouraged.
11. Adequate safety and health standards were to be established for the construction and operation of generating facilities and for disposal of wastes from thermal generating facilities.

The final resolution called for the adoption of a contingency planning program to meet unanticipated electrical energy needs in the future. Standby conservation measures were to be developed, and studies looking at future generation sites (hydroelectric and coal) were to be undertaken.

DAVIS, CALIFORNIA

The city of Davis established a housing development review board and charged it with six tasks. It was to:

- o prevent premature development in the absence of utilities and municipal services;
- o coordinate energy planning and land regulation with the general plan;
- o accomplish the energy goals of the general plan which could not be accomplished solely through zoning;
- o prevent unplanned growth, i.e., growth unrelated to community needs and capabilities; and
- o encourage the development of proposals which accomplished the objectives of the general plan.

The board adopted minimum performance standards for winter heat loss and summer heat gain in residential housing. It set up standards for residential construction which included considerations of infiltration, loose fill insulation, and pipe insulation. Compliance could be achieved through two methods.

The first, known as the "prescriptive" method, involved the builder fulfilling the requirements for energy conservation standards established by the city. In this case, no performance calculations were required.

In the second, "performance" method, calculations completed by a qualified professional (e.g, architect) were required to show that the house met or exceeded the standards developed.

The city also developed a conservation retrofit ordinance. Its purpose was,

to prescribe, by regulation, standards which increase the efficiency in the use of energy by residential structures. These standards accomplish this goal by requiring the application of appropriate energy conservation technologies to the climate control and habitability systems of these structures.

Energy conservation technology units (ECT's) were awarded for incorporation of attic insulation, exterior window shading, solar swimming pool heating, solar-assisted domestic hot water heating, solar-assisted hot tub heating, flat roof insulation, floor insulation, wall insulation, low-flow showerheads, water heater insulation, fluorescent lights, and door weather-stripping. Each practice was worth a certain number of points. Point totals to be achieved were established for 8 types of houses and varied according to the type of hot water heater (gas or electric). One was free to meet the ECT requirements established by using any combination of conservation practices that one desired.

NORTHGLENN, COLORADO

The city of Northglenn worked to establish a rural-urban link so that water supplies could be best utilized for the city and for crops. Northglenn and the Farmers Reservoir Irrigation Company (FRICO) entered into an agreement where the city would exchange capital construction services for water.

According to the agreement, FRICO would supply water to Northglenn, based on the latter's dry-year demand and given projected population figures. In return, Northglenn was to collect the water, treat it (to FRICO's specifications), store it and transmit it back to the FRICO's irrigation network. Northglenn was to be responsible for construction of treatment facilities and improvement of channels.

A minimum amount of water (500 acre-feet) had to be available for irrigation before any water would be shipped to Northglenn. The city was to use its own water sources to supply (in all or part) its demand whenever possible. Additionally, it would return for irrigation 10% of the water that it imported for its own uses. FRICO also kept proprietary rights over the water.

Through this system, the farmers were assured a constant, clean supply of water for irrigation and the city was assured of a supply of water for its purposes. The city maintained itself without displacing farmers or agricultural production.

HARTFORD, CONNECTICUT

The city of Hartford established a Community Energy Corporation, a non-profit corporation professionally managed as a private enterprise. Its objectives were to create good jobs for Hartford residents (with salaries paid through monies saved in conservation), to reduce the impact of energy costs on low-income persons and to reduce the burden on the taxpayer created by the energy wasted by public buildings.

The corporation foresaw three markets.

1. Private homeowners. These were to be served with an integrated service, including a final energy inspection and a financing plan to keep payments for conservation improvements less than the amount saved by those improvements.
2. Public buildings. Major sources of waste were to be identified and corrected.
3. Low-income renters/homeowners. A fully subsidized program was to be set up to help pay for energy as well as make conservation improvements.

This program was to create jobs and save energy, consistent with the economic interests of the customers. Included in the program were careful, complete energy audits.

Initial recruitment of workers was to come from the unemployed and CETA labor pools. These workers would be trained in installation and inspection. Sub-contractors were to be hired to provide expertise where it was required. The program was to help the unemployed improve their work skills and gain a head start in gaining employment in similar industries.

Federal subsidies in materials and supervisory costs were to be sought for the low-income conservation retrofit projects. Public facilities were to show their support by contracting with the corporation, at reasonable prices, to improve the energy utilization there. The private market was expected to respond quite positively to the comprehensive service and to the favorable financing plan.

THE FRIARS VILLAGE PROJECT

The Friars Village Project was an attempt to develop a program for marketing solar technology to the condominium market. Initially intended as a pilot study of retrofit solar water heating for multi-family residences, it was expanded into the development of a cooperative model with applicability to residential housing (multi-family and single family high density); commercial buildings; retrofit and new construction; and water and space heating.

The project was designed and conducted by Wayne Ottinger of the California State Energy Commission and Colin K. Mick of Applied Communication Research. It used "participatory planning" to involve the entire population of the condominium development in exploring the potential of solar technology for their hot water heating needs. The basic thrust of this methodology was to help the residents determine for themselves the feasibility of adopting solar technology. The program provided residents with a structured approach to a solar analysis. It included: assessment of existing energy use; assessment of local attitudes concerning solar; review of local building codes affecting solar; analysis of the legal documents governing the condominium; selection of solar designers and contractors; solar system design alternatives; financing of systems; and other relevant information.

The general strategy used for the Friars Village project followed the principles of "participatory planning" developed by Russell Ackoff. This required that there be heavy involvement, in all stages of planning, of those to be affected by the proposed project. To help accomplish this, the intervention team (Mick and Ottinger) worked primarily as "support staff" to a solar committee appointed by the Friars Village Homeowners Association.

