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Energy Attitudes, Beliefs and Behavior: A Specification of Situational and Personal Determinants of Residential Conservation Behavior

Carl Michael Hand

University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by Carl Michael Hand entitled "Energy Attitudes, Beliefs and Behavior: A Specification of Situational and Personal Determinants of Residential Conservation Behavior." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Sociology.

Kent D. Van Liere, Major Professor

We have read this dissertation and recommend its acceptance:

Thomas Hood, Donald Clelland, William Lyons

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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ENERGY ATTITUDES, BELIEFS AND BEHAVIOR: A SPECIFICATION OF SITUATIONAL AND PERSONAL DETERMINANTS OF RESIDENTIAL CONSERVATION BEHAVIOR

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Carl Michael Hand

June 1986

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ABSTRACT

This dissertation examines the nature and extent of residential energy conservation behavior as well consumers' views of the energy problem. The primary policy question raised by this research has been to clarify the link between energy attitudes, beliefs and conservation actions performed in the home context as a basis for furthering energy policies directed at encouraging residential energy conservation. Despite a plethora of such studies, research findings have failed to provide an unequivocal understanding of the role of consumer energy attitudes and beliefs in guiding behavior.

Theoretical basis for this research is drawn from attitude theory, particularly recent discussions of the attitude-behavior problem in social psychology. Two recent attitude-behavior models are examined in detail: (1) Fishbein and Ajzen's theory of "reasoned action" based upon an informational processing model of behavior, and (2) Triandis' multicomponent model which assumes the latter perspective as well as elements of both symbolic interactionist and behaviorist traditions. Although the models are similar in how they conceptualize social behavior, they differ considerably with respect to the actor's degree of volitional control over behavior they assume. Predicting conservation behaviors, which manifest marked differences in terms of such control, time and resources required of the individual, provided an appropriate test case to examine the validity of either model's approach. To clarify the analysis, three general classes of conservation behavior were constructed: (1) curtailment activities--which involve a limitation of energy services, (2) efficiency behaviors--which make better use of energy services, and (3) efficiency improvements--which involve home retrofit and appliance change.

Utilizing data from a mail survey of Knoxville area residents (N=286), the results indicate that the majority of individuals have made at least moderate efforts to conserve energy. Such efforts usually entailed some curtailment of energy use (primarily turning thermostats down), more efficient use of appliances and additional insulation and weatherstripping. Overall, the relationship to consumer energy attitudes and beliefs is moderate although consistent. The best cognitive predictors of behavior tend to be attitudes toward specific actions as well as beliefs about the outcomes of those behaviors; i.e., their expected utility. While this finding suggests that definitions of the energy problem are not strongly linked to behavior, such general beliefs are instrumental in shaping more proximate attitudinal and belief determinants.

A comparison of the two models suggests that their predictive power is equivalent when the behavior requires only consumer motivation to perform (e.g., turning down the thermostat). As the behavior becomes more constrained by resource and opportunity factors, the utility of either model diminishes. The Triandis model is clearly superior under such circumstances as it includes measures of "facilitating" factors--such as perceived difficulty of the behavior and behavior relevant knowledge, constraining behavioral choices. By incorporating resource and opportunity factors affecting behavior, the Triandis model provides a broader based theoretical model for understanding behaviors of sociological interest.

Several policy implications are discussed. Programs endeavoring to promote conservation should first encourage a broader based view of the energy problem. A more integrated view of energy issues could be instrumental in providing a receptivity to specific appeals to conserve. Second, programs should target specific behaviors for change as well as normative beliefs and attitudes toward those behaviors. Third, providing practical knowledge for saving energy in the individual's residential context could encourage behavior, at least for some types of conservation activity.

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CHAPTER 1

INTRODUCTION

Cheap and abundant energy supplies have played an integral part in the evolution of an American way of life. Migration, including extensive suburbanization, the preponderance of automobiles and single family housing units, styles of leisure and recreation are just a few features of American life which have been intimately affected by energy. Since the 1973 oil embargo, however, the era of energy abundance has at least been temporarily threatened (Barbour et al.,1982). The exorbitant energy needs of American society [nearly twice the per capita consumption of other industrialized nations (Humphrey and Buttel,1982)] engendered a resource dependency abroad and political vulnerability at home. The emerging "energy crisis" has come to represent more than just a temporary perturbation on the road to continued economic progress. For many it is seen as a challenge to the dominant lifestyle and cultural perceptions of American society (Stobaugh and Yergin,1979).

America's energy problems did not begin with the oil embargo, however. The roots of the problem can be traced to the patterns of production and consumption which developed throughout this century (Schnaiberg,1980). In particular, the postwar baby boom population increase combined with relative prosperity brought about fundamental change in the demand for energy. The production of energy shifted dramatically after World War II from primarily a coal base to the convenience and low price of oil and gas. In 1949, coal was the primary fuel, meeting 49.5 percent of the country's needs. From this peak period, coal use declined to a low point of 19.1 percent of total energy use in 1979, primarily in electricity generation. Concomitantly, oil imports rose steadily from 11.3 percent of total use in 1949 to 45.6 percent in 1979 (Congressional Quarterly,1981).

Americans were also finding new end-uses for energy. In the same 30 year period, energy use increased by 132 percent despite the fact that population increased by only 45 percent (Ellison,1980:1). Electricity consumption alone increased a dramatic 700 percent. Such factors as an increase in the number of vehicles and miles driven per capita, a continuing preference for larger less efficient automobiles, rural electrification, and increasing appliance load--especially air conditioning, clothes dryers and dishwashers, were leading causes of America's voracious appetite for energy (Congressional Quarterly,1981).

The oil embargo, with the double shock of quadrupled energy prices and decreased availability, brought about changes in America's perception and use of energy. After 1950 and prior to 1973 energy demand had been growing at 3.5 percent per year. The combined effect of price change, recession and conservation efforts brought this figure down to -.1 percent by 1981--the net effect being that 1981 energy use per capita was less than the 1973 figure (Hirst et al.,1983:196).

The seventies also saw a shift in attitude toward energy in the general public. Despite early cynicism regarding the reality of the energy crisis (Bartell,1976), most Americans came to accept the significance of the energy problem. Farhar et al. (1980) reporting on a 1979 Harris Poll indicate that 80 percent defined the energy problem as "serious" or "very serious." In addition to putting the energy issue on the national agenda, the energy crisis stimulated considerable social science debate on the role of energy (and energy business) in the social and political structure of American society.[1]

Clearly, however, concern for energy problems has declined at the general public level with the stabilization

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[1] Until recently, social science interest on the subject of energy was not particularly strong. Rosa and Machlis (1983) note that energy as a distinct social science concern was brought to the fore by two developments: (1) a recognition of the influence of nonsociological variables in the study of human society--particularly natural resources, and (2) the oil embargo.

of oil prices and competition among members of the OPEC cartel (Hershey,1982; Zinberg,1983). Attention to such issues as nuclear power (Ladd et al.,1983), "hard" versus "soft" energy technologies (Lovins,1978), or "equity" in energy policy (Morrison,1977) suggests a refocusing of concern on questions regarding the appropriate instrumentality for satisfying present and future energy needs.

One such alternative is increasing energy conservation at the residential level. Barbour et al. (1982) as well as Morell (1981) indicate that conservation could reduce by 10 to 40 percent energy usage in the residential sector [which accounts for about a third of total consumption (Newman and Day,1975)], thus forestalling "supply side" solutions to energy needs. Work by Mazur and Rosa (1974), Nader and Beckerman (1978) and others suggests that such reductions could be achieved without a concommitant decline in the GNP or quality of life.

Perhaps the most important question facing residential energy policy is how best to achieve such potential. In order to answer this question effectively, energy policy studies must be able to anticipate the population's aggregate response to different energy policy alternatives (Black et al.,1985). Some observers argue that increased technical efficiency as well as change in the relative price of energy will be sufficient to stimulate greater conservation (Landsberg,1979). However, this view does not take into account the wide discrepancy in energy use between structurally similar households (Sonderegger,1978) as well as the personal and social factors inhibiting greater efficiency. Thus, others argue that long term energy adaptation will reguire individual behavior change. Efforts directed toward this strategy have included increasing public knowledge of energy conserving practices and providing opportunities for individual participation in conservation programs.

While continued technical improvements of residential buildings can be expected in the near future (Landsberg,1979:130), greater efforts need to be made in understanding the motivational and institutional factors affecting residential conservation behavior.[2] The latter problem entails examining individual decision making processes in the home context, particularly those factors

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[2] Such an effort appears justified at this time. Increasing conservation in the residential sector suggests the need for a better understanding of the motivational and institutional factors affecting consumer energy decisions. This is especially true now as "issue attention" (Downs,1972) to energy problems has declined. Second, attention to the motivational and institutional factors affecting energy decisions at the residential level has lagged significantly compared to research on "hardware' issues. As Landsberg (1979:130) notes:

inhibiting greater residential conservation. Some of these problems would include lack of consistent price "signals" (Stobaugh and Yergin,1979), lack of control over decisions affecting energy use (Stern and Aronson,1984), need for appropriate conservation knowledge (Milstein,1978; Kempton and Montgomery,1982), as well as lack of resources for implementing conservation.

What is lacking in prevalent consumer research is how such obstacles to furthering residential conservation are themselves affected by other consumer attributes, particularly attitudes toward conservation and the energy "problem." This problem is important as it affects whether or not consumer education and attitude change represent appropriate avenues for overcoming personal and social inhibitions to conserve.

Considerable effort has been devoted to understanding

> Better light bulbs and advanced engines receive their due but scant attention goes to studying motivations to conserve, or to legal and institutional research. Yet in our judgement, these are exactly the areas that are most promising for a further expansion of knowledge.

Landsberg estimates that only about 4 percent of DOE's R&D devoted to energy conservation is directed toward the latter "nonhardware" issues. Perhaps the chief goal in conservation policy should be as Landsberg notes, to remove motivational and institutional barriers to greater energy efficiency. Research directed at the home energy consumer should help achieve this objective.

such personal characteristics of consumers in the hope of developing an appropriate behavioral change strategy (Stern and Gardner,1981). Unfortunately, research on the link between consumer attitudes, beliefs and conservation behavior has been equivocal. Most of the research suggests a lack of strong relationship between general beliefs regarding the energy problem--such as belief in the reality and seriousness of the problem, efficacy of conservation, commitment to national conservation goals, and actual conservation in the home (Farhar et al.,1979).

Similarly, general value orientations, such as ecological awareness and lifestyle flexibility (Gladhart et al.,1978), support for science and technology (Anderson and Lipsey,1978), political trust (Bartell,1976) and perceptions of "blame" in the energy crisis (Heslop et al.,1981) are not strongly related to behavior. While the logic provided by many energy researchers for including such variables is often intuitive, the accumulated evidence indicates that general definitions of the energy problem do not provide a strong basis for conservation actions. Milstein (1977:9), Olsen (1981) and others indicate that given the lack of strong attitude-behavior relationship, educational programs directed at fostering a more favorable attitude toward "energy problems" may not produce intended consequences.

Reflecting on this problem, many observers indicate that the influence of such social psychological characteristics of the consumer may be through more proximate beliefs, attitudes or norms toward conservation action itself. This is logical considering that the best predictors of behavior are relatively specific attitudes toward the behavior (Heberlein and Black,1976) or norms which are activated in the behavioral context (Cook and Berrenburg,1981).

The latter view has been supported in the literature. In particular, conservation activity appears to be higher for those individuals who have developed a personal norm of conservation and have inculcated this into everyday behavior (Leonard-Barton and Rogers,1979; Gladhart et al.,1978). Additionally, such normative influences appear to be strongest where the behavior is relatively recurring and under volitional control (Black et al.,1985). Likewise, attitudes demonstrate much greater predictive utility when the attitude measure is directed at specific conservation actions in the home context (Stutzman and Greene,1982).

Thus while general definitions of the energy problem are not correlated directly with conservation, behavioral norms and attitudes toward conservation behavior are related. What remains unclear from such research is the interrelationship between general and specific cognitive and normative influences on behavior. If as Olsen (1981) and others indicate general conservation beliefs provide a "context" for conservation acceptance, then such beliefs have a direct consequence for other beliefs/attitudes toward conservation behavior. While recent research has begun to examine interrelationships among energy beliefs (e.g., Dunlap and Olsen,1984), a paucity of research exists specifically examining how a variety of energy beliefs, attitudes, and norms affect different types of conservation behavior.

Similarly, few studies carefully examine how such "personal" characteristics (Black et al.,1985) of residential energy consumers interrelate with other situational factors as household structural variables, and sociodemographic characteristics. While both sets of variables have been extensively examined in the residential context (Gordon et al.,1981), little research exists examining how such factors influence both social psychological characteristics and behavior for a range of different conservation behaviors. The latter is especially important as conservation behaviors vary considerably in effort, skill and resources required. It follows that different personal and situational factors may operate for different kinds of behavior (Cunningham and Cook-Lopreato,1977).

The lack of a reliable relationship between energy attitudes, beliefs and behavior suggests a need for examining the problem in the context of recent discussions of attitude-behavior consistency. Prevalent attention to this issue has tended to emphasize factors which moderate the strength of the attitude-behavior relationship. These include such issues as cognitive-affective consistency (Sample and Warland,1973), social support and situational factors (Liska,1984), attitude structure (Schlegel and DiTecco,1982), and measurement specificity between attitudes and behavior (Heberlein and Black,1976). Attention has thus been refocused away from the examination of the bivariate relationship between attitudes and behavior per se to one of ". . . identifying the conditions which affect the extent and direction of the relationship" (Liska,1974:262).

In this light, recent research has focused on the issue of how best to "model" the most relevant determinants of behaviors. Two such "attitude-behavior" models will be discussed here, one proposed by Fishbein and Ajzen (1975) and the second by Triandis (1977). Both of these models include a number of determinants of behavior which past research suggests are important; e.g., knowledge, facilitating conditions, beliefs about the outcome of the behavior, norms, as well as attitude toward the behavior. While there are a number of similarities in the variables each model includes and their operationalization, significant differences exist in their causal order. Thus the energy conservation attitude-behavior problem will provide a context for examining the comparative validity of either model for explaining behavior. The primary advantage of utilizing either of these models lies in their predictive superiority compared to other attitude-behavior approaches (see Ajzen and Fishbein,1980; Brinberg,1979; Jaccard and Davidson,1979), at least with regard to specific behaviors.

The aim of this research is to: (1) analyze the impact of "personal" factors, such as consumer attitudes, beliefs, norms, knowledge on residential conservation behavior, (2) explain variation in household energy consumption, particularly as it relates to conservation behavior and social psychological attributes of energy consumers, and (3) examine how noncognitive influences, such as demographic variables and household structural features, affect both the latter cognitive determinants and behavior. Apart from a discussion of the comparative utility of either model, the analysis will further specify the causal structure underlying the relationship between attitudes and behavior. This research has relevance both for measuring public response to energy conservation in the "post-crisis" period of America's energy problems, as well as a basis for defining objectives for residential energy policy.

The Study

The previous discussion suggests the need to understand how both personal and situational factors interrelate and affect behavior. For this reason, this study developed a research instrument specifically designed to tap relevant dimensions of energy behaviors necessary for a comparison of model approaches. The "Home Energy Use" questionnaire was developed with the intent of gathering data through a mailed survey method. The questionnaire contains a wide range of items pertinent to concerns for energy problems. The major divisions of the questionnaire focus on general definitions of present and future energy problems, energy policy preferences, inventory of present and past conservation behaviors and future conservation intentions, specific attitudes toward conservation in the home, an energy knowledge quiz, value expectation associated with specific conservation behaviors in the home, perceived social support for energy conservation, as well as description of household characteristics and socio-demographic variables (see Appendix A).

The sampling frame for this study constitutes the customer list of the Knoxville Utility Board. This list covers a geographic area of 6 counties in the East Tennessee area. Knox county is the most centrally located and also serves as the operations center of the Utility Board. KUB serves electricity, gas and water to approximately 150,000 customers.

The Utility's customer list was selected as the sampling frame for two reasons: (1) to obtain actual energy use data for participants, and (2) to include respondents from diverse geographic areas, especially rural sections of East Tennessee, rather than a predominantly urban sample. Accessing customer accounts directly would provide the most reliable means for obtaining energy consumption data. Also this sampling frame allowed for a selection of potential respondents from the six county region served by KUB.[3]

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[3] The organization of the customer listings dictated in part how the sample was to be drawn. The utility list is organized into approximately 20 customer routes. These routes are geographically specific and run fairly uniformly over the 6 county area. However, each route is exclusive of other routes. Thus, random selection from each route could provide a fairly representative selection of the entire listing. In order to minimize utility computer time, three random starts were obtained in each of the 20 routes (through use of a random number table) based on customer account numbers. After the computer selected randomly from the account numbers closest to the random number provided, a page of entries following that account were printed (approximately 24 accounts). These 24 accounts are all adjacent to one another in a selected neighborhood. This situation raised the problem of the independence of sample responses. In order to minimize this problem, 12 accounts were randomly selected from each page of 24. This method provided 36 accounts for each of the 20 routes, or 720 customers. Following this, an analysis of the geographic distribution of the sample was made to assess its compatibility with the overall utility lists. The analysis suggested that while sample accounts tended to be drawn from either the beginning or end of the utility routes, there did not appear to be any manifest geographic bias.

Data collection lasted over the six week period from the first week of March to the third week of April using a survey design similar to that suggested by Dillman (1978). The first mail out consisted of a cover letter explaining the purpose of the study, a questionnaire and return envelope. A week following the first mailing, a follow up post card was sent reminding the respondent to fill out the questionnaire if they had not already done so. The first two mailings obtained approximately 160 responses. Two weeks following the post card another cover letter and questionnaire was sent. Finally a second reminder post card was mailed a week later. The second and third mailing obtained an additional 126 responses, bringing the total to 286. Adjusting for deceased, moved, physically incapacitated persons, and undeliverable questionnaires, the final response rate is 41.6 percent.[4]

The response rate is low by current standards for mail surveys (Dillman,1978). Several factors can probably help account for this. First, the study asked respondents for

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[4] Information for these categories was usually written by the postal service on the returned envelope or by the occupant on the questionnaire. These factors together accounted for 32 questionnaires bringing the effective sample size to 688.

permission to access their tility records to obtain energy consumption data for a specified period (i.e., three years). Because of cost limitations, the consent form to access utility records was included in the questionnaire. This form was stapled to the back page of the questionnaire to avoid affecting respondent's willingness to complete the questionnaire. Warriner et al. (1984) report that such requests usually net about 70-80 percent compliance. However, they do not assess whether the request itself affects the overall response rate. The rather high number of persons (81 percent) who filled out the questionnaire and who provided such permission may suggest that many respondents who might otherwise have filled out the questionnaire, were alienated by the request form itself. However, we do not have any data bearing directly on this point.

Second, the questionnaire was mailed in late winter and early spring. Knoxville's winter weather was particular severe in the months of January and February, as were many parts of the nation. The early part of the data collection period probably capitalized on the general attention to energy issues during this period, as well as a concern for high utility bills. As spring approached, concern for heating costs undoubtedly waned with some concomitant effect on the response rate. The subsequent return to smaller energy bills may have decreased the "salience" of energy issues, at least for those not already concerned. Heberlein and Baumgartner (1978) indicate that salience of the topic to the respondent as well as number of call backs or contacts are the two most important factors affecting response rate. They note that a response rate of 42 percent is considered average for mailed questionnaires with a low salience level (see also Goyder,1985). Perhaps a more effective data collection period may have been somewhat earlier in the winter, especially January and February.

Finally, while use of KUB's customer list provides a rather diverse geographic sample, inclusion of a large rural element probably brought down the response rate. Rural mail surveys may not yield as high response rates compared to mixed or urban samples. Appendix B demonstrates that the response rate from the predominantly rural or partially rural routes (as defined by zip code) tended to be lower than those from urban areas.

The questionnaire itself was fairly complex. A number of sections of the questionnaire may be considered complicated for some--such as an energy "quiz," a section asking respondents to evaluate the outcomes for behaviors they may not have performed, as well as the effectiveness of programs which they more than likely had not participated.

Coupled with this, the length of the questionnaire (16 pages) and the small print may have affected the response rate. The issue of questionnaire complexity undoubtedly interacts with issue salience (Schuman and Presser,1981).

Appendix B provides a detailed analysis and comparison of some selected demographic variables in the study with relevant census data. Like many utilities, the Knoxville Utility Board is not bounded by specific political boundaries. KUB serves six counties in the East Tennesse area. However, it does not provide exclusive service for any of these counties, including Knox which is the major center of operation and the county with the highest population density. Although census estimates for the aggregate counties have been examined for comparison purposes they represent a crude basis for estimating difference.