In this capacity the team worked with the committee to:

- o define goals and objectives;
- o develop a strategy for attaining the goals and objectives;
- o provide all information needed for decisions and planning;
- o arrange for input from consultants and experts;
- o facilitate and coordinate all project activities.

Heavy emphasis was placed on informing residents of project activities. Where possible, local residents were used to assist in information collection and dissemination activities.

Major stakeholders in the study included the homeowners, Friars Village administration, the U.S. Department of Energy and the California Energy Commission, ACR, Southwest Energy Management and other solar contractors, the City of San Diego, San Diego Gas and Electric Company, and the mortgage holders, most notably California Federal Savings and Loan.

The project was to be implemented in three phases, however only the first phase, project development, was completed due to lack of funding. In this phase the solar committee, with the assistance of the intervention

team, collected initial planning data, conducted a preliminary feasibility study, conducted an economic and financing analysis, developed initial project parameters and presented the project for a residential referendum.

At the conclusion of this phase, Friars Village residents voted unanimously to begin the second phase of the project--development of complete project specifications and development of a financing and marketing plan. Unfortunately, the facilitators were unable to secure additional support funds and the momentum and support which had been developed during the three months of the project were lost.

Although the Friars Village Project was not completed, it does provide a prototype for encouraging retrofit solar in condominiums. It demonstrated that the intervention/participatory planning model can work. However, it also demonstrated that it is important that continuity be maintained.

Friars Village did provide a valuable learning experience. In the course of the project we were able to test the viability of our participatory planning model to generate change. Our major conclusions are summarized below.

1. A participatory planning approach can be effectively used to promote solar and/or energy conservation. The greater the involvement of the target population, the greater the probability of success.
2. The involvement of non-resident stakeholders is vital to success.
3. Energy consumption, economic and cost/benefit analyses are very important parts of any change campaign in this area. Projections must be based on actual data from the using community.
4. Reactive survey instruments appear to be exceptionally powerful motivational tools. Asking individuals to describe their energy-related behavior to an interviewer forces them to acknowledge that they are not using energy as efficiently as they could. When forced to confront their behavior, they become receptive to additional behavior change.
5. The energy behavior self-awareness developed through reactive questionnaires can be used to promote energy conservation behavior by immediately providing a set of well packaged suggestions for energy conservation and providing social support for energy conserving behavior.
6. The period between acknowledging the need for personal energy conservation and the actual implementation of energy conserving behaviors is critical. If this period is too long, the effect of the heightened awareness and receptivity will be lost. Failure to provide viable energy conservation options will quickly result in lost opportunity.

THE OVER EASY EXPERIMENT

The Over Easy experiment was a mass media intervention conducted by Applied Communication Research, aimed at generating energy conservation behavior. It involved the preparation of a carefully developed energy conservation message which was presented on the national daily PBS television series Over Easy. The segment was presented initially on May 3, 1978 and rebroadcast on two more occasions: November 11, 1978 and September 24, 1979. The message was specifically tailored to the audience characteristics of the program. Supplemental print materials were developed and made available to viewers upon request.

The intervention was evaluated using a combination of audience data, viewer response, and data collected via a feedback questionnaire which was sent out with each information package.

Overall, the response to the energy segment was highly favorable. After the first segment was broadcast more than 1,300 requests for additional information were received and approximately 25 percent of those receiving the additional information mailed back the feedback questionnaires. More than 4,000 requests for information have since been received. Many of the request letters asked for assistance with specific problems or offered suggestions for other energy saving tips. Individual letters (about 75) were written to those requesting assistance, providing either specific information which could help them with their problem or the name and address of some individual or organization that could help them.

Results of the feedback questionnaire show that the respondents were older with individuals about equally divided between male and female. Most owned their own homes. These were generally single family dwellings in either a suburban or an urban setting. They reported owning an average of one car and driving an average of 6,700 miles per year. A large portion of the respondents reported living alone or without children.

Most respondents had seen the Over Easy program segment and stated they would like to see more such segments on the program. They were particularly interested in obtaining more information about energy-related programs and services. In general they felt that the energy-conserving materials shown in the segment (flow restrictors and weatherstripping) were the most effective visual supplements.

Most stated that they found the information in the mailed package to be helpful. A surprising 58.7 percent stated that they had begun using the ideas contained in the brochures.

The respondents were concerned about the rising cost of energy and 50 percent did not feel that the current cost of energy was too low. They favored the development of relationships and personal improvement over the acquisition of material possessions. Waste and overconsumption by U.S. citizens were seen by most as the major causes of the energy problem.

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Based on the conduct and evaluation of the experiment, six conclusions were reached.

1. The mass media can be effectively used to create audience awareness.
2. To be effective, the mass media messages must be carefully tailored to the intended viewer audience.
3. Active response to mass media appeals will be quite small.
4. Mass media campaigns by themselves are not enough. They must be tied to and reinforced by other activities and programs.
5. The Department of Energy can obtain the most effective use of its mass media budget by capitalizing on the "captive audience" of existing mass media programs and channels.
6. Presentations should be personalized and humanized. This can best be accomplished through the development of a single spokesperson figure for energy conservation.

THE SCORE PROJECT

In 1972 the Institute for Communication Research in conjunction with the School of Medicine (both at Stanford University) began a primary prevention study in three northern California communities on the modification of cardiovascular disease risk factors through communication education. Referred to as the Stanford Heart Disease Prevention Program (SHDPP), it was supported by grants and contracts from the National Heart, Lung and Blood Institute of the Department of Health, Education and Welfare.

One major work of SHDPP was the design, execution, and analysis of the Three Community Study. In this experiment, mass media combined with or without face-to-face instruction were the major tactical choices. Included were: (1) a careful analysis of the specific knowledge levels, attitudes and behaviors and the media consumption patterns of the intended audiences; (2) mass media materials devised specifically to teach behavioral skills, as well as to perform the more usual tasks of offering information and affecting attitudes and motivation; and (3) both the mass media and, in particular, the face-to-face instruction designed to embody many previously validated methods of achieving changes in behavior and self-control principles.

The overall goal was to create and evaluate methods for ultimately achieving risk reduction by promoting behavior changes in smoking, weight, exercise, and diet by means that were likely to be eventually both cost-effective and applicable to large population groups.

Three roughly comparable communities in northern California were selected. Tracy was selected as a control because it was relatively distant and isolated from media in the other communities. Gilroy and Watsonville, the other two communities, shared some media channels (television and radio), but each town had its own newspaper. Watsonville and Gilroy received similar media strategies of health education over a period of two years, but Watsonville also received intensive face-to-face instruction for a subset of the population which was at higher risk of cardiovascular disease than the remaining population.

Annual interviews in the three communities were designed to measure both knowledge about heart disease and individual behavior related to cardiovascular risk. Assessment covered numerous variables. Knowledge of risk factors was measured with a test of knowledge about dietary and other items. Eating habits were assessed in an interview which provided an estimate of daily intake of cholesterol, saturated and polyunsaturated fats, sugar and alcohol. These measures were later validated via predicted changes in plasma cholesterol. Participants were also asked to report their smoking behavior: whether they smoked cigarettes, pipes or cigars and what their daily rate of smoking was. Self-reports of smoking status were validated later through an assay of plasma thiocyanate concentration.

Physiological data were collected from participants at the baseline and at one and two year intervals. In order to control for potential measurement effects, small "after only" samples were not measured until the end of the first year's campaign.

For the mass media campaign, a coordinated set of media messages was prepared to be appropriate for the lay audience in Gilroy and Watsonville. Over time, these basic messages were transformed into a variety of media (e.g., TV spots, bus cards, etc.) and released to the target audience through a variety of the most generally available media channels. A broad range of materials were produced. The media campaign began two months after the initial survey, and continued for nine months in 1973, stopped during the second survey, and then continued for nine more months in 1974. A very reduced campaign continued in 1975. Given a sizable Spanish-speaking population, a specially tailored campaign was presented in Spanish as well as English.

The campaign messages were distributed to target audiences through the most generally available and widely used mass media channels in the towns. The campaigns differed only insofar as the local media gatekeepers varied their overall placement, publication or broadcast of the materials made available to them.

The experimental design precluded the use, in the media-only treatment, of any direct interpersonal or quasi-interpersonal communications with the target audience. The campaign also avoided the use of communication opportunities that were idiosyncratic to one town and not to the other (a popular radio talk show, a TV news feature interview) to keep media output reaching each town as comparable as was practically possible.

One feature of the campaign was the use of various kinds of survey data to guide the design, production and distribution efforts. The initial plan grew out of the profile of the target population, relative to SHDPP objectives that emerged from the information available prior to the beginning of the campaign.

The main pre-campaign data sources were: a pretest of the survey questionnaire on a similar population in Modesto, California; the baseline survey; the results of formative evaluation and audience testing; a series of interviews with academic, professional and political figures in the towns; marketing data on media usage patterns; results of talks with the owners/managers of local media channels; and consideration of the very practical limitation imposed by the available budget and time.

Once the campaign was underway, it became necessary to supplement these preliminary data sources with a series of occasional, information gathering efforts. These were designed to provide media planners with immediate feedback on public response to a particular media event or set of events in order that the ongoing production and distribution process could benefit from the information.

The overall campaign activities could be seen as an orchestration of discrete media events that occurred in many channels with common themes, styles and content; a monitoring mechanism was occasionally activated to provide feedback on both the efficiency and reliability of the distribution system and the public response to current media events. In this way, flexible planning was possible within practical limits to re-focus priorities, reset directions, and, in general, to modulate the course of the campaign in directions likely to promote further progress.

Both the media and the media plus face-to-face instruction treatments did have positive effects on almost all relevant variables after both one and two years of campaigning. At the end of the second year, the level of estimated coronary disease risk decreased by 17-18 percent in the treatment community samples whereas it increased by more than six percent in the Tracy sample. At the end of the first year in Watsonville the face-to-face treatment that was provided to high risk participants enhanced improvement in the total sample (relative to Gilroy, where no face-to-face instruction was provided) in smoking, plasma cholesterol and triglyceride concentrations, diastolic blood pressure, and in a composite measure of risk of coronary heart disease. However, by the end of the second year of intervention significant differences in reduction of plasma lipid levels and in risks between participants in Watsonville and Gilroy were no longer present. This indicated that mass media only treatments "caught up" in effects to those due to media plus face-to-face instruction.

APPENDIX II

RANK-ORDERED CONSERVATION AND SOLAR ACTIVITIES

RANK-ORDERED CONSERVATION AND SOLAR ACTIVITIES

This appendix lists conservation and solar activities (i.e., practices and decisions) according to their predicted difficulty of adoption. The activities are divided into eight groups, representing a continuum of difficulty; the activities are not ordered within each group. The activities were ordered through a three-tiered dichotomization process. A schematic diagram of this process is shown below.

Flow chart showing division of activities into groups.

As the diagram above shows, the group one represents those behaviors most easy to adopt and group eight those which are most difficult to adopt. At each stage the assignment of "harder" or "easier" was made based on previous research and on a principle (formulated during that research) of "impedance" or "least resistance."

We had already collected data (10) on patterns of adoption of certain practices--which practices had been adopted and by how many respondents. Analyzing this data led to the hypothesis that the impedance or resistance to behavior change (as represented in adoption of a conservation or solar-related behavior) was directly related to the change it required of the respondent. Those practices and decisions which required little change were most readily adopted, while those which required greater changes were rarely invoked.