Generally, the sample tends to over represent persons who are higher in income, older, higher in education and those who are homeowners. Some apparent reasons can be cited: (1) the study focuses on energy behaviors which apartment dwellers or renters generally have less control over, and (2) unattached individuals, especially the young, are more mobile and less amenable to filling out a questionnaire. Arguably, the socioeconomic bias raises questions for estimating parameters for the population.

This is especially true when considering that energy conservation attitudes and behaviors are affected by socioeconomic level, especially for those behaviors which require material assets. While the sample is thus "liberal" in such estimates, research suggests that the relationships between variables are largely unaffected by small differences in the nature of the distribution (see Schuman and Presser,1981).

Outline of Dissertation

The dissertation is organized into six chapters. Chapter II provides a review of social psychological and sociological considerations in predicting conservation behavior and energy consumption. This is done by examining energy attitude-behavior consistency and contingency factors moderating this relationship. While the argument is presented here that attitude-behavior models are appropriate for analyzing residential conservation behavior, some limitations of this approach are noted. The chapter proceeds with a general discussion of the problem of attitude-behavior "consistency" in social psychological perspective. The purpose here will be to clarify important theoretical and methodological problems in this research. Following this, a discussion of the Fishbein/Ajzen and Triandis models is provided. Finally this chapter concludes with a discussion of either models applicability to conservation behavior.

The aim of Chapter III is twofold: (1) review relevant determinants of conservation behavior, and (2) examine the interrelationship between conservation knowledge, behavior and actual energy consumption. This analysis will take into consideration differences among conservation actions (in terms of degree of difficulty, time and resources required), as well as structural factors affecting energy use.

Chapter IV examines conservation behavior and energy consumption in the context of the Fishebien/Ajzen and Triandis approaches to behavior. The chapter examines the utility of either model for understanding specific conservation behaviors, general conservation as well as energy consumption. The chapter also examines two criticisms of the causal structure of the Fishbein/Ajzen model. Two modifications of of the basic model are suggested: (1) including a measure of attitude toward the object, and (2) including a measure of attitude certainty. This chapter concludes with a discussion of the attitude-behavior problem and possibilities for future research.

Chapter V examines both situational and personal determinants of energy conservation behavior. The primary problem here is developing a plausible causal model of behavior which takes into account relevant social-demographic, household structural and and cognitive determinants. Causal models are developed for three individual conservation behaviors as well as more general conservation indices. The analysis will serve the twofold purpose of testing the "sufficiency" of social psychological approaches to conservation behavior discussed in Chapter IV as well as provide possible policy implications. Chapter VI provides a discussion of the relevant policy implications of this work.

CHAPTER II

ENERGY CONSERVATION AND ATTITUDE-BEHAVIOR CONSISTENCY

With the advent of the oil crisis, greater efforts have been made in the U.S. to increase the utilization of domestic oil supplies while at the same time decreasing domestic consumption. The latter proposal has included conservation planning and programs at the level of residential consumption (Berry,1983). Social science research has attempted to provide greater information on the nature of residential energy consumption as a basis for gauging anticipated levels of compliance to voluntary appeals to conserve and provide guidelines for policy formation (Olsen,1978:93).

Two observations evident in the period shortly following the embargo remain true today: (1) considerable differences exist in energy consumption between households in the U.S.--not all of which is a function of household structural and climatic factors (Newman and Day,1975), and (2) existing knowledge for developing relevant energy policies directed at the residential consumer is inadequate (Cunningham and Cook-Lopreato,1977). A number of studies indicate that consumer-determined behaviors may account for a large portion of the variation in energy use between households (Verhallen and Raaij,1981; Sonderegger,1978;

Fritsche,1981). However, few studies provide unequivocally clear explanation for such behavior (Olsen,1981). The latter is important considering that conservation may be the most cost effective and the least socially disruptive strategy for dealing with energy supply problems (Sant,1979).

This chapter begins with a review of some of the existing research analyzing energy attitudes and behavior and factors affecting their relationship. An argument is presented that the energy attitude-behavior relationship can be analyzed within the context of recent attitude-behavior "models," such as those suggested by Fishbein and Ajzen (1975) and Triandis (1977), which have a demonstrated validity for predicting behavior. Conservation "behaviors" represent a particular class of activities which vary considerably in difficulty and consumer control. Thus, some issues affecting the volitional control of conservation behavior--a factor important in understanding the attitude-behavior link, will be discussed. Following this the attitude-behavior "problem" is discussed in social psychological perspective. This section serves as an introduction to the review of two attitude-behavior models utilized in this analysis; i.e., the Fishbein and Ajzen and Triandis approaches as well as their application to conservation behavior.

Energy Attitude-Behavior Consistency

Over the past decade, social science research directed at the residential energy consumer attempted to assess whether and how individual consumer attributes, particularly attitudes, contribute to residential energy conservation. Much of this research, following in the wake of the embargo assumed that acceptance of the reality and seriousness of the energy problem was important both for public acceptance of energy policies as well as willingness to comply with voluntary conservation measures (Gladhart et al.,1978). Many argued that widespread acceptance of a "conservation ethic" (Olsen,1978; CONAES,1980) would have important consequences for slowing down the rate of energy consumption.

While most of the public is favorable to acceptance of conservation measures as well as the reality of the energy problem (Farhar et al.,1979), researchers obtained small success in predicting behavior from general energy beliefs and attitudes. Three studies in particular indicate little close relationship between general definitions of the energy problem and reported conservation actions. Murray et al., (1974) show that at the outset of the energy crisis, little change in self-reported behaviors had occured. Respondents reported some changes in appliance use and turning off lights but thermostat setting was consistent between November of 1973 and February of 1974. What's more, only one behavior--shutting off lights, was statistically associated with belief in the importance of the current problem. Gottlieb and Matre's (1976) study of four Texan communities confirms Murray et al.'s findings. However Gottlieb and Matre note that due to Texas' oil advantage, the price and availability of energy had not changed appreciably. Finally, Luyben's (1983) study of thermostat setting behavior during the 1977 natural gas crisis indicates little or no relationship between perceptions of the energy crisis, exposure to Carter's "fireside" chat on the energy crisis, or perceived salience of individual effort to differences in actual observed thermostat settings.

Similar efforts were made at examining the relationship between commitment to specific energy policy preferences and behavior. Research suggests that those viewing the energy problem as serious were more likely to support specific conservation policies aimed at changing consumer behavior; e.g., gas rationing, speed limits, recycling (Milstein,1978). However, those more proconservation oriented do not report any greater efforts to conserve (Curtin,1976).

Some research has looked at the possibility that other beliefs may be intervening between belief in the seriousness of the problem and behavior. Bartell (1976) examines the impact of political cynicism on belief in the problem and behavior. He indicates that political trust and belief in the seriousness of the energy problem are positively correlated (r=.10), the former being primarily a function of attitude toward the administration (i.e., Nixon). Bartell as well as Beck (1980) did not find that lower support for the political administration, nor general seriousness, to correlate with likelihood of conserving. Similarly, Martin (1981) suggests that empathy for others affected by the crisis may be an important factor affecting individual behavior as well as moderating cynicism toward the energy problem.

It is important to consider that beliefs toward the energy problem will differ significantly even for those who consider the problem serious and who favor conservation action. Belk et al. (1981) have explored the possibility that general definitions of the energy problem facilitate individual behavior only when its cause and solution are shifted to the individual level. They indicate that when blame for the energy problem is attributed to individuals, rather than the administration, OPEC or the oil companies, individuals are more willing to support mandatory conservation, enforcement of the speed limit, gasoline rationing, and the like as solutions to the problem. They do not assess whether those with an "internal locus of control" were more conservative. However, the implication of their work is that personal blame for the energy problem should be more likely to activate personal norms of conservation, particularly when collective responsibility is enhanced.

Van Liere and Hand (1984) examine this hypothesis in greater detail. Their research suggests that individuals are more likely to conserve when their "definition of the situation" encourages individual action. The authors assume that such a definition would have three components: (1) a "diagnosis" of the energy situation emphasizing its seriousness as well as blame for the problem, (2) a "rationale" emphasizing effectiveness of conservation, and (3) a "prognosis" emphasizing the desirability of individual conservation action. Results indicate that an index combining these three components was more effective in predicting behavior than the items taken individually. However, the rank order of mean number of conservation actions between different opinion groups, while generally monotonically ordered and in the appropriate direction, achieves statistical significance in only one of the two survey samples examined.

Thus, the evidence reviewed suggests that general definitions of the energy problem--such as attitudes toward the administration, belief in the reality of energy problems, favorability toward energy conservation policies, are not predictive of energy conserving actions. Interestingly, evidence suggests some degree of consistency between energy beliefs, but not between beliefs and action. The lack of supportive evidence led Olsen (1981:118) to state:

> It appears that broad attitudes and beliefs about the reality and seriousness of the energy crisis or the desirability of conservation policies bears little or no relationship to reported adoption of energy saving practices.

Milstein (1978) concurs noting that changing general attitudes toward the "energy problem" is unneccesary for creating behavioral change. Apparently, general belief and attitudes toward the energy problem do not carry specific enough behavioral dispositions to affect conservations directly.

The lack of belief-behavior consistency at the general level could have been predicted. As Curtin (1976) and Olsen (1981) note, it takes very little cognitive commitment to be "proconservation." Like commitment to "environmental protection," conservation in the abstract does not arouse great opposition in the general public. However, public opinion data often fails to segment those committed to conservation as a general value--i.e., need for national commitment to conservation or policies aimed at promoting conservation, from those committed to a personal norm of conservation.

Researchers have found that measures tapping the latter are more effective in predicting behavior. Two studies in particular demonstrate support for this notion. Leonard-Barton (1981) found a moderate correlation between commitment to "voluntary simplicity" beliefs and reported number of conservation practices (r=.24), such as turning furnace lights off during the summer months, weather stripping and caulking doors and windows. Leonard-Barton and Rogers (1979) report a moderate correlation between commitment to a "personal norm" of conservation and reported energy conservation practices (In Olsen,1981:117).

These findings are logical considering that the best predictors of behavior are relatively proximate norms or attitudes toward the behavior (Fishbein and Ajzen,1975). This evidence suggests that cognitive factors do enter into motivational processes in the decision to conserve or not to conserve energy but that significant variance remains unexplained.

Some observations can be made regarding the lack of a strong observed correlation between beliefs and behavior. Perhaps the most noticeable omission in the research reviewed is that researchers fail to include attitude toward conservation behavior itself. Individuals may have a definition of the energy problem which favors conservation but find it inconvenient to conserve personally. Such reticence to conserve should be reflected in the individual's attitude toward personal conservation. We might expect that while belief in the reality and seriousness of the energy problem and commitment to energy conservation policy will place greater strain on individual need for consistency, other attitudinal dispositions could effectively rationalize the apparent discrepancy; e.g., takes too much time/effort, costs to much, effort not worth payoff. It follows that research examining specific beliefs about the outcomes of conservation may be more useful in predicting behavior.

A second problem in the reported studies focuses on the concept and measurement of conservation behavior. The use of self-reported behaviors raises questions of reliability, particularly when we consider the social context of the seventies favoring conservation, a factor which might influence reporting of behavior in a more proconservative direction (see Hummel et al.,1978:39). For example, Luyben (1983) found a noticeable difference between reported and actual observed thermostat settings. Verhallen and Raaij (1981) also indicate a tendency to overreport conservation for Canadian households (see also Black et al.,1985).

Researchers often compound this problem by treating all conservation behaviors as equivalent--usually by summing them into an overall index (e.g., Leonard-Barton,1981). As Cunningham and Cook-Lopreato (1977) note, conservation behaviors vary considerably in time, skill or resources required to perform. For this reason, we can expect that conservation behaviors will also vary with respect to relevant predictors. Olsen (1981) and Farhar et al. (1979) indicate that what behavior change is attributable to general belief orientations tends to be curtailment of relatively recurring behaviors, such as lighting and thermostat adjustment, which require little change in household lifestyle. Such behaviors are apparently rather "elastic" and thus more directly influenced by attitudinal disposition. Less is known how motivational factors interact with resources and opportunity in the case of more expensive retrofit and appliance change.

A number of researchers have attempted to correlate attitudinal orientations directly with energy use. Some argue that consumption data accurately reflects past behavioral choices in the home and thus represents an adequate surrogate of behavior (Stutzman and Green,1982). In this sense, energy consumption is a "behavioral trace" measure (Heberlein and Warriner,1983). Perhaps more importantly, explaining and ultimately altering energy use is of primary significance for residential energy policy.

Again research would suggest the need for distinquishing beliefs and attitudes toward the general energy context from the home context. Craig (1983), Gladhart et al. (1978) and Seligman et al. (1979) confirm the view that perceptions of the energy problem--such as legitimacy and seriousness of the energy problem, as well as commitment to general conservation, apparently have little direct impact on energy consumption. Similarly, Heslop et al. (1981) found very weak though significant effects of price, environmental and conservation "consciousness" on actual energy consumption (r's=-.23, -.11, -.12 respectively).

The lack of strong findings here are not unusual given that energy use is affected by a number of factors other than behavior. The most useful predictors of energy use tend to be climactic, as well as structural characteristics of the household (McDougal et al.,1981). However, as Schipper and Ketoff (1979) note, differences in energy use between structurally similar households are too great to be explained by technological and climactic factors alone, suggesting the importance of behavioral dimensions (see also Sonderegger,1978).

Cognitive factors do influence actual energy consumed but through their impact on household behavior. The Twin Rivers, New Jersey study of Seligman and associates provides strong positive evidence linking attitudes with actual energy consumption. Seligman et al. (1979) focused on explaining summer electricity use (primarily due to air conditioning) using six factors based on a battery of belief/attitude items. Only two of these--thermal preference and family health consequences, were directly relevant to the personal behavior of the individual. The factors together explain an impressive 59 percent of the variance in energy use--most of which is due to thermal preference and family health. The study was repeated in the winter months (Becker et al.,1981). Again thermal preference and health emerged as the most significant factors, but only 18.2 percent of variance in energy consumption was explained. They attribute the difference in explained variance between the two studies to the discretionary nature of summer conditioning use compared to winter space heating.

The latter evidence indicates that general definitions of the energy problem do not play a significant direct role in energy consumption. Such general beliefs appear to be too abstract to impact consumption directly but it is unknown whether they help condition attitudes toward specific energy consuming behaviors. "Thermal preference" and concern for health appear to play some motivational role in actual energy use. The latter may be understood as beliefs regarding the likely outcomes of conservation action; such as being uncomfortable or increasing susceptibility to cold. This implies that energy beliefs affect energy consumption when the content of those beliefs have direct relevance for behavior. Finally, attitudes appear to play a larger role where energy use is more discretionary, as in summer air conditioning use (see also Craig,1983).

Attitudes or beliefs toward energy problems or toward specific conservation actions cannot be expected to unequivocally predict behavior. A number of forces inhibit individuals from being more efficient in the home. The following section reviews some of these issues. The section serves the purpose of introducing other factors which may help account for the lack of strong research findings in the energy attitude-behavior area; in particular, energy knowledge, lack of resources, and lack of control over decisions affecting conservation behavior. This section provides a qualified justification of utilizing an attitudinal approach for predicting behavior and energy consumption in the residential context.

Mediating Factors Affecting the Attitude-Behavior Relation

A number of issues have been discussed as factors affecting individual conservation behavior, particularly the question of why individuals have not made greater efforts to conserve. Lack of appropriate energy knowledge and information may be one factor inhibiting attitude-behavior consistency. Milstein (1978) notes that energy consumers often lack adequate information for how to maximize energy efficiency. He reports that a large minority of individuals did not know their water heater temperature and fully half of the respondents in his study felt that ". . . one must turn down the temperature 5 degrees (F) in order to save energy" (1978:82). The problem goes beyond this, however. Stern and Gardner (1981) indicate that individuals have difficulty integrating complex quantitative information. Determining when appliance replacement will be cost effective for example, involves assessing lifecycle costs of appliance stock against both upfront and long term operating costs of new equipment. This problem becomes more difficult when utility costs are rising over the payback period and additionally, individuals are allowed to deduct part of new equipment costs from their income tax.

While need for quantitative information is high, consumers may not have verifiable information sources. Stern and Aronson (1984) show that whether or not energy information is useful to the consumer may depend on the credibility of the source. Utilities, for example, may not be the most effective information source (Milstein,1978). This problem is often compounded by the fact that "expert" information is often conflicting (Stern et al.,1981); for example, between government appeals to reduce energy and the local utility interested in marketing electricity.

Second, lack of capital resources for home improvement is obviously a significant factor in improving energy efficiency. Lower income groups, while generally living in less efficient dwellings (Newman and Day,1975), often can least afford to improve home efficiency and are least able to arrange financing (Jacobs,1976). Beck et al. (1980) also note that the lower income are more likely to be renters and thus less inclined to modify existing appliance stock or home efficiency.

However, other evidence suggests that considerable differences in energy use exist within income groups even at the subsistence level. For example, Klausner's (1978) study of welfare mothers in public housing indicates that significant differences in energy use can be found between households. Klausner was able to attribute part of the difference to "home-centeredness" of the mother as well as extent of social activities in the home. This research suggests that while the lower income are limited in the number of energy reducing options they have, some discretionary opportunities for conservation may exist. Indeed, lack of resources may be incentive to conserve. Cunnigham and Cook-Lopreato (1977) support this view showing that low and middle income groups tend to conserve more, at least with regard to curtailment of behavior, lighting and thermostat adjustment.

A third barrier to greater conservation activity deals with the extent to which consumers have control over the decisions affecting their energy use. Apartment dwellers in particular have little input into energy efficiency improvements. Major energy decisions, such as appliance change and insulation are made by "intermediaries" (Stern and Aronson,1984) such as building owners who may not have the interests of the consumer in mind. Even where some structural changes are possible, many renters do not have the added home-owners incentive to deduct such investments from income taxes. Finally, as Darmstadter (1975) notes, where rental units are master metered, occupants are not provided with the necessary feedback to monitor behavior. He indicates that the removal of such master meters could have a significant energy saving potential.

Again, renters are limited by the extent of home retrofit and appliance stock improvements but significant variation between similarly situated households exist. For example, Sonderegger (1978) reports a difference of as much as fifty percent variation in energy consumption between "movers" and "stayers" within an apartment complex. The analysis assumed that behavioral factors affected the residual differences between households controlling for structural and climactic features. However, it was not able to pinpoint which behavioral factors affected energy use. The implication of his work is that occupant determined characteristics affect energy use significantly.

This research points to the necessity of differentiating conservation behaviors into appropriate classes of activity. In particular, different behaviors, although ostensibly falling under the rubric "conservation," differ considerably in degree of difficulty, money, time and skill required. Stern and Gardner (1981) suggest distinquishing between "curtailment" and "efficiency" behaviors. The former type refers mostly to repeated behaviors which have smaller savings potential. The latter refers to nonrecurring or "one shot" behaviors which have more direct and extensive effect on energy use. Cunningham and Cook-Lopreato's (1977) research suggests at least two types of recurring behavior: (1) curtailment of energy use, and (2) improved use patterns. The implication here is that different attitudinal, structural and sociodemographic factors may operate for different conservation behaviors. Thus different attitude models may be needed to predict different types of behavior.

This discussion suggests that conservation behavior does not conform to traditional economic models of behavior (Yates and Aronson,1983). Individuals may not always have access to the kinds of information necessary to realize and act upon self-interests. Second, given information that is appropriately framed and integrated, consumers may not be able to act to improve efficiency because of a lack of resources, lack of control over their living environments, or both. However, given that not all conservation actions are under complete volitional control, motivational factors may enter, especially for many recurring no/low cost behaviors.

The review thus far indicates that while prior research suggests a lack of strong A-B fit, few studies have explicitly tested this relationship while including alternative explanatory factors. Those studies which do show a relationship focus on specific attitudes and normative influence directed toward specific behaviors. The study of the interrelationship between energy attitudes and behavior can be furthered by examining the problem in the context of other social psychological factors affecting behavior. This shifts the analysis from strictly an "attitude-behavior" problem to one of explaining behavior given certain social psychological attributes. This latter interest, rather than attitude-behavior problem per se, has come to dominate discussions of how attitudes and other social psychological characteristics affect behavior. Some of this literature is reviewed in the following section. This review provides an introduction to discussion of the Fishbein/Ajzen and Triandis "attitude-behavior" models and is not intended to be exhaustive.