In making these assignments, then, each activity was analyzed in light of the type and extent of investment required of the potential adopter. Typical types of investments included time, money, directed thought, lifestyle change, and increased energy consciousness. At each stage, the activities were divided according to whether they required more or less investment. At the end of the process, eight groups had been created representing a loose continuum of degree of investment/difficulty of adoption.

These groups of activities are listed on the following pages.

GROUP ONE

- o Keep closet doors closed.
- o Keep your fireplace damper closed unless you have a fire going.
- o Close off unoccupied rooms.
- o Don't let the car motor idle for more than a minute.
- o Keep draperies and shades open in sunny windows; close them at night.
- o Be sure to keep windows and outside doors closed during the hottest hours of the day.
- o Keep lights low or off.
- o Use pressure cookers and microwave ovens if you have them.
- o Match the size of pan to the heating element.
- o Don't overfill your gas tank.
- o Use small electric pans or ovens for small meals.
- o If your dryer has an automatic dry cycle, use it.
- o Use the suds saver if you have one.
- o Fill washing machines (unless they have small load attachments or variable water levels).
- o Turn off unnecessary lights.
- o Don't use too much laundry detergent.
- o Fill clothes dryers but do not overload them.
- o Be sure your dishwasher is full (but not overloaded) before you turn it on.
- o Don't allow gasoline-powered yard equipment to idle for long periods.
- o Remember to turn off shop lights, soldering irons, gluepots, and all bench heating devices right after use.
- o Use low wattage night-light bulbs.
- o Always turn three-way bulbs down to the lowest lighting level when watching television.
- o If you have a gas stove, make sure the pilot light is burning efficiently.
- o Never boil water in an open pan.
- o Keep range-top burners and reflectors clean.
- o Use cold water rather than hot to operate your disposer.

- o Keep the lint screen in the dryer clean.
- o Don't leave your appliances running when they're not in use.
- o To reduce overall lighting in non-working spaces, remove one bulb out of three in multiple light fixtures and replace it with a burned out bulb for safety.
- o Use outdoor lights only when they are needed.

GROUP TWO

- o Dry your clothes in consecutive loads.
- o If you cook with electricity, get in the habit of turning the burners off several minutes before the allotted cooking time.
- o Keep windows near your thermostat tightly closed.
- o Watch the clock or use a timer.
- o Do as much household cleaning as possible with cold water.
- o When using air-conditioning, set your thermostat at 78 degrees.
- o Lower the thermostat at night.
- o Lessen heat loss when you use your fireplace while the furnace is on by lowering the thermostat setting to 50-55 degrees.
- o Don't use your fireplace for supplemental heating when your furnace is on.
- o Scrape dishes before loading them into the dishwasher.
- o Don't keep your refrigerator or freezer too cold.
- o Use kitchen, bath, and other ventilating fans sparingly.
- o Wash clothes in warm or cold water; rinse in cold water.
- o Turn off your window air-conditioners when you leave a room for several hours.
- o Dress for warmer indoor temperatures when using less air conditioning.

GROUP THREE

- o Use one large bulb instead of several small ones in areas where bright light is needed.
- o Keep the outside exhaust of your clothes dryer clean.
- o Keep appliances in good working order.
- o Repair leaky faucets promptly.
- o For comfort in cooler indoor temperatures use warm clothing.
- o Pre-soak or use a soak cycle when washing heavily soiled garments.
- o Have decorative outdoor gas lamps turned off unless they are essential for safety, or convert them to electricity.
- o Set the fan on high except in very humid weather.
- o Don't set your thermostat at a colder setting than normal when you turn your air-conditioner on.
- o Keep all lamps and lighting fixtures clean.
- o When using the oven, make the most of the heat from that single source.
- o Dust or vacuum radiator surfaces frequently.
- o Keep cutting edges sharp.
- o Maintain electrical tools in top operating condition.
- o Lower the thermostat in winter.
- o Have your car tuned as recommended by the manufacturer.
- o Clean or replace the filter in your forced-air heating system each month.
- o Have your oil furnace serviced at least once a year.
- o Use the gasoline octane and oil grease recommended for your car.
- o Keep the engine filters clean.
- o Save energy at home if you're going away: turn off lights, lower heating temperature in winter, air-conditioning temperature in summer.
- o Clean or replace air-conditioning filters at least once a month.
- o Don't place lamps or TV sets near your air-conditioning thermostat.

GROUP FOUR

- o You can save ironing time and energy by "pressing" the sheets and pillow cases on the warm top of your dryer.
- o Remove clothes that will need ironing from the dryer while they are still damp.
- o Save energy needed for ironing by hanging clothes in the bathroom while you're bathing or showering.
- o If drying the family wash takes more than one load, leave small, lightweight items until last.
- o Take showers rather than tub baths.
- o Do your cooking and use other heat-generating appliances in the early morning and late evening hours whenever possible.
- o Caulk and weatherstrip doors and windows.
- o Let your dishes air dry.
- o Don't let cold air seep into your home through the attic access door.
- o If you have oil heat, check to see that the firing rate is correct.
- o Don't use the "rinse hold" on your dishwasher.
- o Install an aerator in your kitchen sink faucet.
- o Install flow restrictors, aerators or spray heads in your plumbing.
- o Install a flow restrictor in your shower.
- o Regularly defrost manual-defrost refrigerators and freezers.
- o Check the temperature on your water heater.
- o Make sure your refrigerator door seals are airtight.
- o Buy the most energy-efficient car of the size and style you want.
- o When shopping for an unusual item, telephone ahead to see if the store has it.
- o Test your windows and doors for airtightness.