Attitudes and Behavior in Social Psychological Perspective

Attitudes in Brief Historical Review. The attitude concept has had an interesting attention cycle. Its one time popularity led Allport (1935) to claim that the attitude concept has been so ". . . widely adopted that it virtually established itself as the keystone in the edifice of American social psychology " (1966:15). Despite such early enthusiasm, interest in the concept has waxed and waned considerably over the past fifty years. McGuire (1968) indicates that the lack of conceptual agreement and a lopsided interest in quantification and measurement brought about a decline in attitude interests in the fifties. In the mid-fifties, Blumer (1955) claimed that the attitude concept had failed "miserably" to establish itself as a scientific concept; it did not distinquish a particular class of objects, nor a ". . . high conformity . . . between asserted attitudes and subsequent behaviors" (1955:61). Strauss (1945) noted that attitude theorists did not seem particularly bothered by the "sprawling" nature of the attitude concept, nor the lack of congruence between theory and research.

Defleur and Westie's (1963) influential review brought many of the criticisms of attitude research to the fore. They argue that it is unlikely that behavior is mediated by a single "latent process."[1] Other situational factors, particularly the social and normative context of behavior, probably provides better prediction of actual behavior. Second, individuals do not possess the capabilities to fathom "true attitudes" or self concept assuming that the researcher is even capable of providing such a test. Third, attitudes are not consistent across situations and social contexts. Finally, the accumulated research suggests that attitudes are not good predictors of behavior (which they refer to as the "fallacy of expected correspondence").

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[1] Defleur and Westie argue that two conceptualizations of attitudes exist in the literature: "probability" and "latent process". Both views assume a stimulus-response framework. The former position conceptualizes attitude as a response consistency infered from a behavior pattern. The latent process view postulates the existence of some hidden or hypothetical variable which "mediates the observed behavior" (1963:21).

The sixties did see a resurgence of interest in the attitude-behavior problem (McGuire,1968). The decade ended, however, with further vilification of the attitude concept and prognostication of its ultimate demise by leading social psychologists (Hill,1981; see also Deutscher,1966). Wicker's (1969) often cited review of thirty-one attitude-behavior studies expands the critique of the expected correspondence between attitudes and behavior. In Wicker's classification of studies, the majority of findings (68 percent) indicate no relationship between attitude and behavior, a small positive relation (below a coefficient of .30) or an inverse relation (contrary to expectations). Wicker selected only those studies which had a measure of actual behavior (rather than retrospective) thus giving his findings greater plausibility. As Wicker (1969:65) indicates:

> Taken as a whole, these studies suggest that it is considerably more likely that attitudes will be unrelated or only slightly related to overt behavior than that attitudes will be closely related to actions.

Recent reviews of the attitude-behavior problem (Hill,1981; Schuman and Johnson,1976) suggest that the prediction of the withering away of attitude research has been premature. Attitude researchers appear more confident than ever that at least under specifiable conditions, attitudes can predict behavior. However, as Wicker (1969), Schuman and Johnson (1976), Liska (1974) and others indicate, the nature of the "expected correspondence" has changed dramatically. Liska notes that the bivariate relationship between attitudes and behavior is no longer a compelling research interest. Rather, the attitude-behavior (A-B) problem has been redefined as one of ". . . identifying the conditions which affect the extent and direction of the relationship" (Liska,1974:262).

To some degree, this turn in the focus of research could have been predicted. As Hill somewhat sarcastically suggests, when social scientists are faced with "failure" (i.e., low A-B correlations) they typically ". . . invoke the image of a complex, multivariate world" (1981:360). Be that as it may, social scientists have increasingly come to recognize a range of considerations affecting the A-B relationship.

One approach developed from the view that attitudes have multicomponent attributes. Ajzen and Fishbein (1980) state that though attitudinal researchers have used a unidimensional conception of attitudes, the prevailing view was actually more complex. At least as far back as Allport (1935), attitudes have been conceptualized as having three components: (1) an affective or evaluative dimension, (2) a cognitive or knowledge/belief dimension, and (3) a connative or behavioral disposition (Insko and Schopler,1967; Calder and Ross,1973). Despite this, little effort has been made until the sixties and seventies to measure such dimensions of attitudes independently (Ajzen and Fishbein,1980). As Ajzen and Fishbein indicate, the scaling advancements of Guttman, Likert, Thurstone and Osgood measure primarily the evaluative dimension.

Most recent conceptualizations of attitudes have followed in this tradition. As Hill (1981) indicates, attitude is generally thought of as an evaluation of an attitude "object" and is usually measured in terms of positive or negative affect. This perspective allows researchers to focus more specifically on what role attitudes play in guiding behavior (rather than assuming they do). The following two sections review some recent developments in attitude theory--particularly, attitude structure and situational factors affecting attitude-behavior consistency.

Attitude Structure. Attitudinal researchers have been aware for some time that attitudes can occupy varying positions of importance in cognitive structure (Rokeach,1979). The functional importance or role attitudes play in individual belief structure (see Katz,1960) determines in part how or if they affect behavior. Poor attitude-behavior correlations reported by Wicker (1969) and others appears to be due in part to not considering attitude structure--a problem which in many respects remains unrectified. Petersen and Dutton (1975) indicate that attitude researchers have consistently neglected a number of attitude structure components; for example, "object centrality," attitude "extremity" and attitude "intensity."[2] Their analysis of twenty eight A-B studies reveals that only a handful have taken two or more of these considerations into account.

Research in this area has focused primarily on two problems: (1) dimensions of attitude structure and their interrelation, and (2) factors affecting attitude structure. While a number of attitude structure dimensions have been hypothesized, such as those suggested by Petersen and Dutton, little conceptual uniformity exists. Conceptually similar attitude dimensions often appear under different classifications (Schlegal and DiTecco,1982). The latter problem makes comparisons between dimensions somewhat

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[2] Centrality refers to the importance attached to the attitude object, either in a cognitive or emotional sense. Direction refers to whether the affect associated with the object can be characterized as positive or negative, favorable or unfavorable. Extremity refers to the degree of favorableness or unfavorableness while intensity refers to the strength or conviction associated with the attitude object.

difficult. Perhaps one approach to attitude structure is to view them as different dimenisons of attitude strength (Rokeach, 1979). Generally, the research suggests that the stronger an attitude is; i.e., more "certain" (Sample and Warland,1973), "intense" (Crespi,1971), and the more "central" the attitude object is within individual's total belief structure (Schlegel and DiTecco,1982), the more likely it is that attitude toward the object will influence behavior, all else being equal. Recent attitude research suggests that the strength of attitude effects primarily whether attitudes are cued or "accessed" in behavior relevant contexts (Fazio et al.,1983). Accessing attitudes may also be dependent on how individuals "define the situation" as relevant or not to a given set of attitudes. Thus "filter" questions designed to separate the attitude informed from those with no opinion will undoubtedly improve A-B fit (Schuman and Presser,1981).

The question of factors affecting attitude structure looks primarily at how attitudes are formed. Work by Regan and associates (Regan and Fazio,1977; Zanna et al.,1980; Fazio et al.,1983) suggests that direct experience with the attitude object is an important factor affecting whether or not it becomes a disposition to act. Those with direct attititudinal experience tend to have more stable attitudes and tend to be more resistent to counter-attitudinal information. The research on the role of direct prior experience suggests that the "behavior-to-attitude" model may be appropriate in some circumstances. This view has been articulated elsewhere, most noticeably in Bem's (1967) "self-perception" theory and Festinger's (1957) cognitive dissonance theory.

As Olsen's (1981) review of energy literature would suggest, most energy attitude research has not considered structural dimensions of attitudes beyond the question of direction of attitude statements. In this respect, the energy attitude literature reflects the more general lack of attention to such issues. Research on consumption feedback in the home suggests some possible connections to attitude strength. While some of these studies indicate that information feedback does not have a direct effect on energy consumption (e.g., Heberlein,1975), other evidence suggests that information and consumption monitoring helps arouse feelings of personal efficacy and reinforces the desire to consume less energy (Gaskel et al.,1980:252; Seligman et al.,1981). The effect of consumption feedback may be to increase the strength of proconservation attitudes at least among those individuals already interested in saving energy.

Some effort has been focused on how direct experience of the energy shortage has affected perceptions and behavior; for example, the importance of price increases for encouraging conservation behavior (Cunningham and Cook-Lopreato,1977), perceived negative employment consequences (Bartell,1976), or direct experience of a coal strike (Beck,1980). However, few studies examine how the influence of direct experience is mediated by attitudes.

Social Influence. In a more sociological view, a number of observers have noted that even when attitudes are salient and highly stable, situational factors may intervene and affect the expected correspondence between attitudes and behavior. Wicker's (1969) discussion of situational factors suggests that A-B congruence is most likely to occur when both verbal and overt behavioral responses are obtained in the same or similar situation. Wicker adds that the study of situational variables ". . . will have a higher payoff than similar efforts on intrapersonal factors" (1969:69).

Most researchers today, however, tend to recognize that both information from internal states and external cues will be operative in most behaviors (Eagly and Himmelfarb, 1978:538). Schuman and Johnson (1976) and Liska (1974) suggest that additional variation in behavior can be gained by measuring perceived social support, either in terms of a "generalized other" or reference group support. A number of studies indicate that A-B consistency is likely to be affected by the level of social support. As Wicker implies above, when both attitudes and social support are congruent, A-B consistency is likely to be higher. Liska notes that the causal dimensions underlying the interface between attitudes and social support are not completely understood. He suggests three possible conceptions which bear repeating: (1) a "consistency" conceptualization which assumes the priority of attitudes in predicting behavior and social support acts as a suppressor variable, (2) an "additive" conceptualization where attitudes and social support act together but are statistically independent, and an (3) "interaction" conceptualization which assumes that neither attitude nor social support have independent effects; the contribution of one depends on the other.

Research bearing on this point indicates that the relative influence of attitude and situational factors on behavior is determined by two considerations: (1) characteristics of the behavior, and (2) characteristics of the individual. Attitudinal factors probably play a greater role where the behavior is relatively recurring and stable. In such cases, possible lines of action have been anticipated and are thus more likely to be influenced by prior dispositions (Hewitt,1979). Where the behavior is relatively new and stable disposition not yet formed, social cues may be more important (Liska,1984). Likewise, normative or social cues may be more operative when the behavior is performed in a public rather than private context (Farhar et al.,1979).

Recent research indicates that certain individuals are more likely to infer behavioral cues from the situation than from attitudes. Studies of "self-monitoring" reflect this concern. For example, Zanna, Olsen and Fazio (1980) indicate that "low self monitors" were much more likely than high self monitors to infer their attitude directly from behaviors performed in the study context.

Few energy attitude-behavior studies additionally include measures of social support for behavior. Normative influences appear to be strongest for publicly visible behaviors, such as solar adoption (Leonard-Barton,1981) or conservation actions made publicly visible through a program of social commendation (Pallak and Cummings,1976; Pallak et al,1980). It follows that increasing the public visibility of energy conservation behaviors among individuals may provide a "foot-in-the-door" technique for encouraging conservation (Cook and Berrenburg,1981). However, the influence of normative factors is less clear for private conservation actions. Stutzman and Greene (1982) do not show a strong effect for perception of normative influences for conservation actions on actual energy consumption (R^2 =.02). Their study was rather limited in the number of conservation actions considered, however.

More importantly, lttle research has been conducted examining how normative influences affect attitude toward conservation, perhaps because the concept of normative influence--in the case of residential energy conservation, is itself rather vague. For example, stronger attitude-behavior consistency can be expected when perceptions of normative "oughtness" are also consistent with such behavior (see Liska,1974). Unfortunately, such normative influence may vary considerably between contexts; e.g., friends, neighbors, family, local community and nation. Even where individuals perceive such normative influences as consistent--which is not very likely--they may be unwilling to comply. The implication of the latter is that normative "influence" should be defined with respect to specific contexts.

In summary, the A-B problem has stimulated considerable interest and research. Early disenchantment with attitudes stemmed in part from ambiguity surrounding the meaning of the concept itself and from the apparent inability of attitude researchers to predict behavior. In more recent years, the A-B problem has itself become the focus of attention. Three features of the A-B problem have been discussed: (1) measurement--both attitudes and behavior measures should be at the same level of specificity and generality, (2) attitude structure--attitudes which exhibit greater affective commitment or cognitive centrality will have a greater impact on behavior than will attitudes with low affect or peripheral importance, and (3) social influence--both attitudes and behavior are subject to social influences, especially when attitudes have low salience and the behavior is public. In the latter case when attitudes are salient (i.e., cognitively central, intensely held, etc.) and social pressures are mutually reinforcing, congruent behaviors are more likely to result.

Thus while research has identified factors affecting the attitude-behavior relationship, considerable debate continues to exist as to how such variables should be organized into coherent causal models. The following section reviews two approaches to modeling attitudes and behavior which have received wide attention in the literature.

Modeling the Attitude-Behavior Relationship

A number of observers have indicated that while the relevant factors affecting the attitude-behavior relationship have been identified, few studies provide a systematic analysis of the interrelationships among such components. The Fishbein (1967) model has received wide attention among researchers as a promising approach. Hill

(1981) notes that the Fishbein model has attracted more attention during the latter half of the past decade than any other A-B model. Ajzen and Fishbein (1980) refer to the approach as a theory of "reasoned action"; that is, it assumes that humans are rational, information utilizers, and that most behaviors of interest to social scientists are under volitional control.

Briefly, the most relevant determinant of action is the "behavioral intention" to perform that action. Behavioral intention is a function of: (1) attitude toward the behavior (or act) and, (2) "subjective norm"--or the specific behavioral prescriptions/proscriptions attributed to a generalized other. The Fishbein model can be summarized as:

B BI = Att(act)wi + SNwii
where:
BI = behavioral intention
Att(act) = affect associated with object
SN = normative beliefs (what referents think subject should do) attributed to significant others
wi and wii are empirically determined regression weights

Furthermore:
Att(act) = Biei (sum of the probability of certain outcomes multiplied by evaluation of those outcomes
SN = NBiMCi (sum of probability of normative expectation attributed to significant others multiplied by willingness to comply)3

Attitude toward the act is defined as an affective

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3 This is not considered an interaction term.

evaluation (i.e., liking/disliking) of the behavior. Thus attitude is conceptualized as having a single dimension. For Fishbein and Ajzen, attitude toward the behavior is determined by the "expected value" associated with a particular action. The expectancy value construct consists of two dimensions as the equation above indicates: (1) the probability of certain outcomes occuring as a consequence of performing the behavior, and (2) the evaluation of those outcomes on a desireability scale. Under most conditions, the expectancy value construct and attitude toward the behavior should be highly correlated. In fact, Fishbein and Ajzen consider them to be functionally interdependent.

The second major determinant of behavioral intention is subjective norm. This can be defined as the perception of what significant others think the individual should do. This component is contructed by summing the normative expectations which the individual attributes to others and multiplying these by the willingness to comply with these expectations. Subjective norm and attitude toward the behavior constitute the sufficient determinants of behavioral intention. More general beliefs and attitudes or factors exogenous to the model are mediated by these two factors. Fishbein's (1967) earlier model included a third component, personal subjective norm. He dropped this component later arguing that it was a surrogate measure of behavioral intention. Furthermore, behavioral intention is sufficient to explain behavior.

A number of studies have demonstrated the utility of the Fishbein model (e.g., Bowman and Fishbein,1978; Brinberg,1979; see Ajzen and Fishbein,1980). The importance of the Fishbein model is that it is inclusive of a number of variables which research has shown to be important; i.e., correspondence of attitude-behavior measurement, belief/affect consistency, social support and behavioral intention.

While the model has been widely used, a number of conceptual issues remain unresolved, particularly with respect to the causal order among variables as well as other situational factors affecting behavior (Hill,1981). Schwartz and Tessler (1972) as well as Bentler and Speckart (1979) indicate that the model components do not always partial out when behavioral intention is included in the equation. Other components such as prior behavior (Fredericks and Dossett,1983), or a personal normative belief (Schwarts and Tessler,1972) have been shown to be directly related to behavior.

Liska (1984) provides one of the most extensive critiques of the Fishbein/Ajzen model. Liska notes that considerable research exists which supports a nonrecursive model of attitude-behavior relations. Fishbein and Ajzen consider only the impact of attitudes, behavioral intentions and subjective norms on behavior and ignore the impact of prior behavior on model components. Second, Liska repeats his earlier (1974) claim that interaction between subjective norms and attitudes is likely especially for new behaviors. Fishbein and Ajzen allow only for additive and independent effects of both on behavioral intention. Third, the assumption of "volitional control" of behavior sets up a false dichotomy as most behaviors of interest to social scientists are neither completely volitional nor involitional. Fourth, the model does not include a host of contingency variables--such as attitude strength, which mediate between attitude and behavior. Finally, the Fishbein/Ajzen approach ignores the relationship between behavior and social structure--i.e., "resources and opportunities," which affect behavioral outcomes. The latter are relegated to a position outside of the model. Liska notes that while the model provides a parsimonious summary of the major determinants of behavior, it may be too simple to adequately address the conceptual and causal relationships between the components.

The Triandis (1975) model has also received wide attention as a possible improvement over prior research efforts. Triandis attempts to integrate different social science "paradigms" into an analysis of behavior: (1) a stimulus response or reinforcement approach as reflected in behavioral psychology or sociology, (2) a cognitive approach, and (3) a social interaction approach focusing on norms, roles and self concept. Like Fishbein, Triandis assumes that the influence of cognitive factors on behavior is mediated by behavioral intention. The model can be represented:

Pa = [(Hwi + BIwii)] (F)

where:
Pa = probability of an act
F = facilitating conditions (ease of act, relevant ability)
BI = behavioral intention
H = habit

Furthermore:
BI = Awiii + Cwiv + Sv
where: A = affect toward the object
C = perceived value of consequences of act
S = social determinants

The C component is an expectancy value contruct and it is identical to Fishbein's although the notation is somewhat different. The subjective norm component is different from the Fishbein/Ajzen model. Triandis does not consider specific behavioral expectations of relevant others. Rather the model can be given:

S = NBi + RBi + PNBi
where:
NBi = normative beliefs
RB = role beliefs
PNB = personal normative belief

Normative beliefs are defined as relevant to a specific community of persons. Role beliefs pertain to beliefs about behaviors that are defined as "appropriate for persons holding a particular position in the social system" (1975:51). The most basic difference between the two models is that Triandis indicates that cognitive, attitudinal and social factors are mediated by behavioral intention whereas facilitating factors and habit have a direct effect on behavior (see Figure 1).

Two empirical comparisons of the models exist. Brinberg's (1979) study indicates that the Triandis model is a better predictor of intentions than the Fishbein/Ajzen approach. He suggests that behaviors which have a moral component attached to them, or which require knowledge and/or skill to perform would be better predicted by the Triandis model. He adds that the Triandis model is more capable of specifying which determinants of intention need to be modified to produce behavior change. Jaccard and Davidson (1979), however, show that the two models are practically equivalent in their ability to predict family planning intention. Their evidence is unclear whether or not a personal normative belief adds any independent effect.