GROUP FIVE

- o Separate drying loads into heavy and lightweight items.
- o Eliminate unnecessary trips.
- o Remove unnecessary weight from the car.
- o If you need central air-conditioning, select the smallest and least powerful system that will cool your home adequately.
- o Keep out daytime sun with vertical louvers or awnings on the outside of your windows, or draw draperies, shades and blinds indoors.
- o Save energy by using the clothesline.
- o When buying a dishwasher, look for a model with an air-power and/or overnight dry settings.
- o Consider using a fan with your window air-conditioner.
- o If you plan to buy a new gas heating system, ask about electronic ignition.
- o If you're buying a refrigerator, it's energy economical to buy one with a power-saver switch.
- o If you don't need central air-conditioning, consider using individual window or through-the-wall units.
- o Turn the water heater to low.
- o Plan your trips.
- o Check the tire pressures regularly.
- o Open the windows instead of using your air-conditioner or electric fan.
- o Lower the thermostat to 65 degrees during the day and 55 degrees at night.
- o If you need to purchase a gas oven or range, look for one with an automatic (electronic) ignition system instead of pilot lights.
- o Use the car air-conditioner and/or other power-draining accessories sparingly.
- o Don't buy an air-conditioner unless you really need it.
- o Turn off the furnace pilot light in the summer.
- o When using a fireplace, close all doors and warm air ducts entering the room with the fireplace and open a window near the fireplace about 1/2 to 1 inch.
- o Ask for a description of the insulation and data on the efficiency of space heating, air-conditioning and water heating plants.
- o Consider buying lamps with three-way switches.

- o Use hand tools, hand lawn mowers, pruners, and clippers wherever possible.
- o Consider radial tires.
- o Clean refrigerator condenser coils frequently.

GROUP SIX

- o Don't use energy-consuming special features on your appliances if you have an alternative.
- o Consider installing a flow restrictor in the pipe at the showerhead.
- o Place your refrigerator in the coolest part of the kitchen.
- o You can save on lighting energy through decorating: light colors for walls, etc. reflect light and reduce the amount of lighting required.
- o Try to use energy-intensive appliances in the early morning or late evening hours to help reduce that peakload.
- o Buy products made of recycled materials or those that can be recycled.
- o Buy the household equipment that's right for you.
- o Try 25-watt reflector flood bulbs in high-intensity portable lamps.
- o Try 50-watt reflector floodlights in directional lamps.
- o Use window or whole-house ventilating fans to cool the house when its cool outside.
- o Use vents and exhaust fans to pull heat and moisture from the attic, kitchen and laundry directly to the outside.
- o Consider energy costs when cooking.
- o Purchase only the optional automobile equipment that you really need.
- o Don't let sediment build up in the bottom of your hot water heater.
- o Use appliances wisely; use the one that takes the least amount of energy for the job.
- o Consider the need for additional insulation or replacement of equipment.
- o Before buying new appliances with special features, find out how much energy they use compared with other, perhaps less convenient, models.
- o Buy power tools with the lowest horsepower adequate for the work you want to do.
- o Use long-life incandescent lamps only in hard-to-reach places.
- o When you buy fabrics or garments, try to choose those that can be washed in cold water.

GROUP SEVEN

- o Light-zone your home and save electricity.
- o Consider solar heat gain when you plan your window locations.
- o Flourescent lighting also is effective for makeup and grooming areas.
- o Check the duct work for air leaks about once a year if you have a forced-air heating system.
- o Consider the advantages of a clock thermostat for your home heating system.
- o Consider florescent lighting for the kitchen sink and countertop areas.
- o Drive at a steady pace.
- o Accelerate smoothly and moderately.
- o Minimize braking.
- o When buying appliances, comparison shop.

GROUP EIGHT

- o Take a train or a bus instead of the family car.
- o When designing a house, consider a square floor plan.
- o Use public transportation, a motorcycle, a moped, or a bicycle, or walk to work.
- o Share your ride.
- o Go shopping with a neighbor occasionally.
- o Observe the 55-mph speed limit.
- o Give gifts with year-round benefits.
- o Consider installing solid state dimmers or hi-low switches.
- o If the base of the house is exposed, as in the case of a mobile home, build a "skirt" around it.
- o Install louvered panels or wind-powered roof ventilators to ventilate the attic.
- o Install windows you can open.
- o Use double-pane glass throughout the house.
- o Insulate your hot water storage tank and piping.
- o Consider buying refrigerators and freezers that have to be defrosted manually.
- o If you use electric furnace heating, consider a heat pump system.
- o Install storm windows.
- o Insulate floors over unheated spaces.
- o Insulate or increase the amount of insulation in your attic floor or top floor ceiling.
- o Consider insulating exterior walls.
- o Make sure the ducts in your air-conditioning system are properly insulated.
- o Buy a water heater with thick insulation on the shell.
- o Add insulation around the water heater you now have if it's inadequately insulated.
- o Buy equipment on the basis of initial cost plus operating costs rather than on the basis of purchase price alone.
- o Try to buy products that will last.
- o Don't buy a larger or more powerful piece of equipment than you need.

- o Don't buy motorized equipment or gadgets when hand-operated versions will do.
- o Find out about R-values before you buy your insulation materials.
- o Find out if your home needs insulation.
- o Rediscover the pleasures of walking, hiking, and bicycling during your vacation.
- o Plan to stay in one place if you vacation away from home.
- o Make energy saving an integral part of your purchase decision process.
- o Consider the energy costs involved in making as well as purchasing non-essential or throwaway items which require large amounts of energy to make.
- o Install a whole-house ventilating fan in your attic to cool the house when it's cool outside.
- o Use florescent lights whenever you can; they give out more lumens per watt.
- o Choose a hotel or campground close to where you live when vacationing.
- o Vacation at home this year.
- o If you have a simple open masonry fireplace, consider installing a glass front or glass screen.
- o Consider buying a properly sized furnace that incorporates an automatic flue gas damper.
- o Plant deciduous trees and vines on the south and west sides of the home.
- o If you live in a warm climate, remember that light-colored roofing can help keep houses cooler.
- o Install the water heater as close as possible to major areas of use.
- o Insulate floors over crawl spaces, cold basements, and garages.
- o Insulate walls and roof to the highest specifications recommended for your area.

APPENDIX III

ANNOTATED BIBLIOGRAPHY

Abelson, P.H. (Ed.) Energy: Use Conservation and Supply. Washington, DC: American Association for the Advancement of Science, 1974.

This is a collection of articles originally appearing in Science magazine. Topic areas covered include people and institutions; energy and food; oil, coal, gas, and uranium; and developing technologies.

_____. and Hammond, A.L. (Eds.) Energy II: Use Conservation and Supply. Washington, DC: American Association for the Advancement of Science, 1978.

This followup book is also a collection of articles originally appearing in Science magazine. Topic areas covered include energy use in transition, conservation and public policy, and future energy supplies (fossil, fission, solar, and fusion) in evolution.

AIA Research Corporation. Passive Solar Design: A Short Bibliography for Practitioners. (Prepared for the U.S. Department of Energy; Report No. HCP/CS-4113.) Washington, DC: Department of Energy, October, 1978.

Included are 28 subject matter categories, with alphabetically listed entries. The categories include such topics as costs, economy and politics; design, storage; cooling; and radiation.

_____. Passive Solar Design: An Extensive Bibliography. (Prepared for the U.S. Department of Energy; Report No. HCP/CS-4113-3.) Washington, DC: Department of Energy, December, 1978.

The same topics are covered as above, though with much more extensive listings. Material is arranged by identical categories as above. Also included is an alphabetical listing of sources by author.

Aitken, D.W. A Bibliography for the Solar Home Builder, 1979. San Jose, CA: Center for Solar Energy Applications, San Jose State University, 1979.

This is a selective bibliography of books and journals covering all aspects of home design. It focuses somewhat on the West and California.

Antolini, H.L. Sunset Homeowner's Guide to Solar Heating. Menlo Park, CA: Lane Publishing Company, Inc., September, 1978.

Brief introduction to solar energy is given, as are guidelines for planning one's own solar system. Active and passive heating (space and water) systems are discussed, as are pool, spa, and hot tub heating. Photos and sketches are included of exemplary passive and active solar systems.

Bainbridge, D. The First Passive Solar Catalog. Davis, CA: The Passive Solar Institute, 1978.

This is a comprehensive look at passive solar energy. It explains and justifies passive design; explains passive heating and cooling, solar water heating, and daylighting. It also includes advice and information on how to build passive systems, examples of passive homes, and directories of solar consultants and vendors.

Barnaby, C.S., Caesar, P., Wilcox, B., & Nelson, L. Solar For Your Present Home. (Prepared for the California Energy Commission.) Berkeley, CA: Berkeley Solar Group and Environ/Mental, 1978.

This is an excellent manual, though it is limited in use to California. Step by step instructions regarding solar are given, starting with a home energy audit and progressing to solar system purchase and installation. Lots of worksheets are included, accompanied by example calculations. Also included are space and water heating system comparisons, performance charts, Bay area climate maps, and locations of Bay area retrofit systems.

Berdahl, P., Grether, D., Martin, M., & Wahlig, M. California Solar Data Manual. (Prepared for the California Energy Commission and the U.S. Department of Energy.) Berkeley, CA: Lawrence Berkeley Laboratories, March, 1978.

This is a good presentation of solar data for various sites throughout California. It also includes narrative climatological summaries of each of the areas for which raw data are presented.

California Energy Commission. Energy Choices for California: Looking Ahead. Sacramento, CA: State of California, March, 1979.

This report examines the California energy situation--trends, changes, and choices to be made. It describes the electricity sector, including demand forecasts. It also discusses improving energy efficiency through such techniques as biomass conversion and cogeneration, and implementing innovative technologies such as solar, geothermal power, wind and biomass. It concludes with a view of the future California energy situation.

"California Orders Its Utilities to 'Unsell' Energy." Business Week, May 26, 1980.

This begins with a discussion of projected California electricity demand and supply. It then describes the shift in public utility mandate away from selling of energy and toward efficient management of energy, through such means as financing home insulation, providing low-cost loans for solar systems, and the purchase of power from co-generation and non-conventional sources.

Campbell, S., with Taff, D. Build Your Own Solar Water Heater. Charlotte, VT: Garden Way Publishing, 1978.

This gives good step-by-step instructions on how to size, build, install a solar water heater. It is light on theory as well as on the long term issues surrounding solar energy. Its main emphasis is on application of the technology for home hot water heating.

Campbell, V.N., Brown, R.V., Rhees, T.R., & Repeti, D.S. An Attitudinal Study of the Home Market for Solar Devices. (Federal Energy Administration Technical Report No. 77-5-53.) McLean, VA: Decisions and Designs, Inc., September, 1977.

This study estimates residential market penetration of solar space and water heating under various cost assumptions. Estimates are made for solar energy costing: the same per month as conventional

energy; \$20 more than conventional energy; and \$20 less than conventional energy (these for space heating). Estimates are similarly arranged for water heating, though in \$5 increments. The survey data is mainly attitudinal in nature, though it does include some probabailistic estimates.

Carosso, M. and Oliver, S. Energy Futures for California: Two Scenarios, 1978-2000. (Staff Draft) Sacramento, CA: California Energy Commission, November, 1979.