Thus, both the Fishbein/Ajzen and Triandis models incorporate a number of factors which prior research has

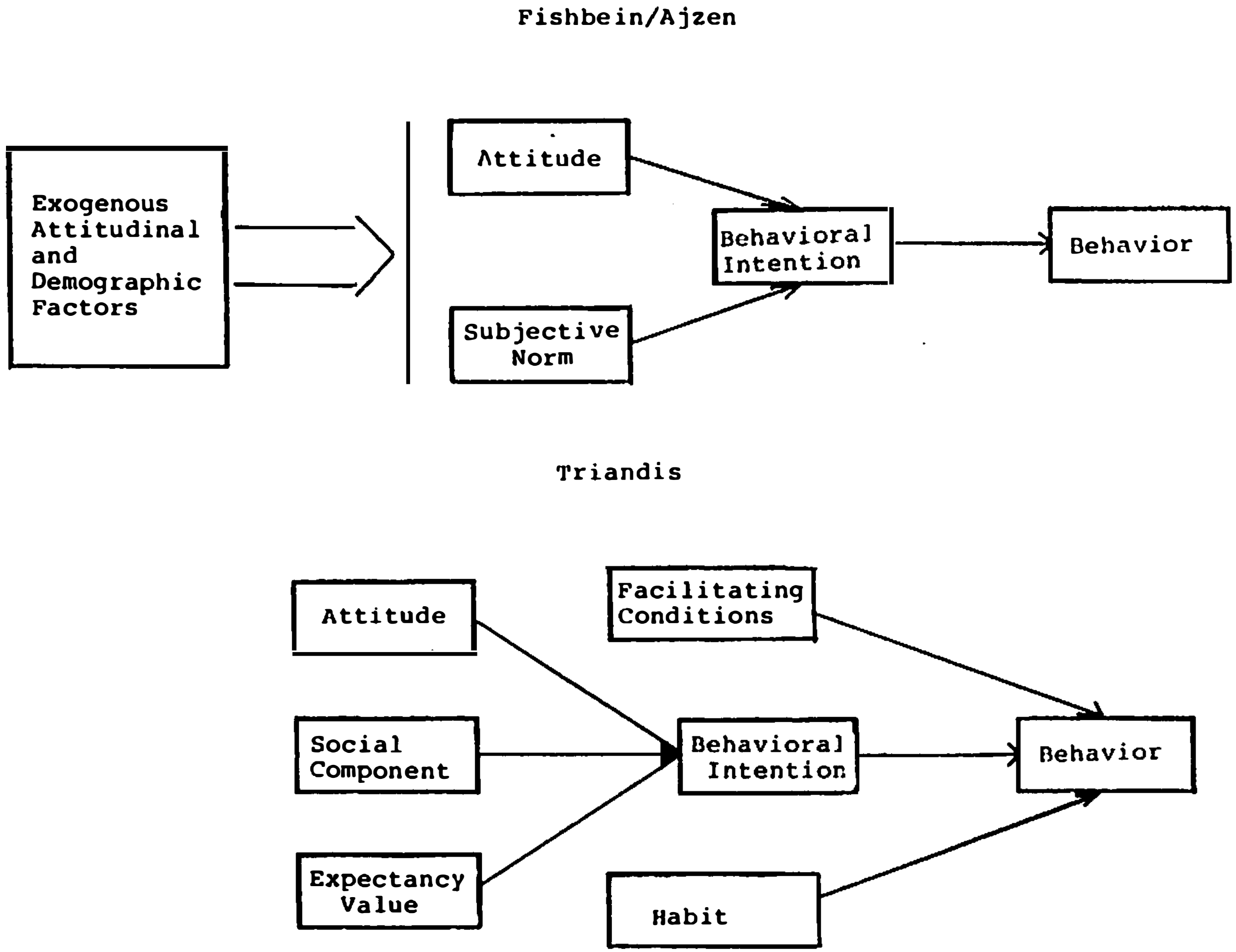

Figure 1 Fishbein/Ajzen and Triandis Attitude-Behavior Models

demonstrated as important. The Triandis model includes a number of elements presumably lacking in the Fishbein/Ajzen model; i.e., a personal normative belief, prior behavior, facilitating factors affecting the volitional control over behavior, as well as a multicomponent conceptualization of social influence. It thus is ideal for examining some of the underlying inadequancies of the Fishbein/Ajzen approach. On the other hand the Triandis model lacks the causal specification of the Fishbein/Ajzen model, and thus leaves the weighting of variables to the researcher.

In terms of modeling the A-B relationship, research on energy consumption suggests the necessity for including model components dealing with "facilitating" factors; such as knowledge, difficulty, and prior behavior. For example, Leonard-Barton (1981) indicates that self-reported mechanical ability is moderately correlated with number of conservation behaviors. Milstein (1978) and others support this view indirectly by showing that knowledge of conservation activities is very low. The evidence implies that knowledge and skill are important facilitating conditions affecting the A-B link. Macey and Brown (1983) indicate that prior conservation behavior had a significant and independent effect on conservation intentions and behavior, suggesting that "habit" may have important effects. Their study only examined three conservation behaviors--caulking, filter change, and nighttime thermostat setback, and may not adequately reflect attitudinal and normative contributions, especially for "innovative" behaviors such as solar adoption.

Stutzman and Green's (1982) application of the Fishbein model provides relevant although contradictory evidence on the role of model components on conservation behavior. In their first study of a sample of college students, a negative association was reported between knowledge of conservation behavior and energy usage (r's= -50 to -.38). Knowledge predicted usage over and above the summed conservation intentions; together they explain about 40 percent of variance in energy usage. Attitude(act) and subjective norm added an additional 5 percent variance. Stutzman and Green believe this evidence suggests that Fishbein belief items not be used as knowledge equivalents. However, in a second study of a probability sample of Alabama Power customers, knowledge was positively associated with energy consumption (r=.24) implying that those who knew more about how to save energy actually used more. Intention provided the bulk of the explanation with att(act), subjective norm and knowledge adding 6 percent of the variance in energy consumption. When income is included in the regression equation, the partial correlation for knowledge and consumption drops to .05 (NS). Income and behavioral intention together explain about 35 percent of the variance in actual usage, while subjective norm, Att(act) drop to about 1 percent of the variance.

Thus, research examining the affect of such facilitating conditions as habit, knowledge and skill is somewhat inconclusive. Some behaviors are relatively accessible to most individuals (e.g., turning off lights, caulking windows and doors), while others require some knowledge and skill (e.g., putting a timer on the water heater) or money (e.g., replacing existing appliances). For this reason such factors as knowledge and income must be examined within a range of conservation activities. Cunningham and Cook-Lopreato (1977) suggest that the relative importance of any of the model components depends in part upon the criterion behavior under investigation. As conservation represents a set of behaviors, different components can be expected to be more useful for certain types of behaviors; for example, "recurring" versus "nonrecurring." The former implies routine activities where habit is likely to be more important; the latter implies a one time investment of time, resources and knowledge. Innovative conservation behaviors imply greater weight to attitudinal and normative constraints.

In summary, this chapter has examined a number of issues in conceptualizing the "personal" and "situational" determinants of conservation behavior. This analysis is premised on the assumption that a clearer understanding of such factors is essential for evaluating residential conservation policies. A number of problem issues have been raised which prior research has not adequately addressed. These include: (1) clarifying the relationship between conservation knowledge and behavior, (2) examining personal factors in the context of sociodemographic and household structural variables, and (3) examining the relationship between general definitions of the energy problem and more proximate determinants of conservation actions, such as attitude toward the behavior, normative beliefs, facilitating factors and outcome beliefs.

The preceding discussion argues that conservation behavior is particularly suited for examining applied and theoretical dimensions of the current attitude-behavior consistency debate. Two "attitude-behavior" models are suggested for study: the Fishbein/Ajzen approach which includes a number of attitudinal and normative factors which prior research suggests are important, and the Triandis approach which in addition to the latter incorporates elements of both behaviorist and symbolic interactionist traditions in the prediction of behavior, such as prior habit, role beliefs and self concept. The following chapter will provide a foundation for a comparison of the two models by examining the diffusion of conservation innovations and their relevant sociodemographic and knowledge determinants.

CHAPTER III

CONSERVATION BEHAVIOR, KNOWLEDGE AND ENERGY USE

The first step in understanding residential conservation is to examine the nature of conservation action itself, as well as the distribution of conservation behaviors by the relevant sociodemogrpahic characteristics of consumers. Conservation behavior represents a general class of actions which may differ significantly between time and contexts. Thus it is useful to keep in mind that specific conservation actions may vary considerably in how they are distributed, even within the household context. The most important use of such information is in understanding how different consumers respond to energy price changes and public exortations to conserve (Black et al.,1985).

This chapter analyzes the nature of conservation behavior in more detail. The first part of the chapter begins with a discussion of the distribution of residential conservation behavior in the U.S. since the oil embargo. The review will examine the extent of specific conservation and some possible reasons for the lack of a stronger behavioral response to the energy crisis. The second issue will analyze how conservation behaviors are distributed throughout the population with respect to such sociodemographic characteristics as age, income and education.

The third section will examine the relationship between conservation "knowledge" and energy saving practices in the home. Earlier it was suggested that energy knowledge may have significant direct effects on conservation behavior as well as serve a mediating function between attitudes and behavior. Thus it seems appropriate to examine the knowledge-behavior relationship prior to undertaking a more formal analysis of the cognitive determinants of behavior. Two issues are examined: (1) whether or not conservation knowledge has a direct effect on individual behavior, and (2) whether individual perception of the "savings potential" of individual conservation actions affects likelihood of engaging in these actions. The final section endeavors to develop a theoretically informed basis for differentiating behaviors into appropriate indices or classes. The latter will be useful in distinguishing relevant situational and personal determinants of conservation in the analysis to follow.

Residential Conservation Behavior

With the advent of the oil embargo, greater attention has been focused on those factors affecting the timing and extent of conservation in the home context. Perhaps the first question raised by this problem is what lifestyle changes have individuals made to accommodate themselves to the demands of energy limitation. The latter problem is useful in anticipating adaptations to future energy supply problems.

While it is clear that the majority of the public have made efforts to conserve, most of this has involved relatively little lifestyle change (Olsen,1981). Farhar et al. (1980), compiling data from six national surveys between 1974 and 1978, provide the most detailed account of the diffusion of conservation actions. The largest single conservation activity is undoubtedly turning off lights when not being used. About three fourths of those polled in 1973 indicated that they had lowered their home temperature (see also Beck et al.,1980), although this tended to decline somewhat as the decade progressed. Approximately a third of respondents replaced lighting with lower wattage bulbs, a figure which remained relatively constant over the five year period. Utilizing the appliances more efficiently, such as washing with cold water or only full loads, was reported by approximately a quarter of the respondents. Thus, the evidence would suggest relatively low level of diffusion of those behaviors involving curtailment or efficiency adjustments. This is somewhat unusual considering that such activities are relatively available to most individuals regardless of socioeconomic status.

Home improvement activities, such as weatherization, storm doors/windows and appliance replacement were reported by few respondents at the outset of the crisis. As of 1975, only 10 percent had installed storm doors, although this figure increased to 21 percent by 1978. Similarly, weather stripping increased from 19 percent in 1974 to 33 percent in 1978.

A survey collected by RMH Research Incorporated in 1980 showed that only 1 in 10 individuals in the TVA area had not taken any steps to conserve energy. The three leading "investment" activities individuals had done were adding insulation (33 percent), installing storm windows (18 percent) and adding a woodstove (12 percent). For noninvestment activites, turning down the thermostat led the list (36 percent), followed by turning off the lights (30 percent) and cutting down use of appliances (14 percent). The mean expenditure in the area in the past few years was $500 overall and $700 specifically for electric homes. An interesting point raised from these findings is the rather low incidence of weather stripping (5 percent) and use of less hot water (7 percent).

Generally, the evidence indicates that most individuals had made some efforts to conserve by the end of the decade.

Those behaviors reported by the majority of individuals tended to be rather "visible" such as turning off lights and turning down thermostats. Much less activity is reported for efficiency improvements in the dwelling which have a larger savings potential (Stern and Gardner,1981). However, the incidence of such behaviors appears to have increased through the decade although still falling short of a majority of individuals.

It is important to note here that while the potential for increasing individual conservation appears to exist, what changes individuals have made are signficant. As Hirst (1983) notes, residential demand has declined dramatically, largely the result of better thermal efficiency.
Having said this, some reasons can be cited for why individuals have not made greater efforts to conserve. Earlier it was suggested that lack of appropriate conservation knowledge, lack of control over decisions affecting energy use and lack of resources all affected the likelihood of conservation. Looking at the problem in the aggregate, another explanation for the lack of a stronger conservation response may have to do with the price of energy itself. Actual price changes throughout the past decade provided the consumer with rather mixed signals. For example, Walter and Zentner (1978) argue that the "real" costs of energy did not increase greatly for the major part

of the decade. As Beck et al. (1980:3) indicate, overall domestic energy costs increased some 52 percent between 1973 and 1978, while oil and petroleum costs to the consumer increased by only 30 percent between 1970 and 1978. Not until 1979 did oil prices move forward sharply bringing about a turn around in public inattention. Prior to 1973, consumer oil prices had been declining, although unevenly. However, this viewpoint does not take into account that changing energy prices were differentially felt, particularly with respect to the socioeconomic status of the consumer (Perlman and Warren,1975; Morrison,1977; Newman and Day,1975), as well as region of the country (Landsberg and Dukert,1981).

One question which remains unexamined here is whether conservation behavior has declined as individuals have adapated to higher energy prices and as attention to the energy issue has declined. Evidence from more recent surveys may shed some light on this problem, particularly considering that the past five years have represented a relatively stable period for energy supply and demand. To the extent that increased conservation behavior was an artifact of the crisis, we would expect more recent surveys to indicate a decline in reported household conservation practices. However, recent survey data does not appear to bear this out. For example, an EPRI report (1984) examined extent of conservation activities among customers of the General Public Utilities Corporation (GPUC) in the late Spring of 1982. The survey included a large number of residential customers in the states of Pennsylvania and New Jersey. While the data reported by Farhar et al. are for national samples, evidence for curtailment and efficient behaviors should compare favorably between national and regional samples. GPUC results indicate more extensive conservation for these categories than indicated by the Farhar et al. review. For example, 56.1 percent reported reducing home lighting compared to 30 percent in Farhar et al. The GPUC survey indicated that 54.6 percent had used cold water for washing clothes compared to 25 percent in Farhar et al. However, only 50.6 percent of the GPUC respondents reported lowering heating temperatures compared to about 75 percent otherwise. These data suggest, although tentatively, that with declining "issue attention" (Downs,1972) to the energy problem, a concommitant decline in energy conservation has not occurred. This may be explained in part by the fact that energy prices still remain higher than their preembargo levels.

Correlates of Conservation Behavior

A number of studies have attempted to link conservation behavior with specific sociodemographic factors. Income and home ownership, factors which are themselves intercorrelated, have been shown to be related to behavior. Unfortunately, the income-behavior relationship is far from clear. Dunlap (1977) indicates that most studies show a positive relationship between income and conservation behavior. One explanation for this finding is that affluence and home ownership are highly correlated with energy use. Energy affects the lifestyle of the higher income in many more ways than the lower income. Consequently, greater "discretionary" uses of energy can be curtailed or eliminated (Beck et al.,1980). A second factor explaining the income link with conservation is that retrofit and appliance stock replacement allow the more wealthy to "buy out" of the energy price crunch without significantly altering their lifestyle. In addition, such investments can be deducted from one's income tax and thus minimizing their real cost.

However, the income-behavior relationship appears to be postive only for the latter efficiency improvements. Cunningham and Cook-Lopreato (1977) indicate that improved use patterns (e.g., closing off unused rooms, effective use of drapes) tended to be higher among the lower income and the less educated. Curtailment of energy using activities also tended to be inversely related to income and education. Adjustment of thermostat and lighting had no relationship to any demographic base. Interestingly, Beck et al. (1980) report a negative relation between education and conservation, controlling for the effects of income. This may suggests that curtailment of energy use is one of the few options available to the lower income for offseting negative price changes (Morrison,1977). Again looking at the RMH (1980) study, individuals "most likely" to have made a conservation investment are age 35-49, college educated with incomes falling between $40,000-$65,000.

Two conclusions can be drawn from these results. First, the effect of income and education on conservation behavior is probably best thought of as indirect. Most of the effect of both variables is through home ownership (Black et al.,1985). For example, the RMH study indicates that home owners were about twice as likely to have made energy investment than renters. While this is particularly the case for home improvements, such as retrofit and appliance change, homeowners are probably more concerned about the energy situation (Beck,1980) and in a much better situation to engage in a wide variety of conservation actions. Homeowners are obviously able to build home equity through conservation improvements. Additionally, home owners are more apt to make investments which require long term planning, even where such investments are feasible for the apartment dweller (e.g., water heater timer) (Beck,1980).

Second, differences in education and income between conservers and nonconservers varies significantly between types of behavior. The more affluent have responded to higher energy prices by investing in improved dwelling efficiency. The affluent have thus shielded themselves from the negative impact of price increases through investment. Middle and lower income groups have increased efficiency in routine energy using behaviors and curtailment of energy services. The latter may be especially the case for the lower income (Morrison,1977).

An alternative explanation of the relationship between income and conservation investments may be that respondents with higher incomes and education are more likely to overreport conservation behavior. This may be due in part to this groups' heightened sensitivity to social expectations of conservation (Beck,1980) as well as a need to rationalize higher energy use. Beck et al. (1980) support this view, showing that income and education are correlated with the tendency to overreport conservation for two categories--storm window insulation and use of mass transit. However, this bias does not occur for either adding insulation or thermostat setting.

Two other factors--age and race, can be considered. While some of the effects of age are due to income and home ownership, relevant evidence suggests that some influence remains unaccounted for by either variable. Again, some discrepancies in the research exist. Curtin (1976) and Beck (1980) indicate that those most likely to conserve are younger--perhaps as a consequence of this group's greater lifestyle flexibility and concern for the energy problem. However, DeFronzo and Warkov (1977) suggests a slightly curvilinear relationship, with middle aged individuals the most likely to conserve. This may be due in part to the fact that with increasing energy use through the life cycle (see Fritsche,1981), greater discretionary use of energy can be curtailed.

Finally, only one study, Beck (1980), has examined the influence of race. He reports a slight positive effect of race on conservation with whites being slightly more likely to conserve (beta=.17). Unfortunately, Beck doesn't explore the possible cause of this difference, particularly with respect to differences in conservation attitude, or family size and composition between black and white households.
As suggested in Chapter II, the sociodemographic correlates of conservation behavior vary considerably between types of behavior. In addition, the extent of conservation activity

varies by type and age of house as well as region of the country. The RMH study indicates that energy home investment varied significantly by region within the TVA area; the latter being primarily a function of the percentage of electric homes. Similarly, older homes are more likely to necessitate retrofit and new appliance change. In this respect sociodemographic variables and age of dwelling may be interrelated.

Energy Knowledge and Behavior

Chapter Two emphasized the point that energy "knowledge" may be an important mediating factor between attitudes, motivation and behavior. This discussion suggested looking at knowledge as it relates directly to conservation behavior in the home and the propensity to conserve. In particular, are individuals who are more "knowledgeable" with respect to the impact of behavior or specific consumer choices on energy use more likely to conserve than those less knowledgeable, all other things equal? Whether or not conservation knowledge is related to behavior has consequences for the form and content of residential conservation programs aimed at the consumer.

Research by Stutzman and Greene (1982) reported earlier did not provide conclusive findings with regard to the relationship between energy knowledge and conservation behavior. By focusing on general knowledge, however, their analysis does not examine whether the likelihood of engaging in certain conservation behaviors is itself affected by relevant knowledge about that behavior; e.g., are individuals who know their water heater temperature more likely to turn it down?

A less direct assessment of energy knowledge looks at how individuals perceive energy conserving/saving behaviors in the home. Kempton and Montgomery (1982) provide some rather interesting work with regard to individual perceptions of energy. For example, individuals often use "folk" units of energy, such as gallons or dollars, when comparing monthly fuel costs. By folk quantification, Kempton and Montgomery mean the "informal measurement technique" individuals utilize in estimating their energy use. While it is tempting to discount this method of quantification as wrong, the authors note that folk units are functional for how consumers make market decisions. Dollars provide a basis of comparison between different energy sources, such as fuel oil and electricity, as well as between energy costs and other household expenditures.

Respondents in their study ranked adding insulation as having the greatest potential for energy saving, followed by lowering the thermostat, reducing lighting and using less hot water. The authors indicate that reduction of lighting was seen by 59 percent of the sample as a means to reduce energy while only 12 percent noted lower hot water temperature. This is contrary to what more objective analysis of the savings potential of each of these activities would indicate (Stern and Gardner,1981). The historical reason for the overemphasis on lighting stems from a cultural remnant of an earlier period in America's electricification where lighting preceeded the adoption of major appliances and hot water heaters. The expression "light bill," instead of utility bill, reflects this cultural carry over.

Utilizing folk quantification methods results in two disadvantages for the consumer: (1) it significantly underestimates the consequences of specific conservation behaviors, and (2) provides the individual with an incorrect strategy for reducing energy consumption. The first problem is that folk units are simply too crude to reliably reflect small changes in behavior. This is especially problematic over a longer period of time where energy unit costs increase, as well as seasonal fluctuations are acting on the dollar amount. This obviously makes correctly estimating "payback" periods for conservation investments rather difficult. The second problem focuses on the individual's locus of attention for affecting energy conservation. For most average houses, space heating and water heating are the two most important energy users in the household. Household conservation actions which give a higher salience to decreasing lighting will not be as effective as decreasing space and water heating.

Kempton and Montgomery's work poses three problems: (1) how does "folk" assessment of the saving potential of specific conservation actions compare with more objective estimates, (2) how do individuals evaluate their utility bill (i.e., dollar or KWH), and (3) do such folk assessments actually affect conservation behavior.