This report examines future energy requirements for California under two scenarios: "conventional outlook" and "alternative resources". The former scenario assumes little or no action taken to alter present energy consumption; the latter examines the implications of a minimal reliance on conventional fuels and a drastic reduction in foreing energy imports. Its major conclusion is that conservation can play a major role in state energy reduction.

Crowley, M. (Ed.) Energy: Sources of Print and Non-Print Materials. New York: Neal-Schuman, 1980.

An expansion of Library Journal's "Energy Source Directory", this book is a storehouse of sources of materials on virtually any aspect of energy. A wide range of organizations are listed, from energy producing companies to anti-nuclear groups. Each listing includes a brief characterization of the organization, its interests, its publications programs, and representative publications.

Fischer, R. and Yanda, B. The Food and Heat Producing Solar Greenhouse: Design, Construction, Operation. Santa Fe, NM: John Muir Publications, 1976.

This book begins with a brief discussions of greenhouse design and ecology. Detailed step by step instructions on designing and constructing a solar greenhouse, on improving its performance, and on using it for gardening are then given. the concluding chapter is on current designers and manufacturers. Sun and planting charts are included, as are reviews of selected research projects.

Ford Foundation. A Time To Choose: Energy Policy Project of the Ford Foundation. Cambridge, MA: Ballinger Publishing Company, 1974.

This develops three scenarios: (1) Historical Growth (3.4% annual growth); (2) Technical Fix (slightly less growth with greater efficiency through technology); (3) Zero Energy Growth (a move away from energy-intensive activities and toward those which require less energy). The project concludes that we can reduce energy consumption (primarily in auto, home and industrial sectors), balance budget, alleviate pollution, etc. without hurting economy.

Hamrin, J. and Dunipace, D. New Intitiatives to Encourage a Solar California. (Draft) Sacramento, CA: California Energy Commission, 1979.

This discusses: state goals for solar in California; state leadership in this area; financial incentives proposed; prototype

design development assistance; public information and training programs; research and development activities; and impact studies.

International Business Machines Corporation. September 1978 Environmental Data for Sites in the National Solar Data Network. (Prepared for the National Solar Heating and Cooling Demonstration Program and the National Solar Data Program, U.S. Department of Energy.) Huntsville, AL: Federal Systems Division, Command and Space Systems, International Business Machines Corporation, 1978.

This lists results of thirty-day measurements of insolation, temperature, and other solar variables for sites in National Solar Data Network. These measurements available for all areas of the U.S.

Keyes, J. H. Consumer Handbook of Solar Energy for the U.S. and Canada. Dobbs Ferry, NY: Morgan and Morgan, 1979.

Though this has a fairly technical orientation, it does an excellent job describing how to size and buy active solar space heating systems (some discussion of water heating is also included). Little consideration is given to passive techniques. There are lots of tables useful for getting a good approximation of solar requirements, economics, etc.

Leckie, J., Masters, G., Whitehouse, H., & Young, L. Other Homes and Garbage. San Francisco: Sierra Club Books, 1975.

This includes a discussion of the energy-conscious ethic and offers a rationale for an altered lifestyle. A variety of energy saving and energy producing systems are proposed, including wind energy, biomass production and solar. Though somewhat technical (it includes complete data for designing and building systems), it is well written so as to be comprehensible to most.

Margolin, J.B. and Misch, M.R. Solar Energy Incentives Analysis: The Psycho-Economic Factors Affecting the Decision Making of Consumers and the Technology Delivery System. Washington, DC: U.S. Department of Energy, January, 1978.

This report introduces notion of "psycho-economic" factors in solar energy adoption decisions. Economic considerations are important, but psychological factors are, as well. Perceived risk is as important to consider as more tangible sorts of risk. Considerations of "psychic income" are proposed as areas for positive intervention.

Market Facts, Inc. Passive Solar Energy Focus Group Results. (Prepared for the U.S. Department of Energy; Job Number 9319.) Washington, DC: Market Facts, Inc.

This is a summary of focus group interviews conducted with members of solar, government and financial communities regarding the state of passive energy and its potential in the U.S. The main barriers to adoption are seen as ignorance (mandating educational programs as a remedy) and cost (in the subsidization of conventional fuels).

Mazria, Edward. The Passive Solar Energy Book. Emmaus, PA: Rodale Press, 1979.

This book is useful as: (1) a primer on solar concepts; (2) a source book for passive systems and the passive design process; (3) a workbook for personal solar calculations. It moves from the general to the specific. The solar primer in front is rather clear and the tables in the appendices are also quite useful.

McPhillips, M. (Ed.) Solar Age Catalog. Church Hill, Harrisville, NH: Solar Vision, Inc., 1977.

This is a reference work for products and services, technical know-how, and practical ideas and solutions. Articles introduce the products and the thought behind them. The book covers active and passive solar; photoconversion; comparative data tables; performance curves; directory of manufacturers.

Merrill, R., and Gage, T. (Eds.) Energy Primer. NY: Dell Publishing Company, 1974.

This is a comprehensive look at renewable fuels: solar, wind, water, and biomass fuels. (Biomass discussion includes agriculture, aquaculture, methane, alcohol and wood.) Energy conservation, solar architecture, and small scale systems are also discussed. Reviews of books and hardware sources are included. Integrated, renewable systems discussed at the end of the book.

Metz, W.D., and Hammond, A. L. Solar Energy in America. Washington, DC: American Association for the Advancement of Science, 1978.

This gives a thorough overview of the state of the art of solar and renewable systems. It includes research strategies, photovoltaic cells, collector systems, biomass, wind, thermal energy and the energy shortage. Appendices include solar supply projections, solar/wind systems available, and a breakdown of the federal solar research budget.