The previous discussion raises three issues: (1) the extent, classification and distribution of conservation behavior, (2) the relationship between energy knowledge and conservation behavior, and (3) the relationship between behavior, knowledge and actual energy use. Before measures are discussed, the concept of conservation "behavior" needs to be more fully explicated. The following section provides a theoretical discussion and points to a logical categorization of behavior types.

Theoretical Differentiation of Conservation Behavior

Conservation behavior represents a class of several behaviors and raises special problems for the researcher.

In particular, different behaviors, although ostensibly falling under the rubric "conservation," vary greatly in degree of difficulty, money, and time and skill required. Fishbein and Ajzen (1975:353) refer to such behaviors as "multiple act criterion." Multiple act criterion behaviors differ with respect to their "target" (e.g., saving energy, saving money), "time" in which they are performed, "situation" they are peformed in, and the actual "behavior" which is performed. In this discussion, conservation activity is limited to one situation--namely, the home. However, home conservation activities may still be differentiated with respect to target, time, and behavior.

In constructing a behavioral index of conservation, it is useful to keep in mind that differences in context and time may also involve different behavioral predictors. A simple sum of behaviors averages over the nonequivalence of conservation activities and may not provide an adequate measure. At least two choices are avaliable to the energy researcher. One method Fishbein and Ajzen point out is to scale behaviors into an ordinal ranking and constructing a single index. One basis for scaling conservation activities is in terms of difficulty. Triandis (1977) suggests that difficulty associated with behavior(s) mediates between cognitive response and actual performance. Defining difficulty can be done from the researchers viewpoint--as in the case of assigning a monetary cost to behaviors, or from the individual's viewpoint--for example, a difficulty ranking for each behavior.

A second approach is to disaggregate behaviors into specific classes. Stern and Gardner (1981) suggest distinguishing between "curtailment" and "efficiency" behaviors. The former type refers mostly to repeated behaviors which have smaller savings potential but may be more psychologically important. The latter refers to nonrecurring or "one shot" behaviors which have more direct and extensive effect on energy consumption. Cunningham and Cook-Lopreato's (1977) factor analysis of conservation activities suggests three types of recurring behavior: (1) thermostat and lighting adjustment, (2) improved use patterns, (3) reduction of energy consuming activities.

Methods

Following Fishbein and Ajzen's analysis, conservation behavior will be dealt with in two different manners. First, conservation behavior will be classified into three broad categories: (1) efficient use, (2) curtailment, and (3) efficiency improvements. The first category refers to improving energy use behaviors--such as running only full dishwashers and washing machines. The second focuses on decreasing personal energy using behaviors--such as limiting shower time, and watching less T.V. Adding insulation, new appliance stock and the like refer to efficiency improvements.

The first two classes of behavior are included in a list which asks the respondents to indicate the extent to which the behavior had been done in the past month; i.e., very often, somewhat often, not very often, not at all. This measure provides a temporally specific period for which the behaviors have been done. The time limitation is useful as it focuses on those behaviors which the respondent should be able to remember and have an impact on their energy bill. Each group was then summed to form two overall indexes. While a summed index may again average over differences, the degree of difficulty and time required for each of these behaviors is similar.

A second list of efficiency improvements is provided which asks the respondent to indicate whether or not they "have done" a given activity, "plan to in the future" (the next few months), "do not plan to" and "not applicable" to the situation. To construct an overall index of this group of behaviors created a somewhat different problem as each of the activities differed significantly in cost. To overcome this problem, each of the 14 efficiency improvement behaviors was assigned an average monetary cost to the individual. These average costs were obtained from pooling estimates provided by contractors, hardware and retail stores.

Table 1 provides the average cost for each activity. To account for some of the variability in cost associated with each item, an ordinal ranking was then assigned to each activity such that items estimated at $1 to $50 received a value of 1, $51 to $100 a value of two, etc. The efficiency improvement scale was obtained by adding item values. The net effect of this is that individuals who made a single expensive improvement in their home may have a higher conservation score then individuals who had made several less expensive improvements. While significant bias in the measurement of such home improvements still exists, we can assume that the measure is superior to simply adding activities as it builds into the scale rank order. A second measure of behavior utlizing a "difficulty" rating will be discussed further in the following chapter.

Knowledge Measures. Knowledge of energy and conservation was measured in different ways. First, following Kempton and Montgomery's (1982) analysis, respondents were asked to rate seven conservation behaviors for their potential to

Table 1 Estimated Cost[1] for Each Efficiency Improvement Activity.

Activity	Cost[2]
Water heater and insulation	$280
Adding insulation (at 36 cents square ft.)	$576
Replacing heating system (at $1400 a ton)	$4200
Thermopane windows (replacing whole window at $250 a window)	$3500
Thermal drapes (at $105 for sliding door and $185 for five windows)	$290
Clock timer for water heater	$38
Water heater insulation blanket	$25
Solar water heater	$3500
Weatherstripping ($12 dollars a door/window)	$180
Flow restricting shower head	$5
Woodburning stove	$650
Storm Windows ($71 @ window)	$1000
Plastic on Windows	$5

[1] Estimates based on a 1600 square ft. house with fourteen windows. These are suggested average prices and thus still represent rather crude estimates of actual costs.

[2] Score ranks 1--$1-$50; 2--$51-$150; 3--$151-$250; 4--$251-$500; 5--$501-$750; 6--$751-$1000; 7--$1001-$1500; 8--$1501-$2500; 9--$2501-$3500; 10--$3501-$5000.

save energy. This was done through a seven point rating scale with categories ranging from the two polar extremes "Saves You Very Little" and "Save You A lot." These seven behaviors are: (1) use less lighting in the home, (2) turn the thermostat down 2 or 3 degrees, (3) turn water heater down to 120 degrees, (4) put insulation in attic or walls, (5) put weatherstripping around doors/windows, (6) use appliances less, and (7) replace old heating equipment with new.

Secondly, respondents were asked whether they compare monthly utility bills by examining dollar amount or the KWHs. This question is phrased, "When comparing monthly utility bills, do you look at the dollar amount only or the kilowatt hours." A minority of respondents volunteered "Both" as a response.

Third, respondents were asked if they knew their water heater temperature, and if so, what it was. The form of this question is simply, "What temperature is your water heater set on." This was asked of all respondents who had water heaters. Temperatures are reported by the respondents.

Finally, the respondent was provided with a ten item energy "quiz" which tapped knowledge relating to energy in the home; e.g., most of the winter utility bill is for space heating. These ten questions were developed from "Tips for Energy Savers," a report of the Department of Energy for residential energy conservation (ND). Coding scheme for these items is the same as Stutzman and Greene's (1982) knowledge index: right answers were coded 1, don't know a 0, and incorrect answers a -1. This method of coding penalizes respondents more for hazarding an incorrect answer then a don't know. Each of the ten items was summed into an overall scale with a possible range of values from -10 to 10. Missing data for the above knowledge questions were excluded from the analysis.

Measures of Energy Use. Energy use data was obtained from the utility board for those respondents who signed the consent form. Data for the analysis was obtained from the period December 1984 to March 1985. Respondents who were not all electric customers had to be excluded from the analysis focusing directly on energy use. This was done because total household energy consumption could not be obtained for those customers who were receiving gas or electric service from more than one utility. Also, not all those customers who agreed to release their utility data had completed data on file at the utility board. Unfortunately, both factors reduced the number of usable cases with electric data to 129.[1]

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[1] Appendix B compares electric customers with the rest of the sample. Generally, the differences between this subsample and the rest of the sample are small.

Measures of Household Structural Characteristics. Finally, several structural household variables will be examined. First, an overall appliance score was developed by summing whether or not individuals had a dishwasher, clothes washer, clothes dryer, and water heater (coded 1 and 0 respectively for each appliance). Second, household square footage was obtained through respondent's estimate. Other structural features considered are size of dwelling, number of rooms, type of dwelling, and number of people in the household.

Results

The first issue discussed in the analysis focuses on the extent of conservation activity among sample respondents as well as the socio-demographic correlates of such behavior. Findings reviewed earlier suugested that while most individuals had made efforts to conserve, few of these activities involved significant lifestyle change (Olsen,1981). Study results generally confirm this view. Table 2 presents a partial frequency breakdown of each of the conservation activities ranked from most to least done. Results indicate that the majority of the sample reported having done at least 10 activities. Two efficiency improvements appear in this list--installing weatherstripping and adding insulation. According to Table

Table 2 Frequency Breakdown for Each Efficiency Behavior and Curtailment Activity Done "Very Often" and Efficiency Improvements Ranked from Most to Least Frequent.

Behavior (rank)		Percent	Behavior (rank)		Percent
Curtailment			Efficiency Improvement		
1	Turned out lights when no in use	79.6	4	Installed weatherstripping on doors and windows	62.1
5	Setback thermostat back at night	60.4	10	Added insulation to attic/walls	51.2
8	Turned down waterheater	54.4	11	Installed storm windows	42.8
12	Limit shower time	36.1	13	Purchased thermal drapes	36.1
Efficiency Behavior			14	Installed thermopane windows	35.8
2	Turned heat down heat while away	70.2	15	Purchased wood burning stove	31.9
3	Washed only full loads in washer	69.1	17	Replaced heating system	29.1
6	Changed washing machine cycle to use less hot water	61.1	19	Replaced water heater with more efficient one	25.6
			21	Plastic on windows	21.1
7	Closed fireplace damper	56.5	22	Added insulation blanket for water heater	21.1
9	Washed only full loads in dishwasher	53.0	24	Added clock timer for water heater	9.1
16	Added a flow restricting shower	29.5	25	Purchased solar water heater	2.1
18	Hung clothes out rather than use dryer	27.7			
20	Turned dishwasher off before dry cycle	24.9			

1, these two activities together equal an investment of approximately $740 (based on an average home). The efficiency activity with the greatest activity is turning down heat while away from home (70.2 percent). The most frequent curtailment behavior is turning out lights when not in use (79.6 percent). The results indicate that most individuals have made some efforts to reduce their energy consumption and that most of these behaviors have involved more efficient use of resources, some moderate curtailment of energy use, and home retrofit. However, it is also clear that considerably more low and no-cost activities could be done by individuals. For example, only 21.1 percent of the respondents had added an insulation blanket for the water heater.

As suggested earlier, the conservation behaviors are broken up into three scales: (1) curtailment, (2) efficiency behavior, and (3) efficiency improvements. The mean number of four curtailment activities is 1.5 with some 16.1 percent of the respondents reporting none of these while 5.9 percent reported doing all of them. Of the six efficiency behaviors, the mean number was 1.91 with 26.7 percent reporting doing none and 1.7 all of them. The mean number of 13 efficiency improvements was 4.0 with 8.3 percent reporting having done none of these while only one person reported doing a total of eleven conservation improvements.

The results reported earlier suggested that the relationship between behavior and sociodemographic variables was somewhat inconclusive. Despite the lack of complementarity, at least three variables were seen as important determinants--income, age, and education. Study results reported earlier suggested that these demographic variables could be curvilinearly related to behavior. Thus the data were examined for possible nonlinearity. This was accomplished by comparing the R^2 for each variable regressed on behavior against these same variables but with categories of the demographic factors treated as dummy variables. Utilizing a modified F Test (see Nie et al.,1970:376), none of the variables departed significantly from linearity.

It was thus appropriate to utilize correlation techniques for assessing the relationship between demographics and behavior. Table 3 reports the Pearson correlation of each of the conservation categories including average temperature setting and nighttime thermostat set back by income, age, and education. The result of the bivariate relationships are similar to those provided by Cunningham and Cook-Lopreato (1977). In general, the results suggest weak to moderate relationship between behavior and sociodemographic factors. Income is positively associated with efficiency improvements as expected (r=.20).

Table 3 Pearson Correlations for Conservation Behaviors with Income, Age, and Education.

Behaviors	Income	Income Controlling for Educ.	Age	Educa-tion	Education Controlling for Inc.
Efficiency Improvements	.20[c]	.28[c]	.18[b]	-.17[b]	-.26[c]
Curtailment	-.28[c]	.33[c]	.13[a]	-.15[b]	.02
Efficiency Behavior	.02	.11[a]	.17[b]	-.23[c]	-.26[c]
Average Thermostat Setting	.04	.01	.09	-.01	-.05
Nightime Thermostat Setback	.13[a]	.20[c]	-.13[a]	-.12[a]	-.01

[a] P<=.05
[b] P<=.01
[c] P<=.001

However, it is clearly not the case conservation improvements are the province of upper income groups. Indeed, the bivariate coefficients suggest weak association. Income is unassociated with efficient behavior but negatively associated with curtailment. Results indicate some slight relationship between income and average thermostat setting. However, when the income-efficiency improvement relationship is examined controlling for age of dwelling, this coefficient drops to zero.

Oddly, education is negatively correlated with all three behavior groups, indicating some tendency for the less educated to make more efforts to conserve. Unlike Cunningham and Cook-Lopreato (1977) findings, the partial correlation between education and behavior controlling for income drops to zero only for curtailment, but becomes stronger for efficency behavior (-.25) and efficiency improvements (-.26) both significant at the .001 level.

Although one might expect the influence of income and education to be confounded, this does not seem to be the case. In the case of efficiency improvements, for example, the income-behavior correlation remains strong (.28) even after controlling for education. This is less true for efficiency behavior which drops to .11 (NS).

Another possible reason for the effect of education on conservation may be that conservation behaviors are more necessary in older homes which have not been appropriately weatherized. To the extent that the education factor may be tapping social class position, there may be some tendency for lower social classes to occupy older less efficient homes. Newer homes are more likely to have less insulation and retrofit problems, newer appliance stock and the like. To test for this, the partial correlation between education and efficiency improvements was run controlling for age of dwelling (not reported in table). Results suggest that the size of the coefficient is reduced somewhat from -.25 to -.18 (p<=.01). Thus at least some of the observed relationship between education and conservation improvement is due to the age of the dwelling.

Age effects appear to be rather slight as a whole. Results suggest a slight tendency for older respondents to be more active in conservation activities. Again, age, income and education are confounded. The affects of age on behavior decreases slightly when income and education are included. In general, the results suggest that standard sociodemographic variables provide significant although weak explanation for the distribution of conservation activities.

Differences in conservation behavior were also examined between renters and home owners. As expected, owners have a higher average number of conservation improvements (4.4) compared to renter (2.8). Mean number of curtailment activities was approximately equivalent between owners and renters (2.2 and 2.0 respectively). For those renters who did engage in efficiency improvements, these tended to be rather limited activities, such as turning down the water heater (31.7 percent) and placing plastic on the windows (41.5 percent). Renters were slightly more likely to engage in efficiency behaviors (3.3) compared to owners (2.7).

Finally, the relationship between behaviors was examined. A justification for distinguishing three types of conservation "behavior" is that conservation activities differ markedly in time, context, object and behavior. Pearson correlations between each behavior justify the classes of behavior as suggested. For example, efficiency improvement is modestly associated with efficiency behavior ($r=.37$; $p<.001$), but is uncorrelated with curtailment activities ($r=.08$; ns). The two recurring behaviors are correlated ($r=.30$; $p<.001$) as expected. These findings suggest that efficiency improvements and efficiency behaviors are seen by many as alternatives to cutting back on energy use in the home--i.e., changing individual or family lifestyle.

Energy Knowledge

Kempton and Montgomery (1982) suggested earlier that a major impediment to increased energy conservation in the home is related to how individuals perceive and quantify their energy using activities. The point made here is that "folk" quantification of energy systematically undervalues conservation efforts and shifts individual locus of attention to conservation strategies which do not result in the highest payoff (e.g., reduction of lighting). Two issues are examined here: (1) how do individuals assess their utility bill (i.e., dollar amount versus kilowatts) and whether such perceptions are systematically related to how individuals evaluate the "savings potential" of specific conservation actions, and (2) how such perceptions compare to more objective estimates of energy savings.

As in Kempton and Montgomery's analysis, data for this study indicate that a high percentage of individuals (69.2 percent) look only at the dollar amount when analyzing their utility bill. Some 25.5 percent assess their bill in terms of kilowatt hours. Dollar amount obviously provides most individuals with the "bottom line" on their energy bill. This has some significant policy implications. As Kempton and Montgomery (1982) note, individuals looking at dollar amount only are less able to disassociate behavioral from nonbehavioral determinants of energy use. "Small" conservation actions may appear inconsequential in that they provide little perceivable impact on the monthly bill.

However, it is not at all certain that monitoring KWHs carefully will provide individuals with all the necessary information to evaluate individual conservation activities. As Heberlein (1978) and others indicate, more direct and immediate feedback may be necessary to reinforce less dramtic conservation activities.

Table 4 examines the issue of whether dollar/kwh affects the rank ordering of the "savings potential" for seven conservation behaviors. The results confirm to some extent that how one monitors his/her utility bill has little affect on perceptions of individual conservation actions. For both column one and two, the rank order of conservation activities is identical. The average Pearson correlation between dollar/kwh and folk assessment of behaviors confirms the lack of association (average r=.07).

Table 4 also provides the rank ordering of behaviors for the entire sample. The results suggest that "putting insulation in the walls and attic" had the highest mean savings potential. Fully 63.5 percent of the respondents gave this the highest rating of 7. At the bottom of the list is "use less lighting". Only 14.4 percent of the sample gave this the highest rating. Oddly, weatherstripping the house got a higher mean score than either replacing the heating system or turning down the water heater. One reason for this may be that

Table 4 Means and Rank Order for Folk Assessments of Conservation Behaviors by Whether Respondent Examines Dollar Amount or KWH On Utility Bill.

Activity by Rank	Mean Dollar[1]	Mean KWH[2]	Mean Sample[3]
Put weatherstripping around doors/windows	6.4	6.4	6.3
Put insulation in attic/walls	6.1	5.9	6.0
Replace old heating equipment	5.3	5.4	5.3
Turn water heater down 120 degrees	5.0	5.1	5.0
Use appliances less	4.6	4.5	4.6
Turn down thermostat 2 or 3 degrees	4.1	4.2	4.0
Use less lighting	4.0	4.1	4.0

[1] Mean dollar refers to the average folk assessment for a particular activity given by those individuals who look at the dollar amount only when assessing their utility bill.

[2] Mean KWH refers to the average folk assessment for a particular activity given by those individuals who look at the kilowatts when assessing their utility bill.

[3] Mean Sample is the overall sample means for each of the folk assessments.

weatherstripping as well as insulation are very visible to the individual, intuitively understandable and more routinely experienced. Replacing the heating system is done rather infrequently and most individuals may not be able to evaluate its savings potential. Turning down the water heater is rather "invisible" from the consumer's point of view. As Stern and Gardner (1981) suggest, individuals tend to overestimate the savings potential of overt and clearly visible actions while underestimating the more subtle ones.

A factor affecting how individuals evaluate conservation activities should be whether or not thay have done them. Table 5 presents the average "folk" ratings comparing adopters to nonadopters as well as the Pearson correlations for each of the folk assessments with whether or not the individual had performed the behavior. In every case correlations are positive and significant with the exception of replacing the heating system and thermostat setback. This suggests that individuals have a higher evaluation of the savings potential of a given activity if they have performed that behavior.

While this is not a surprising result, it does have policy implications. If individuals can be shown what the "savings potential" of a given course of action is, they may be more willing to engage in that behavior. However, the

Table 5 Folk Assessments Paired with Whether Behaviors Are Actually Done (Comparison Made Where Possible).

Behavior	Average Nonadopters[1]	Average Adopters	Folk Assesment
Changed heating system	5.2	5.6	.10
Turned Down Water Heater	4.4	5.5	.32[c]
Added Insulation	6.1	6.5	.15[b]
Added Weatherstripping	5.6	6.1	.20[b]
Turned Out Lights	3.3	4.2	.17[b]
Turned down thermostat	3.9	3.9	.05

[b] P<=.01

[c] P<=.001

[1] The average rank given to savings potential for behavior on a seven point semantic differential.

opposite may also be true--positive effect is more likely to be associated with behaviors already performed. This form of attitudinal "rationalization" from behavior already exhibited is not an unreasonable postulate (see Bem,1967). If this is the case, greater emphasis should be placed on incentive to do the behavior rather than encourage it indirectly through attitude/knowledge change.

How well do these folk rankings compare with technical estimates? Here comparisons are difficult as household, structural and regional factors may dictate savings possibilities accruing to any single behavior. However, Stern and Gardner (1981) provide an analysis of aggregate estimates of savings for a number of household conservation activities. Stern and Gardner base their estimates on the assumption of a nationwide adoption of activities, so "percent saved" by household represents an average.

Table 6 presents the rank order of Stern and Gardner's list against the sample where comparisons are appropriate. Column one presents the percent saved on individual household energy consumption. The greatest savings potential obviously accrue from home insulation and retrofit--factors affecting space heating and air conditioning. This latter category usually accounts for almost a third of household energy consumption and thus represents the area of greatest savings potential.

Table 6 Comparison of Technical[1] and Folk Estimates of Energy Savings Associated with Specific Conservation Behaviors

Technical List	Percent Saved	Rank	Sample List
Insulate and Weatherize Home	10	1-1	Put insulation in attic/walls
More Efficient Heating Equipment	8	NA-2	Put weather-stripping on doors/windows
Thermostat Setback 4 Degrees	4	2-3	Relace Old heating equip.
Buy More Efficient Water Heater	2	5-4	Turn down water heater to 120
Turn down Water Heater 20 degrees	1	6-5	Use appliances less
Use Clothes Dryer 50 percent Less	.5	3-6	Turn thermostat down 2-3 degrees
Use Less Lighting	.3-1	7-7	Use less lighting

[1] Adapted from Stern and Gardner (1981)

Curtailment activities have much less of an impact on energy usage. Table 6 shows that technical and sample rankings are not markedly different. Both home insulation and use of lighting activities are similarly ranked (ranks 1 and 7). Some difference in question wording with technical estimates can help account for some of the nonequivalence in other ranks. For example, respondents were not given the specific decrease in water temperature, only the final temperature of 120 degrees. Also "use appliances less" is compared here with only using clothes dryer less. Thermostat setback is fairly close for comparison. The results suggest that there may be an underestimate of the savings potential of thermostat setback for most respondents.

Overall, the results from Table 6 suggest that on the average individuals have a reasonably accurate concept of what activities will and won't save much energy in the household. However, the underestimate of thermostat setback could be significant and one area that an information campaign could affect. A four percent reduction in the residential energy sector could have an appreciable impact on the nation's energy bill. While the results say nothing of how such information should be diffused, they clearly point to the need for accurate and convincing knowledge.

Finally, results for the energy "quiz" are presented in Table 7. Results provide an indication of the

Table 7 Frequency Distribution for Response to Energy Quiz

Item	AGREE	DISGREE	DON'T KNOW
Most of the Winter Utility Bill is for Space Heating	70.6	12.2	12.2
R value refers to heat loss in the fireplace	7.0	53.1	34.6
Lowering the thermostat to 65 degrees will make most people more susceptible to flu and colds	11.9	73.4	10.5
An open damper in the fireplace has no effect on heating loss	8.4	78.3	8.4
Clock thermostats cannot be used for water heaters	6.3	55.2	33.6
You must turn down the thermostat 5 degrees to save any energy	28.0	40.9	27.6
The Energy Efficiency Ratio (EER) is a number that rates energy efficiency for similar appliances	33.6	5.2	56.6
A 40 watt bulb uses less energy than a 60 watt bulb	74.5	9.4	14.0
Frost free refrigerators use less energy than manual defrost ones	19.6	50.0	27.6
Flow restricting shower heads don't really save energy	6.3	60.1	30.8

distribution of conservation knowledge among respondents. For example, over a third of the sample appears to be unfamiliar with "R value." A similar number do not know whether a clock thermostat can be used for water heaters. Over half (56.6 percent) do not know the meaning of the term "Energy Efficiency Ratio." Perhaps the most disturbing result is that fully 28 percent of respondents believe that one must turn down the thermostat 5 degrees to save any energy. While this figure is smaller than that reported by Milstein (1978), it does suggests a significant underestimation of this particular activity.

Knowledge and Behavior

The relationship between specific folk assessments of conservation and individual conservation behaviors has been discussed. However, the relationship betwen general knowledge and behavior can be examined more directly. Table 8 reports findings relevant to this issue. Overall, the size of the Pearson coefficients suggests weak association between knowledge and behavior. Energy quiz score is positively associated with efficiency improvements in the home (r=.16; p=.05). However, the size of the coefficient suggests a weak relationship. Impact of knowledge on curtailment is in the opposite direction from expected (r=-.15) indicating that those who knew more did less,

Table 8 Pearson Correlations Between Knowledge Variables and Conservation Behaviors.

	Efficiency Improvements	Curtailment	Efficiency Behaviors	Average Home Temp.
Energy Score	.16[b]	-.15[b]	.05	-.13[a]
Dollar/ KWH[1]	.04	.13[a]	.21[c]	.01
Knowledge of water heater temperature2	.25[c]	-.01	.06	-.12[a]

[a] P,=.05

[b] P<=.01

[1] Coded 1 for Dollar amount and 2 for Kilowatt amount

[2] Coded 1 if respondent knew temperature and 0 otherwise

confirming Stutzman and Greene's (1982) findings. Efficient behavior is uncorrelated with knowledge (.05).

The correlation between dollar/kwh and efficiency behavior is as expected ($r=.21$; $p=.01$). This finding indicates that those who watch how they use energy by trying to use resources more efficiently also tend to monitor their energy bills by examining the KWHs. Similarly, curtailment is weakly associated with greater likelihood of looking at kilowatts of usage but in the expected direction. Overall the findings indicate that knowledge has some affect on behavior, but that simple bivariate relationships are rather weak. There is some tendency for those practicing conservation to monitor their behavior more, as well as have lower home temperature.

Behavior, Knowledge and Energy Consumption

The final issue in the analysis focuses on the impact of knowledge and behavior on energy consumption. As discussed earlier, household factors have a very strong impact on total energy consumption. For this reason, the independent effects of knowledge and behavior must be considered net of these factors. To examine this proposition a regression model will be employed which accounts for the relative contribution of household, behavioral and knowledge factors. Household factors included in the analysis are number of major appliances (APPLIANCE), number of rooms (ROOMS), number of people in the household (PEOPLE), house square feet (SQFT), dwelling type broken into single family dwelling (SINGLE), apartment (APARTMENT), or trailer (TRAILER), age of dwelling (OLDDWELL), and income (INC).

Table 9 reports the analysis for three different regression models. Model one includes the regression of all variables listed above on average monthly energy use for the period December of 1984 to March of 1985, roughly corresponding to winter energy consumption. Multiple R for model one is .57, or 32 percent of the variance explained. Beta coefficients for model one listed on column one indicate the relative weight of each factor controlling for the effects of the other factors. With the exception of APARTMENT, each of the factors make some contribution to the variance explained. The most important factors appear to be dwelling type and appliance mix, with age of dwelling and square footage having some effect. Model two accounts for all model one factors plus behavioral categories including average home temperature. Multiple R for model two is .63 with some improvement in the variance explained (R^2=.39). Thus the additional behavioral categories improve prediction of average energy consumption by some 7 percent ($p<=.01$). In

Table 9 Regression Results for Three Models of Winter Energy Use Accounting for Structural factors, Behavioral and Knowledge Variables.

Variable	Model One (beta)	Model Two (beta)	Model Three (beta)
INC	.05	.09	.12
ROOMS	.03	.08	.02
OLDDWEL	.13	.09	.09
SQFT	.13	.11	.14
APPLIANC	.23	.30	.32
PEOPLE	.09	.05	.06
TRAILER	.21	.28	.32
SINGLE	.30	.43	.45
APARTMENT	.00	-.03	-.05
EFFICIENT BEHAVIOR	___	-.25	-.27
EFFICIENCY IMPROVEMENT	___	-.12	-.10
CURTAILMENT	___	.21	.20
HOME TEMP	___		.01
WATTEMP KNOWLEDGE	___	___	.08
ENERGY SCORE	___	___	-.17
DOLLAR	___	___	.13
MODEL R	.57	.63	.65
R^2	.32	.39[1]	.43

[1] Differences in R^2 significant at the .01 level (F values for model Two and Three 20.6 and 14.7 respectively; df 14,120).

the average utility bill of 2056 KWHs, behavioral imputs account for about 144 KWHs or about 2.1 days of usage.

Model three is the "saturated" model including structural, behavioral, and knowledge variables (energy score, dollar/kwh, and knowledge of water heater temperature). Model three Multiple R increases somewhat to .65 and the R^2 to .43. The addition of the knowledge variables adds approximately 4 percent to the variance explained ($p<=.01$). Knowledge and behavior factors account for 11 percent of the variance in energy consumption. It should be noted that only efficiency improvement and efficiency behavior are correlated with energy in the expected direction. The curtailment beta is positive (.21) suggesting that greater number of curtailment activities are associated with higher energy users. This finding may not be anomalous when we consider that the high energy use group has greater opportunity to curtail energy use. However, high energy users may also have greater sensitivity to social pressures to conserve and thus overreport such behaviors.

Discussion

The results of this analysis indicate that most individuals have made some efforts to conserve energy in the home. Findings indicate some tendency for individuals practicing conservation to be somewhat higher in income but slightly lower in education. However, conservation behavior (as defined here) is fairly ubiquitous in terms of sociodemographic indicators. This finding is rather interesting considering that many of the efficiency improvements entail considerable cost. It is possible, however, that significant differences do exist between income groups on whether the conservation improvements are done professionally or "do-it-yourself" as finances permit.

Second, most individuals do tend to evaluate their energy bill in terms of "folk" units (i.e., dollars) as Kempton and Montgomery (1982) suggest, but that this method of analysis has little affect on how individuals evaluate the savings accruing to specific conservation actions. Perhaps a more detailed energy bill, one disaggregating seasonal fluctuations from normal base load, would help individuals monitor their own conservation activities more effectively. The monthly billing cycle may also to be too long a period to adequately reinforce less significant conservation actions. Results did indicate that a determinant of how individuals view the savings potential of specific conservation behaviors was whether or not the individual had done the behavior.

Results indicate that the folk rankings of behavior are reasonably close to technical estimates of energy savings.

However, these rankings were based on mean scores and significant differences exist--both over and underestimating savings. Individuals need to be provided with reasonably accurate estimates of savings for conservation actions.

Energy knowledge is slightly correlated with behavior, but the size of the coefficients is rather small--accounting for some 3 percent of the variance in usage. Knowledge itself does not seem to provide strong direct effect on behavior. However, this may be due to the fact that not all relevant energy knowledge is tapped here (e.g., whether individuals know how to turn down the water heater) and second, whether or not individuals are motivated to try to save energy.

Both knowledge and behavior do have a direct impact on energy usage. Results suggest that some 11 percent of the variance in winter energy consumption is explained by these factors. This finding is somewhat less than other similar studies (e.g., Verhallen and Raaij,1981). However, as Becker et al. (1981) note, winter energy usage has less discretionary energy choices than summer usage. Space heating requirements as well as more social activities indoors (Klausner,1978) undoubtedly increase energy consumption. Second, individual thermal perference has a smaller range of tolerance than the summer time.

A number of behavioral factors were not included in the study which could have increased the explained variance; for example, lighting behavior, extent of social activities in the home, use of windows while space heating, closing off unused rooms, filter change, and the like. The analysis also does not take into account "indirect" energy costs incurred by households--preference for frozen foods, use of restuarants, patterns of consumption, and leisure activities. Indeed, significant differences exist between household "lifestyles" that may not show up directly on individual utility bills (Morrison,1977).

CHAPTER FOUR

A COMPARISON OF ATTITUDE-BEHAVIOR MODELS

As discussed earlier, the Fishbein/Ajzen (1975) and Triandis (1977) A-B models appear particularly suited for studying the complex of social psychological factors affecting conservation behavior. These include attitude toward the behavior, perception of social support for conservation, knowledge and perceived difficulty of behavior, personal conservation normative belief, as well as behavioral intention. A comparison of the two models suggests substantial similarity in how some of the model components are conceptualized as well as their causal order. However, significant differences exist between the two models, particularly with regard to the assumption of volitional control over the behavior. This chapter provides an application of both models to an analysis of conservation behavior and energy use. The argument was presented earlier that the Triandis model is better suited for specifying the determinants of some kinds of conservation actions--particularly those which require skill or knowledge to perform. Thus the first object of this chapter is to analyze the usefulness of either model in specifying the relevant determinants of specific conservation behaviors.

A second goal of this chapter is to further elaborate the causal structure of both models by examining the relationships among model components. The primary issue raised in the following section focuses on incorporating "contingency" factors affecting the A-B link within the FIshbein/Ajzen and Triandis model. This is accomplished in two ways: (1) examining how attitude "certainty" or strength affects the attitude-behavior relationship, and (2) whether attitude toward the "object" of energy conservation is mediated by attitude toward the behavior or contributes an independent influence.

The final goal of this chapter is to apply both Fishbein/Ajzen and Triandis models to predicting general conservation indices as well as energy consumption in the home. The purpose this part of the analysis serves is to provide an indication of what impact changing personal determinants of behavior will have for decreasing residential energy use. The secondary function of applying the behavior models to the general conservation is to examine the usefulness of either model for explaining a general class of behavior as well as energy use. The following section reviews the two belief structure issues as these relate to the attitude-behavior relationship.

Contingency Factors Affecting the Attitude-Behavior Relationship

As suggested earlier, attitude structure can be conceptualized in terms of the strength and direction of the attitude as well as the role it plays within the individual's belief system. Attitudes which are more cognitively central and more intensely held are more likely to influence behavior, all else being equal (Petersen and Dutton,1975). The concept of attitude structure thus allows the researcher to differentiate attitudes more clearly as well as anticipate their likely affect on behavior.

The Fishbein/Ajzen model measures attitude primarily in terms of the direction of affect; i.e., desireable or undesireable. By not including other components of attitude structure, Fishbein and Ajzen may be underestimating the extent of attitude-behavior consistency. One factor affecting A-B consistency discussed earlier is the "certainty" to which an attitude is expressed. Sample and Warland (1973) as well as Sherif et al. (1965) claim that normative influences are more important for those individuals whose attitude certainty is low. In such cases, inclusion of normative or situational factors improves the A-B link. Individuals with high attitude certainty are less likely to infer behavior from normative and situational variables. Neither Triandis nor Fishbein include measures of certainty. The implication of the research is that certainty and attitude may interact with one another in their influence on behavior.

A second factors affecting A-B consistency is whether a general attitude toward the "object" is included; i.e., toward the general activity (e.g., saving energy) rather than a specific conservation behavior (thermostat setback). Fishbein and Ajzen as well as Triandis assume that attitude toward the act is one of the most proximate determinants of that behavior and that it mediates the influence of more general belief or attitude orientations. However, research by Rokeach and Kliejunas (1972) as well as Weinstein (1972) indicate that the combination of attitude toward the act as well as object may be superior in predicting behavior than either one alone. Research reviewed earlier, particularly Heslop et al. (1981) suggests that attitude toward conservation itself may have a direct impact on conservation behavior. Thus including this component may improve the A-B fit as well as provide a further specification of both models.

To summarize, this study examines two alternative models for explaining energy conservation behavior and energy usage. Fishbein and Ajzen assume that behavioral intention to perform an act is sufficient condition for that behavior, at least for those acts under volitional control.

Triandis modifies this volitional assumption of his model by including measures of facilitating conditions; for example, knowledge and difficulty, and prior habit associated with a behavior. The argument is presented that facilitating conditions, especially knowledge of conservation behavior, should be important determinants of behavioral intention, at least for some kinds of behavior.

Two elaborations of the basic Fishbein/Ajzen model are tested. The first will examine whether a measure of attitude "certainty" improves the A-B fit. The second problem looks at whether attitude toward the "object" contributes independently to explaining behavior when including Att(act) in the model.

While both the latter issues could be examined for the general indices of conservation developed in the previous chapter, a test of the "sufficiency" of either the Triandis or Fishbein/Ajzen model mandates that we examine only specific conservation actions. Three behaviors are examined in this part of the analysis: (1) thermostat setback, (2) water heater turndown, and (3) adding insulation. These behaviors are indicative of the three classes of behavior discussed previously (curtailment, efficiency behavior, and efficiency improvements respectively). In addition, examining the belief structure issues only for these behaviors will provide for greater economy of space in the analysis.

Methods

Because model components could not be obtained for all conservation behaviors, three were selected; nightime thermostat setback, turning down water heater temperature, and adding insulation (home retrofit). The Fishbein/Ajzen model consists of primarily three components: behavioral intentions, subjective norms, and attitudes. Because this study represents a one time cross sectional survey, behavioral intentions could not be measured prior to when the behavior is actually performed. For "one shot" behaviors it would be very difficult to measure these prior to behavior in any case. Thus for turning water heater temperature down and adding insulation a modified form of the dependent variable is made. Respondents were asked whether they had done either of these behaviors, plan to in the future, or do not plan to do in the future. The analysis for both of these behaviors is accomplished by creating a behavioral "likelihood" variable wherein those who have done the behavior receive a coding of 1, those who are planning to .5, and those who do not plan to do the behavior 0.

For thermostat setback, respondents are asked if they "intend to do" the behavior this week, coded yes or no.

Reported thermostat settings are measured in another portion of the question. Missing data were excluded from the analysis.

For Fishbein and Ajzen as well as Triandis, subjective norm consists of two components: (1) respondent's perception of others' expectations to perform the behavior, and (2) willingness to comply with these expectations. The first item measures normative "oughtness." This item is worded following standard usage: "Most people who are important to me think I should. . . " followed by each of the conservation behaviors. Following this, the respondent's willingness to comply with such expectations was obtained: "Generally, I want to do what most people think I should do." Both items were scaled using a semantic differential with polar extremes of "Extremely Likely" and "Extremely Unlikely." As Fishbein and Ajzen (1975) suggests, each of the subjective norm components was multiplied by the willingness to comply with other's expectation. Each of these items are highly intercorrelated (average r=.81). Thus, a general subjective norm item was constructed which summed each of the individual subjective norms (Cronbach's alpha=.94).

Attitude toward the act consists of a single measure of affect toward the behavior. This was obtained by having the respondent rate each of the three behaviors using a 5 point semantic differential with polar extremes of "Very Good" and "Very Bad."

An item which should be closely aligned with attitude toward the act is the expectancy value contruct. This item is identical in both models. The expectancy value dimension taps respondent beliefs about the outcomes associated with the behavior and the evaluation of these outcomes. For the first component a list of "modal" beliefs is provided where the respondent must assess the probability of their occurence using a Likert scale with categories ranging from "Extremely Likely" to "Extremely Unlikely." Following this, respondents are asked to evaluate how desireable or undesireable such occurences are (were they to occur). Like the subjective norm component, each items likelihood rating is multiplied by its desireability rating. The logic of this construction is that a more positive attitude should exist for those respondents who see negative outcomes accruing to a behavior as unlikely and where such negative outcomes are defined as less undesireable.

The Triandis model includes all of the Fishbein measures as well as components tapping self concept, role beliefs, facilitating factors and prior behavior. Two self concept measures will be used: "I'm the kind of person who is careful in how they use energy," and, "The Energy situation is one that I watch pretty carefully." Both items are moderately correlated (r=.32). Two items are used to measure role beliefs: "It's appropriate for residents of Knoxville to try and save energy," and,"It's appropriate for residents of America to try and save energy." Both items are moderately correlated suggesting that they measure a single dimension (r=.30). Both the role belief and self concept items are in a Likert type format with categories of "Strongly Agree" to "Strongly Disagree."

Facilitating conditions include two factors--knowledge associated with general energy use, and difficulty associated with performing behavior. Knowledge is tapped using an energy "quiz" related to energy use in the home. The respondent was provided with ten statements about energy use developed from a Department of Energy publication "Tips for Energy Savers." Right answers were coded as 1, Don't Know as 0 and incorrect answers as -1. This method of coding penalizes respondents more for hazarding an incorrect answer then a don't know. Missing data were excluded from the analysis.

Difficulty refers to respondent's self reported difficulty associated with behavior. This was obtained via a five point sematic differential scale with categories ranging from "Extremely Difficult" to "Extremely Easy" for each of the three behaviors: (1) thermostat setback, (2) water heater turndown, and (3) adding insulation.

Prior behavior is obtained for all of the recurring behaviors (curtailment and efficiency use). Included in this list is night time thermostat setback. Respondents were asked how often "you or members of your household have done a particular activity in the past month." Categories ranged from "Very Often" to "Not At All." Missing data are excluded from the analysis.

Finally, personal normative belief consists of one item. Respondents were asked whether they have a "moral obligation to save energy." Response categories are also in a Likert type format with categories ranging from "Strongly Agree" to "Strongly Disagree."