Milstein, J. "Attitudes, Knowledge, and Behavior of American Consumers Regarding Energy Conservation with Some Implications for Governmental Action." Presented at A Symposium on the Social and Behavioral Implications of the Energy Crisis, University of Houston, June 27-28, 1977.

This looks at the psychological, cultural, economic and political reasons for the acceptance and non-practice of energy conservation. The reasons given for this apparent paradox include: lack of knowledge, idea of American society as comfortable, affluent and convenient; skepticism and cynicism. Milstein discusses whom people believe and examines incentives for saving energy. He concludes by discussing implications for governmental action.

Morse, F. and Maybaum, M. Commercialization Strategy Report for Passive Solar Heating. (Draft) Washington, DC: U.S. Department of Energy.

This draft report concludes that good passive performance is possible in all parts of the country and that the decrease in effectiveness (as one moves away from the equator) is relatively less than for active solar systems. It also lists barriers to market penetration of passive solar.

National Solar Heating and Cooling Information Center. Passive Design Ideas for the Energy Conscious Builder. NY: Franklin Institute Research Laboratories.

A variety of design ideas are presented, along with estimated energy savings to be had from each. The authors distinguish between energy-saving and energy-conscious homes.

Olsen, N.E. "Public Acceptance of Energy Conservation." Presented at A Symposium on the Social and Behavioral Implications of the Energy Crisis, University of Houston, June 27-28, 1977.

Olsen reviews the then-current knowledge of the American public's acceptance of energy conservation. He explores three strategies (persuasion, pricing, pressures) to promote greater acceptance of conservation. He ends by looking at the potential economic and social consequences of widespread acceptance of energy conservation.

Ridgeway, J. Energy-Efficient Community Planning. Emmaus, PA: The JG Press, Inc., 1979.

This book provides a fairly general discussion of community energy planning. The bulk of the book is composed of case studies of a number of community energy programs. There are some generic discussions of target areas such as housing and solar technology, but little actual "how to" information.

Robinson, J. Solar Energy Books. (Prepared for the National Solar Energy Education Campaign.) Beltsville, MD: International Compendium.

This book is a catalogue of solar energy books. It covers solar energy, alternative energy, the solar business, solar and the homeowner, conservation, and government publications. Each area is introduced briefly, and is followed by a listing and index of relevant books.

Rogers, E., Eveland, J.D. & Bean, A.S. Extending the Agricultural Extension Model. Stanford, CA: Institute for Communication Research, September, 1976.

This report details the history and methodology behind the development of the agricultural extension service, and critiques its effectiveness. The authors evaluate the success of its extension into three non-agricultural areas. It presents a succinct characterization of the diffusion of innovation model and includes conclusions of some applicability to solar marketing.

"Sawhill Urges New Approaches in Residential Energy Conservation." Department of Energy Information News Summary, 13-30, April, 1980, 1-2.

Sawhill urges utility industry executives and regulators to commit their institutions to help promote residential energy conservation. He stresses programs that show consumers the economic advantages of residential retrofit programs.

SolarCal Council. Toward A Solar California: The SolarCal Action Program. Sacramento, CA: The State of California, January, 1979.

This report outlines actions recommended to increase solar adoption. These mostly address the economic, information, and performance problems of solar energy.

"Solar Water Heaters." Consumer Reports, 45 (5), 1980, 322-328.

In this report on the performance of solar hot water heating, the state of the art is examined, rather than particular units. It includes a brief description of and experiences with sample systems, competition with other energy sources, and cost calculation worksheets. The authors argue that greater reliability (performance) and cost-effectiveness are needed.

Sparrow, T., Warkov, S., & Cass, R. "Socio-Economic Factors Affecting the Adoption of Household Solar Technology: Preliminary Findings." Presented at A Symposium on the Social and Behavioral Implications of the Energy Crisis, University of Houston, June 27-28, 1977.

This is a discussion of factors affecting solar adoption by homeowners; the role of financiers; and the lack of utility encouragement (and sometimes active discouragement) for solar purchases. Solar adoption is examined according to income, region; characteristics of early and late adopters presented.

Stein, R.G. Architecture and Energy. Garden City, NY: Anchor Books, 1978.

The emphasis here is on planning buildings to make more efficient use of energy. Conservation through efficient design, as opposed to incorporation of more clearly passive techniques, is stressed.

Stobaugh, R. and Yergin, D. (Eds.). Energy Future: Report of the Energy Project at the Harvard Business School. New York: Random House, 1979.

This details the present and anticipated U.S. energy situation. The report argues for conservation and solar energy as the best choices for meeting long-term (future) energy needs.

Sunrae and Solar Energy Advocates. 1978 Solar Bills Enacted Into Law. Sacramento, CA: Sunrae and Solar Energy Advocates, 1978.

This is a brief descriptions of 14 acts, statutes, and resolutions regarding solar that were passed by the California legislature and signed into law for 1978. Bills include solar easement, financing, utility involvement and solar tax credits.

U.S. Department of Energy. Passive Solar Research and Development Project Summaries. (Draft). Washington, DC: Division of Solar Applications, Office of Conservation and Solar Applications, U.S. Department of Energy, January, 1979.

This gives a description, the project title, sponsoring institution, principal investigator, contract number, starting date, project duration, amount of award, and information on reports or publications for 41 passive solar studies being conducted either by or for the Department of Energy.

Wright, David. Natural Solar Architecture: A Passive Primer. New York: Van Nostrand Reinhold & Company, 1978.

This is a fairly technical look at passive solar energy. There is a lot of explanation of constants, calculations, symbols, etc. Also emphasized is the "ethics" of passive solar energy--implications for changes in society. It is good as source book, though it has a fairly dry narrative.