Two other measures are needed for the analysis: (1) attitude certainty, and (2) attitude toward the object of saving energy. Items tapping the certainty of respondent's attitude are also in a semantic differential form. After obtaining their attitude toward a specific behavior, respondents were asked to indicate "How certain are you?" The rating instrument was a five point scale with values ranging from "Very Certain" to "Very Uncertain." The hypothesis suggested earlier is that attitude should be more affective in guiding behavior when the attitude is stronger. This implies that attitude and certainty interact with one another. Thus an interaction term was created by multiplying certainty by its attitudinal affect. Missing date were excluded from the analysis.

Finally, a measure of attitude toward the object of general energy conservation was obtained. The form of this question is exactly as the previous Attitude(act) items. Respondents were asked to evaluate "More energy conservation in the United States." Categories ranged from "Extremely Bad" to "Extremely Good." An expectancy value construct was also obtained corresponding to the general attitude. Modal beliefs consisted of three items: "Make us less dependent on foreign oil," "Help protect the environment," and "Decrease our quality of living." Missing data for knowledge, expectancy value constructs and attitude were recoded to sample item mean. Sample size for this item and for any of the other variables which have been recoded to their item means is thus 286. When the analysis returns to electricity consumption as the dependent variable in the latter part of the chapter, the sample size drops to approximately 130 cases for reasons already indicated (see Chapter III).

Results

The first issue examined in the results looks at the relationship among the attitude and belief components which both models share in common; i.e., the Fishbein/Ajzen model.

We would expect to find similar components of the model to be intercorrelated, particularly between the expectancy value components, as well as the attitude items. Subjective normative beliefs on the other hand should be relatively independent of both the latter components.

Table 1 reports the Pearson correlation between the model components. Looking first at the relationship among the expectancy value constructs or outcome beliefs individuals have about each behavior (top left), the size of the coefficients suggests a moderately strong relationship (average r=.59). Individuals who define one of the three conservation behaviors (adding insulation, thermostat setback, water heater turndown) as desirable also tend to find the other behaviors desirable. Thus expectancy value appears to be tapping a general evaluative dimension.

The strength of the intercorrelation between the attitude toward the act (Att(act)) items is somewhat weaker (bottom right) with an average r of .25. While all the attitude items are positively related to one another, a positive attitude toward one behavior does not necessarily predispose one to having a strong proconservation response toward other behaviors. The relationship between expectancy value and Att(act) is as expected. The size of the coefficients between attitude and its corresponding expectancy value components suggests moderate correlation

Table 1 Pearson Correlations Between Components for Basic Model.

	SETBACK	TURNDOWN	INSULATION	ATT1	ATT2	ATT3	$\bar{X}$	S.D.
THERMOSTAT SETBACK[1]	___						9.3	13.6
WATER HEATER TURNDOWN[2]	.54						4.7	11.6
INSULATION[3]	.62	.60					12.8	11.6
ATT1(SETBACK)[4]	.42	.22	.27				4.4	.9
ATT2(TURNDOWN)[5]	.20	.60	.26	.31			4.8	.4
ATT3(INSULATE)[6]	.12	.20	.30	.24	.20		4.2	1.0
SUBJECTIVE NORM[7]	.03	-.06	-.03	-.12	-.04	.02	44.3	25.7

[1] Expectancy value construct for setting back thermostat at night

[2] Expectancy value construct for turning down water heater to 120 degrees

[3] Eexpectancy value construct for adding insulation

[4] Attitude toward setting back thermostat at night

[5] Attitude toward turning down water heater to 120 degrees

[6] Attitude toward adding insulation

[7] Index of three subjective norm beliefs multiplied by motivation to comply

(average r=.44). The weakest correlation between Att(act) and expectancy value is for adding insulation (r=.30) and the strongest is for water heater turndown (r=.60). However, it is clear that both components are not as strongly correlated as is expected in Fishbein and Ajzen's work.

Perhaps one reason for this finding is that the study may not have included the most salient "modal" beliefs in the assessment of behavioral outcomes. As Fishbein and Ajzen note, beliefs about the behavior may undergo change, be substituted or forgotten. One shot conservation behaviors may be particularly vulnerable to such belief evolution. Liska (1984) indicates that behavioral beliefs and attitudes toward the act may undergo differential rates of change and thus should not be perfectly correlated. In any case, the data tends to support Triandis' view that both components may make an independent contribution to explaining intention to act as the attitude component itself does not appear to be a strong substitute for the expectancy value component. Thus the analysis will include both factors.

Finally, subjective norm is uncorrelated with almost all of the other model indices. The coefficients for the summed subjective norms is repeated for the individuals items (not reported), although water heater Att(act) and its subjective norm component are moderately interrelated (r=.25). While Fishbein/Ajzen model implies that the latter findings are not unusual given that subjective norm is relatively independent of other model components, the more likely expectation is that exceptance of conservation normative pressure should be correlated with a stronger conservation attitude. Two things are indicated by the low results. First, the study measured perceived subjective norm only for general significant others. Questionnaire space did not allow for a more detailed analysis which could have included separate subjective norm components for "friends, family and neighbors." Use of general significant others may simply have been too vague for respondents to adequately evaluate normative pressures.

However, it may also be the case that with present inattention to energy problems, individuals feel less normative constraint for engaging in conservation actions. While the normative perception variables are relatively well distributed across the scale, motivation to comply was distinctly skewed. In fact, 70 percent of the respondents felt that it was "unlikely" or "neither unlikely or likely" that they would comply with normative expectations. Again the problem emerges of being unable to disentangle the effects of different significant others on willingness to comply.

The following section examines the effectiveness of models for explaining individual conservation intention and behavior.

Predicting Individual Conservation Intentions and Behavior

The analysis of individual conservation behaviors begins with thermostat setback. As discussed earlier, thermostat setback is one behavior which requires primarily motivation to perform, at least in the sense of not requiring special knowledge or resources. It is also a relatively recurring behavior and thus we would expect that the personal (i.e., cognitive) components to exert greater influence.

Table 2 presents the results obtained from a regression analysis of each of the A-B models on nighttime thermostat setback. The first two columns represent components of the two models regressed on behavioral intention, while columns three and four report results with intention included in the regression equation on the difference between evening and sleeping thermostat setting. The Fishbein/Ajzen model components (column one) show a show a moderately strong relationship between Att(act), expectancy value and subjective norm on behavioral intention (multiple R=.40). Overall the model explains 16 percent of the variance in intention. Att(act) has the strongest

Table 2 Results of Regression Analysis for Fishbein/Ajzen and Triandis Models for Nighttime Thermostat Setback

Variable	Fishbein/ Ajzen (BI)	Triandis (BI)	Fishbein/ Ajzen (Beh)	Triandis (Beh)	Triandis (Minus Prior Beh)
SETBACK EXPECTANCY VALUE	-.05	.08	.06	.06	.06
ATT(act)	.42[c]	.33[c]	.13[b]	.05	.04
SUBJECTIVE NORM	.06	.06	.03	.01	.02
BEHAVIORAL INTENTION	___	___	.25[c]	.05	.25[c]
SELF CONCEPT	___	-.06	___	.08	.10
PERSONAL NORMATIVE BELIEF	___	.03	___	.03	.03
ROLE BELIEF	___	-.15[b]	___	-.18[c]	-.19[c]
ENERGY SCORE	___	-.13[b]	___	.08	.07
DIFFICULTY OF BEHAVIOR	___	-.20[c]	___	-.16[b]	-.18[c]
PRIOR BEHAVIOR	___	___	___	.20	___
Multiple R	.40	.48	.34	.42	.41
R^2	.16	.23	.12	.17	.17

[a] P<=.05
[b] P<=.01
[c] P<=.001

relation to intention with subjective norm and expectancy value making some contribution. However, the size of the standardized regression coefficient (beta) suggests that Att(act) represents the single best predictor. The effect of expectancy value on intention is rather weak (r=.13) and drops significantly when Att(act) is included in the regression equation.

The Triandis model (2nd column) includes three other items in explaining intention--self concept, personal normative belief and role belief. The difficulty and knowledge components have been included here as well. It was believed that both variables would have important influence on intention. Here the multiple R is .48 with some improvement in the variance explained (R^2=.23). The results suggest that the additional Triandis components do add to explaining variance in intention. Att(act) and perceived difficulty of behavior appear to be the two leading predictors although role beliefs has some influence. The basic Fishbein components remain relatively unchanged with the exception that some of the additional explained variance appears to be at the expense of Att(act) which decreases to .33. While energy knowledge score indicates a negative beta (-.13) with intention, this finding may be incorrect as the bivariate relationship is near zero (r=-.04). Personal normative belief is moderately correlated with role beliefs (r=.46) which may help explain the lack of explanatory effect (i.e., it is partialed out).

Both models reinforce existent research regarding the need for measurement specificity when trying to predict behavioral intention. The strongest model component reported in columns one and two is attitude toward the behavior. Second, the results suggest that including at least some of the Triandis model components is justified. As expected, the difficulty component has the single largest effect on intention other than Att(act). The more difficult individuals found the behavior the less likely they were to turn their thermostats down. As with Stutzman and Greene's (1982) study, conservation knowledge is negatively associated with the likelihood of turning down the thermostat. This finding may suggest that those less likely to curtail energy as a means of conservation also tend to be higher in education and income--two factors which are positively associated with energy knowledge.

The third and fourth columns report the regression results with intention included as a predictor variable. The Fishbein model (column three) provides a moderately strong explanation of behavior (multiple R=.34). Both subjective norm and expectancy value remain essentially unchanged but Att(act) declines significantly. The beta associated with behavior intention is the strongest model component and appears to mediate much of the attitude effect. This finding is congruent with what Ajzen and Fishbein (1980) report. The Triandis model, including strength of prior behavior, adds an additional 5 percent in explained variance. Perceived difficulty and prior behavior provide the strongest predictors while intention drops closer to zero. Role beliefs are negatively associated with thermostat setting, a finding inconsistent with expectations.

To examine how prior behavior is affecting other model components, regression results were again obtained but excluding prior behavior (column five). Most of the model components remain unchanged as does R^2 with the exception of intention (beta=.25). The apparent effect of prior behavior on target behavior is through intention. One reason for the high correlation between behavior and intention is that the two measures are nearly perfectly correlated (r=.91). This suggests that intention might be an adequate proxy for past behavior. However, we would not expect prior habit and behavioral intention to be so strongly correlated. In this study, habit represents a retrospective measure and may reflect a certain degree of rationalization with extent of present behavior. Over time, we would expect the habit-intention measure to decline, especially as change in attitude, and facilitating factors occur.

Results of Table 2 suggest that while the Triandis model is more successful in predicting intention, it does not provide an unequivocally superior prediction of behavior. The Fishbein model appears to do the bulk of explanation among the components, particularly Att(act) and intention. Fishbein/Ajzen approach is clearly more parsimonious. However, the Triandis model correctly points to the importance of facilitating factors affecting behavior. Turning down the thermostat is apparently more difficult for some individuals.

In Table 3 a similar pattern of regression results for turning down the water heater. Respondents were asked whether they had turned down their water heaters to 120 degrees or planned to in the future. Again, Att(act) is the strongest component in the Fishbein model, followed by expectancy value and subjective norm. The multiple R is .37, or 14 percent of the variance in behavior/intention factor. The pattern of beta coefficients for the Triandis model is similar to those in Table 1. Difficulty, energy knowledge score and Att(act) appear to be the most important factors in adding to the explained variance. Self concept plays a slight role in water heater turndown (bivariate r=.20). As with thermostat setback, the Triandis model is more successful in predicting intention (multiple R=.48).

Table 3 Results of Regression Analysis for Fishbein/Ajzen and Triandis Models on Turning Down Water Heater.

Variables	Turn Down Water Heater[1]		Water Heater Temperature	
	Fishbein/ Ajzen (beta)	Triandis (beta)	Fishbein/ Ajzen (beta)	Triandis (beta)
TURNDOWN EXPECTANCY VALUE	.08	.04	-.12	-.18[c]
ATT(act)	.32[c]	.17[c]	.03	.00
SUBJECTIVE NORM	.01	-.02	.02	.01
SELF CONCEPT	___	.12[c]	___	.05
PERSONAL NORMATIVE BELIEF	___	.00	___	.01
ROLE BELIEFS	___	.00	___	.01
ENERGY KNOW.	___	.14[c]	___	.21[c]
DIFFICULTY	___	-.27[c]	___	.02
MODEL R	.37	.48	.11	.26
R2	.14	.23	.01	.07

[1] Behavior variable coded 1 for having done behavior, .5 for intention and 0 for not planning to do behavior.

[c] P<=.001

The additional 9 percent of the variance provides a stronger justification here for adding the additional factors.

Columns three and four regress water heater temperature on the model components. While this does not constitute the criterion behavior, elements of both models should be relevant to water heater temperature settings--at least in the case where individuals know their temperature. Here Att(act) declines significantly while expectancy value increases in importance (beta=-.18). The sign of the beta coefficient suggests that having a more positive expectation of the consequences of lowered water temperature is associated with lower (self-reported) water temperature. Knowledge provides a moderately large effect relative to the other factors. The Triandis model improves over Fishbein/Ajzen predictive capability by 6 percent of the variance explained.

Overall, Table 3 suggests that while turning down the water heater temperature is influenced by attitude toward that behavior, the attitude component has less functional importance in guiding behavior than in the case of thermostat setback. Att(act) plays a smaller though significant role for water heater turndown while energy knowledge and perceived difficulty are more important. The data suggests that for "attitude change" campaigns to be effective, they must overcome the perceived negative costs associated with this action as well as technical inability to turn down the water heater. Unlike thermostat setback or adding insulation, turning down the water heater temperature is relatively "invisible" from the consumer's viewpoint and thus may require greater persuasive efforts to change.

The last of the individual behaviors analyzed in the results is adding more insulation to the home. Respondents were asked to indicate whether or not they had added insulation to the home or plan to do so in the future. Table 4 provides regression results for both models on adding more insulation in the home. The Fishbein coefficients are markedly similar to the other two behaviors with Att(act) being the strongest component, while subjective norm and expectancy value are roughly equivalent. Att(act) and expectancy value are moderately correlated (r=.27). Perhaps one reason for this is that individuals may have positive attitudes toward a behavior despite the fact that some of the outcomes associated with the behavior are negative. Certain negative outcomes are apparently tolerated while the overall benefit of the conservation activity (e.g., saving money) is positively valued.

The Triandis model demonstrates a marked superiority in predicting insulation behavior/intention over the Fishbein formulation (R^2 of .17 versus .04). Again, role beliefs are

Table 4 Regression Results for Fishbein/Ajzen and Triandis Models for Adding Insulation.

Variable	Fishbein/ Ajzen (beta)	Triandis (beta)
INSULATE EXPECTANCY VALUE	.05	.02
ATT(act)	.18[c]	.16[c]
SUBJECTIVE NORM	.04	.05
SELF CONCEPT	___	.14[c]
PERSONAL NORMATIVE BELIEF	___	.02
ROLE BELIEF	___	-.09
ENERGY KNOWLEDGE	___	.11[b]
DIFFICULTY	___	.30[c]
MODEL R	.20	.41
R^2	.04	.17

[1] Behavior variable coded 1 for having done behavior, .05 for intention and 0 for not planning to do behavior.

[b] P<=.01

[c] P<=.001

negatively associated. The analysis of the effects of role beliefs suggests that it may not be measuring the concept adequately. As expected, difficulty has an important effect on adding insulation. Self concept and energy knowledge follow in importance in influencing the respondent's likelihood of adding insulation.

From the results reported in Tables 2, 3 and 4, three conclusions can be drawn. First, the attitude-behavior models explain some of the variance in behavior. The influence of model factors is strongest for thermostat setback and weakest for adding insulation. Second, the results underscore the importance of measurement specificity with regard to the criterion behavior. Third, the influence of attitude varies as a function of consumer control over the behavior--the more control over the behavior, the greater the influence of the attitude variable. Conversely, facilitating factors such as knowledge and perceived difficulty become more important the less control the consumer has. The last point is particularly evidenced by the size of the R^2 which is strongest for curtailment and weakest for efficiency improvement, as well as by the size of the attitude coefficients which are similarly ordered.

Having examined the Fishbein/Ajzen and Triandis approaches to an application of three conservation behaviors, the following section will examine two issues affecting the causal structure of these models. These issues are: (1) how attitude "certainty" or strength affects attitude-behavior consistency, and (2) whether attitude toward the "object" of conservation has an independent influence on behavior or is mediated by the Att(act) component as both Fishbein and Ajzen as well as Triandis imply.

Elaboration of Models

As Liska (1984) noted earlier, the Fishbein/Ajzen model does not include any of the "contingency variables," such as attitude strength, affecting the A-B relationship. A measure of attitude certainty was included for this reason. While attitude certainty represents only one factor affecting A-B consistency, prior research has shown that it is important (Fazio et al.,1984). The earlier review suggested that certainty of attitude and attitudinal affect interacted in affecting behavior; i.e., the influence of attitude on behavior depended on the level of attitude certainty. Thus an interaction term was created by multiplying Att(act) by attitude certainty.

Table 5 reports the results of the saturated model including the attitude/certainty interaction term on three conservation behaviors. The results indicate that only in the case of turning down the water heater and adding

Table 5 Results of Regression Analysis for Model Components, Including Attitude Certainty and Attitude Toward the Object for Three Conservation Behaviors.

	Thermostat Setback	Adding Insulation	Water Heater Turndown
ATT(act)	.18b	.17b	.20b
ATTITUDE CERTAINTY	-.02	.12[a]	-.12[a]
ATT(obj)	.02	.04	.09[a]
GENERAL SUBJECTIVE NORM	.00	.02	.02
SETBACK EXPECTANCY VALUE	.02	___	___
INSULATE EXPECTANCY VALUE	___	.04	___
TURNDOWN EXPECTANCY VALUE	___	___	.00
GENERAL EXPECTANCY VALUE	.01	-.09	-.05
DIFFICULTY	-.37[c]	-.28[c]	-.22[c]
ROLE BELIEFS	-.01	.07	.04
SELF CONCEPT	.12[a]	.13[a]	.14[a]
ENERGY KNOWLEDGE	-.18[c]	.13[a]	.12[a]
MODEL R	.52	.40	.48
R^2	.27	.16	.23

[a] p<=.05
[b] p<=.01
[c] p<=.001

insulation does interaction between Att(act) and certainty achieve statistical significance. Of these, only for adding insulation is the beta significant and in the expected expected direction. In fact, the beta for attitude/ certainty interaction remains significant even after the other components are included in the regression equation (beta=.12). This finding indicates that the more certain individuals are of a positive attitude toward adding insulation (or conversely), the more likely they were to have already done so or plan to do in the future. While the evidence supports Liska's earlier claim that the Fishbein model should include a measure of attitude strength, the size of the coefficients suggests a weak relationship.

Earlier it was suggested that while attitude toward the behavior is the most proximate determinant of that behavior, attitude toward the "object" may also be influential. The Fishbein/Ajzen approach assumes that such general object attitudes are either too removed to influence behavior or are themselves mediated by attitude toward the behavior. Other research suggests that this may not always be the case (Rokeach and Kliejunas,1972).

Table 5 also provides results relevant to this question. The beta coefficients for both general attitude toward conservation (i.e., Att(obj) as well as its associated expectancy value component are reported. Overall, the results confirm Fishbein and Ajzen's assumption that such general object attitudes are mediated by more proximate determinants of behavior. Only in the case of turning down the water heater does Att(obj) achieve statistical significance. The coefficient is in the expected direction indicating that those who had a more positive general conservation attitude were slightly more likely to turn down their water heaters or plan to do so in the future. Results for the expectancy value suggests that they do not contribute significantly to understanding conservation behavior.

Perhaps the most important reason for the lack of strong general attitude effects is that the criterion variable is a specific behavior. Both Fishbein and Ajzen and Triandis indicate that the attitude-behavior correlation is likely to be weaker when the target behavior and attitude measure are not matched with regard to level of specificity. While this finding is thus expected, it does not demonstrate whether or not Att(obj) may be useful for predicting general conservation behavior.

Table 6 presents the "best fitting" regression models on each of the three conservation behaviors. For thermostat setback, intention is the strongest component explaining approximately five percent of the variance in temperature

Table 6 Best Fitting Regression Model for Three Conservation Behaviors.

Variable	Thermostat Setback	Water Heater Turndown	Add Insulation
BEHAVIORAL INTENTION	.23[c]	———	———
ATT(act)	.08	.22[c]	.15[c]
DIFFICULTY	-.19[c]	-.25[c]	-.31[c]
SELF CONCEPT	.10[a]	.11[a]	.12[a]
ENERGY KNOWLEDGE	———	.11	.10
ATTITUDE CERTAINTY	———	———	.12
MULTIPLE R	.40	.50	.40
R^2	.16	.25	.16

[a] P<=.05
[b] P<=.01
[c] P<=.001

settings. Att(act) maintains some effect. Perceived difficulty of the behavior remains important despite including intention in the equation. This finding is replicated in the two other behaviors--Perceived difficulty becoming more important as the behavior more constrained by resource and opportunityfactors. behavior. Att(act) plays its most significant role in turning down the water heater and the least significant role in nighttime thermostat setback.

Perhaps one reason for this is that insulation and heater turndown are "one shot" behaviors and require stronger affective response to saving energy/money to overcome the inertia of inactivity as well as the added difficulty associated with the behavior. Turning down the thermostat is habitual and routine and requires less normative and attitudinal support.

<u>Predicting General Conservation Behavior and Energy Use</u>

While the models appear to operate relatively well for single behaviors, perhaps the more important question is how well do the models predict general conservation activity. Each of the components of the model was directed toward specific behaviors. For this analysis, two scales were constructed. The first tapping general conservation attitude was constructed by combining the four attitude affect components into a single index. A general difficulty measure was obtained in a similar manner by combining the perceived difficulty variables for each of the three conservation behaviors (adding insulation, turning down the water heater, and thermostat setback). In addition, the general expectancy value construct is utilized here. The manner in which this variable is constructed is similar to the other expectancy value components.

Three general conservation indices are examined: (1) curtailment--includes those behaviors which cut back on energy services, (2) efficiency behavior-- includes those behaviors which attempt to make better use of energy using services, and (3) efficiency improvements-- includes home retrofit and appliance change and entail some cost to the individual. The latter variable represents a set of conservation behaviors which have been weighted to reflect differential costs.

Table 7 reports the results of the analysis of model components on three conservation indices (efficient use, curtailment and efficiency improvement) including general energy conservation expectancy value. The regression model predicts behavior more effectively for recurring behaviors. Difficulty, energy knowledge and general attitude are leading factors for curtailment activites. Self concept plays a minor role for curtailment and a somewhat larger role for efficient use. This finding suggests that self

Table 7 Three General Conservation Scales Regressed On Model Components.

Variable	Curtailment Behavior (beta)	Efficient Behavior (beta)	Efficient Improvement (beta)
ROLE BELIEFS	.05	.17[c]	.02
GENERAL DIFFICULTY	-.12[b]	-.14[c]	-.12[b]
SELF CONCEPT	.10	.24[c]	.06
ENERGY KNOWLEDGE	-.21[c]	.09	.20[c]
GENERAL ATT(act)	.23[c]	.00	.03
SUBJECTIVE NORM	-.02	-.18[c]	-.04
GENERAL EXPECTANCY VALUE	.00	-.07	-.01
MULTIPLE R	.38	.43	.25
R^2	.14	.19	.06

[a] P<=.05
[b] P<=.01
[c] P<=.001

concept has its greatest impact on efforts to be more efficient around the house but not necessarily in curtailing energy use, or efficiency improvement. The latter appears to be affected primarily by difficulty and energy knowledge, though this is probably confounded with sociodemographic factors. Efficient use provides the best regression model with self concept, role beliefs, general subjective norm playing the most important role. Efficiency improvement is least amenable to explanation using model factors with an R^2 of .06, while efficient use is the most affected (R^2=.19). These findings suggest that cognitive factors are more useful when the behavior is recurring. Additionally, efficiency improvements are more likely the result of lifecycle on appliance stock and home retrofit rather than attitudinal or normative support for conservation.

The influence of model factors as well as behavior on energy consumption was also examined. To compare the independent contribution of both sets of factors, the first regression model obtained included a subset of the important structural factors (i.e, age of dwelling, appliance stock, rooms, income, and square feet). Multiple R for this model is .53 explaining 28 percent of the variance in energy consumption among all electric households. Table 8 reports the regression results of this model with additional

Table 8 Regression Results for Model Components, Structural Variables and Conservation Behavior on Average Energy Use.

Variable	Model One (Structural and Model Factors)	Model Two (Structural, Model and Behavior)
AGE OF DWELLING	.15	.12
NUMBER OF APPLIANCES	.43	.54
NUMBER OF ROOMS	.02	.04
INCOME	.02	.04
HOUSE SQFT	.16	.05
GENERAL DIFFICULTY	.05	.05
GENERAL EXPECTANCY VALUE	-.12	-.12
SUBJECTIVE NORM	.08	.06
GENERAL ATTITUDE	-.16	-.19
SELF CONCEPT	-.07	-.04
ROLE BELIEFS	.18	.21
ENERGY KNOWLEDGE	-.14	-.13
CURTAILMENT	___	.20
EFFICIENCY IMPROVEMENTS	___	.01
EFFICIENCY BEHAVIOR	___	-.24
MULTIPLE R	.59	.63
R^2	.35	.42

Fishbein and Triandis model components added (column one), and for the saturated model including behavior (column two).

Most of the beta coefficients are in the expected direction. For model one, general expectancy value and general attitude toward energy conservation are the most significant factors. General attitude as well as knowledge are in the expected direction. The general difficulty factor does not appear to affect energy consumption--perhaps because the difficulty variables are not well correlated. However, role beliefs, while relatively large is again in the opposite direction from expected. Commitment to conservation self concept is not strongly associated with energy use. Attitude, norm and knowledge components add an additional 18 percent in the variance in actual energy consumption. Model two (column two) adds three conservation behavior scales. Only one of the betas is large and in the expected direction--efficient use. Curtailment is positively associated with energy use (beta=.20), while efficiency improvement is unrelated. As indicated earlier, curtailment should be positively related to energy consumption as we would expect that higher energy conservers have more opportunity to engage in this type of activity. Including general conservation behaviors adds an additional 8 percent of the variance in energy consumption.

Conclusion

These findings suggest that while conservation behaviors vary in complexity, they are comprehensible and predictable. The results indicate that both attitude-behavior models are applicable to conservation behavior but that significant differences exist between them. Where the behavior is generally under the control of the consumer; e.g., thermostat setback, difference between the two approaches is negligible. Future research efforts may not need to go to the extended effort of including Triandis components if the behavior is recurring and requires only consumer motivation. As suggested earlier, the inclusion of more extensive subjective norm components will probably improve the effectiveness of the Fishbein/Ajzen approach.

However, many conservation actions do not fall into this category. The Triandis model correctly anticipates that facilitating factors operate in the context of energy behavior. In almost every case, perceived difficulty of the behavior affects conservation activity for both general and specific behavior. Further analysis should include more sophisticated measures of difficulty as they relate to health, finances, and family dynamics.

Second, energy knowledge relevant to the behavior does not appear to operate through the expectancy value component as Fishbein and Ajzen assume. This finding confirms Stutzman and Green's (1982) report that knowledge and beliefs associated with the behavior should not be considered equivalent. Knowledge continues to exert a direct influence on behavior despite the inclusion of other factors. Knowledge appears to operate to some extent in turning down the water heater and adding insulation, as well as one general conservation index (efficiency behavior), and for energy consumption directly. These findings substantiate the earlier claim that knowledge is important for at least some conservation actions. Positive attitudes cannot be sufficient to overcome the respondent's inability to act. Knowledge and perceived difficulty of the behavior both appear to affect intention as well as behavior directly. While the Triandis model does not specifically indicate a direct effect of facilitating factors on intention, the findings point to the need for including this in the model.

Both models were relatively unsuccessful in predicting efficiency improvements. While the results suggest some explainable variance, it appears to be more the case that adding new appliance stock, storm windows and the like are less a consequence of attitudinal and normative factors than more recurring behaviors. What may be the case, however, is that such behaviors impact on how individuals perceive their energy using activities. Adding more efficient appliances and insulation may enhance an individual's conservation self concept while at the same time providing a justification to use more energy.

It is important to temper this conclusion somewhat. The study did not include a number of possible questions which focused specifically on one shot behaviors. These might have included whether or not respondent had a felt obligation to do such behaviors now or within some other specified time frame, beliefs about the ultimate payoff of such activities, normative pressures, etc. While its true that recurring behaviors are more easily predicted, the latter questions could have improved the A-B fit for one shot activities.

One result which appears to be in conflict with Triandis is that while role beliefs are related to behavior and energy consumption, the direction is contrary to expectations. Only in the case of thermostat setback behavioral intention is role belief related as expected. One probable reason for this fact may be that role beliefs is inappropriately measured, allowing for a considerable "social desireability" bias. However, the concept of role beliefs is itself rather vague. "America" and "Knoxville" do not provide clear examples of groups to which normative expectation can be attributed. Several normative expectations may actually exist. For example, individual's may perceive that the utility wants them to use more energy. Second, a number of other "groups" may also exist contravening between the more general perception. The evidence suggests that role beliefs need to be more specified with respect to the target and context of saving energy in the home than toward the object of saving energy.

Overall the "social" component of the Triandis model does not add significantly to what facilitating conditions, prior habit and Att(act) explain. All of the social components tap some willingness on the part of respondents to identify themselves as conservation oriented. The results indicate that this view is honored more in the breach than the observance. The Fishbein and Ajzen subjective norm makes little contribution to either behavior or actual energy consumption--a finding confirming Stutzman and Green's (1982) analysis. However, self concept does make some contribution to both specific and general behavior despite the relative lack of measurement sophistication. The influence of self concept is strongest for efficient behavior. Future research might develop more appropriate measures, first to deal with the problem of social desirability bias, and second, to understand when self concept is important to behavior.

Finally, the model components relate well to energy consumption. The amount of explained variance due to the latter (18 percent) is comparable to Becker et al.'s (1981) study of attitudinal predictors of winter energy use. As discussed earlier, winter energy consumption is probably less amenable to discretionary manipulation than other seasons.

Including a measure of attitude toward general conservation (i.e., Att(object)) did not improve the predictive power of the model. Although attitude toward the behavior provides the most effective prediction of specific behavior, Att(object) may have greater consequences for general behavior and actual energy consumption. The results justify to some extent inclusion of a general attitude component. Future research needs to specify other modal beliefs in creating a general expectancy value construct for conservation.

The results suggest that in general, both behavior and actual energy consumption are relatively predictable. Knowledge, attitude and social support factors contribute individually and together in explaining behavior and energy use. The analysis has suggested some of the weaknesses of the study as well as ways of improving future research. Overall, the Triandis model is more effective in explaining conservation as it allows for a range of factors which may be operating. Future research should be able to pair these down to more manageable levels.

Perhaps more importantly, the Triandis model provides clear implication for energy conservation campaigns for which cognitive factors need to be influenced to change behavioral intention. These include perceived difficulty of the behavior, knowledge facilitating behavior, and outcomes accruing from conservation actions. These factors have an important influence on specific attitudes and subsequently behavior. Social support factors should not be discounted. In fact, a positive normative climate should impact favorably on behavior by reinforcing the motivation to conserve. Utilities in particular may have more impact on conservation intentions than expected. How individuals perceive the utility's commitment to energy conservation may be an important normative "cue" for individuals. While attitude change campaigns can be effective, they must provide practical tips for how individuals can be more efficient around the home, as well as some idea of the magnitude of outcomes they should expect.

Results for this analysis suggest a need to integrate both "person" determined characteristics as well as those "resources and opportunities" (Liska,1984) affecting the link between attitudes and behavior. Conservation behavior in particular appears to reflect the dialectic between both. By relegating these resource constraints moderating the attitude-behavior relationship to a position outside the formal model, Fishbein and Ajzen significantly narrow the types of behavior that the model can address. While they admit to this limitation, the model's attractiveness to sociologists will be enhanced by a consideration of these factors. Opportunity affects how and when certain activities are engaged in, if at all. They thus affect the "volitional control" individuals have over behavior. Furthermore, as the analysis demonstrates, such resources and opportunities are structured by individual life circumstances. By including such "facilitating" factors as habit, knowledge and those "contractual agreements" entered into with other individuals, the Triandis model more easily enters into sociological discourse on the nature of human behavior.

This discussion brings to a close further analysis of the two models. The following chapter will examine different attitude models in the context of individual household structural and sociodemographic factors. The primary point here is to examine how these latter variables impact on the attitude models themselves, as well as behavior.

CHAPTER V

AN EXAMINATION OF POSSIBLE CAUSAL ORDER AMONG PERSONAL, AND SITUATIONAL FACTORS AND CONSERVATION BEHAVIOR

Earlier it was argued that social science research on the residential energy consumer has not produced a reliable relationship between conservation attitudes, beliefs and behavior. Research in this area has examined a number of possible factors which might influence behavior. However, the most consistent evidence indicates that attitudes are most useful in predicting conservation when they are "matched" in level of specificity with the criterion behavior (Stutzman and Greene,1982). Much of this research has examined only simple bivariate relationships between variables and has not accounted for the causal structure underlying individual attitude-belief systems. While general energy beliefs do not appear to play a direct role in guiding behavior, less is known how they may provide a "context" (Olsen,1981) for more specific attitudes and normative beliefs toward individual conservation.

Similarly, research reported by Farhar et al. (1980) and others has not provided an unequivocally clear explanation on the role of sociodemographic variables on energy behavior. Ambiguity arising in such research is due in part to not accounting for differences in types of conservation activity (Cunnignham and Cook-Lopreato,1977), such as between efficiency improvements, and curtailment activities. Again, many of these studies examine direct effects only and may thus underestimate the influence of sociodemographic factors on conservation. While we have already seen that such household structural and demographic factors set resource and opportunity constraints on what actions can be taken by the individual, less is known how such factors themselves condition individual energy beliefs and attitudes.

The object of this chapter is thus to explore a possible causal order between the determinants of conservation behavior discussed to this point. These have included six groups of variables: (1) sociodemographic, (2) household structural, (3) general energy beliefs, (4) household conservation beliefs, (5) attitudes and beliefs toward specific behaviors, and (6) such "facilitating" factors as perceived difficulty and knowledge of conservation behavior.

The analysis in this chapter will focus on three issues in an attempt to establish a possible causal order among these factors: (1) how are energy attitudes and beliefs affected by household structural and sociodemographic factors, (2) is the influence of such factors on behavior direct or mediated by individual belief and attitude orientations, and (3) what are the relevant direct and indirect determinants of behavior for different conservation actions. The following section will provide a basis for discussing these issues by examining the question of interrelationships between cognitive levels among energy beliefs as well as the possible indirect effects of household structural and sociodemograhpic factors on energy cognitions.

Relationships Among Factors

As we have already seen, efforts at finding correlates of residential conservation have ranged over a number of possible dimensions. Most of such research suggests that general energy beliefs are not directly relevant to behavior. In retrospect, it was probably unreasonable to expect such a relationship to exist between general energy beliefs and specific conservation actions. Perhaps motivated by an overly pragmatic concern with predicting behavior, consumer energy research may have ignored more subtle relationships among cognitive factors (Olsen,1981).

In particular, few studies have examined interrelationships among different levels of cognitive organization in energy belief systems. While specific conservation attitudes appear to have the most direct effect on conservation behavior, the implication of the previous analysis is that general beliefs could influence behavior, although indirectly.

Theoretical support for this view comes from attitude literature on the nature of cognitive organization. Rokeach (1968) suggests that specific attitudes are drawn from more general belief and value orientations. Values and "self concept" beliefs constitute the most cognitively "abstract" and enduring features of belief organization. Because of their "centrality" it is more likely that they influence specific attitudes and beliefs.

Three energy attitude studies would seem to support this view. Dunlap et al. (1984) demonstrate that proponents of "soft" and "hard" path energy policies (see Lovins,1977) differed significantly from one another with respect to belief in ecological limits, support for science and technology, and such values as environmental protection, antimaterialism and participatory democracy (chi square values reported only). A now somewhat dated study by Gladhart et al. (1978) indicates that support for a number of energy policy programs, such as an extra tax on gasoline, rationing, and tax deductions for small cars, is moderately associated (average gamma=.52) with two general belief scales--"ecosystem awareness" tapping the seriousness of the energy problem, finiteness of fossil fuels, as well as a "human responsibility" scale measuring felt obligation to help solve the energy problem. Similarly, Leonard-Barton (1981) found a moderate association between "voluntary simplicity" values such as self-reliance, antimaterialism, and environmental awareness with a personal ethic of conservation.

This research is suggestive of a more complex organization underlying energy attitudes, beliefs and values. The more important question here is whether or not general energy beliefs are significant for establishing a receptivity to conservation at the individual level. Is the influence of such general energy beliefs and values mediated by more proximate perceptual and attitudinal determinants of behavior and how do such belief-attitude models change for different types of conservation action?

While the analysis has focused on the impact of attitudes, beliefs and knowledge on energy behavior, these factors alone cannot be expected to explain behavior. Sociodemographic and household structural variables play an important role in establishing the context of household behaviors as well as influence energy use directly (McDougal et al.,1981). Prior research has considered both sets of variables independently of one another and thus underestimates the complexity of interrelationships between factors and their joint effect on behavior.

Some observers have suggested that in addition to their direct effects, household structural and demographic factors may influence energy use and behavior indirectly through energy beliefs and knowledge. Support for this view comes from recent efforts at developing a causal model among sets of conservation determinants. For example, Verhallen and van Raaij (1981) show that sociodemographics directly influence conservation behavior as well as indirectly through conservation attitudes. Similarly, Heberlein and Warriner (1983) examine whether price differential as against a personal norm for shifting behaviors to off-peak usage better predicted peak use energy consumption. Their data suggest that houshold structural factors are an important contextual influence stimulating energy knowledge. The overall model suggests a pattern of causal influences on energy consumption going from household structural factors through energy knowledge and cognitive factors.

Finally, Black et al. provide the most extensive analysis of the interrelationships among conservation determinants for a range of different conservation behaviors. Their analysis tests the extent to which household structural and sociodemographic factors activate personal norms of conservation in the household context. Their primary conclusions are that personal normative conservation beliefs tend to be strongest for recurring behaviors and to decrease in importance as individual behavior becomes more constrained--for example, as in the case of efficiency improvements. Second, home ownership appears to be both a resource factor limiting behavior as well as one stimulating behavioral norms. Homeowners were more likely than renters to have a personal norm of conservation and to be more concerned about the energy problem, a finding supported by Beck (1980). Third, the influence of demographic and household structural variables is indirect, operating through behavioral norms.

Their analysis does not account for the role played by attitudes toward conservation actions. This may be signficant as attitudes and moral norms may not always mutually support a given action--believing one "should" do something is not the same as wanting to. Second, their model does not show how constraint factors affect perception of the behavior--particularly its perceived difficulty. By examining behavioral "norms" only their model thus tends to underestimate cognitive influences on less recurring behaviors. Finally, the link between household structural, demographic factors and conservation knowledge is not examined. This variable in particular influences behavior directly as well as other cognitive determinants.

These results support the notion that conservation behavior is determined by a number of factors operating in the household context. First, conservation attitudes should be thought of as existing within a larger system of beliefs and value orientations at the individual level. Second, while such belief and value orientations may not be dependent on household structural and sociodemographic factors, they are at least influenced by them. Finally, the relevance of any particular factor will vary considerably between different conservation behaviors.

Causal Order Among Variables

This research suggests the plausibility of developing causal order among determinants of conservation behavior. The view which emerges here is similar to that suggested by Black et al. (1985). They argue that causal influence on behavior work from logically prior sociodemographic variables, through household structural, and general energy beliefs with the most proximate factors being specific norms and beliefs about the behavior. In keeping with Black et al.'s terminology, household structural and demographic factors are refered to as "situational," whereas the cognitive determinants are refered to as "personal." Table 1 provides a breakdown of each of the factors categorized under these two headings. The variables in this table are grouped according to the level of their presumed effect on

Table 1 Situational and Personal Determinants of Conservation Broken Up Into Six Levels Ranging from Least to Most Proximate to Behavior.

SITUATIONAL

<u>Level 6: Sociodemographic</u>

Age
Education
Income
Number of People in Home

<u>Level 5: Household Structural</u>

Number of Appliances
Home Ownership
House Size
Age of Dwelling

PERSONAL

<u>Level 4: General Energy Beliefs</u>

Seriousness of Energy Problem
Environmental Concern
Support for Conservation
Suffering as Consequence of Crisis

<u>Level 3: Houshold Conservation Beliefs</u>

Conservation Ethic
Thermal Preference
Dissatisfaction with Past Conservation Efforts
Conservation Self Concept

<u>Level 2: Facilitating Factors</u>

Perceived Difficulty of Behavior
Conservation Knowledge

<u>Level 1: Attitudes Toward Behavior</u>

Affect Associated with Behavior
Expected Outcomes of Behavior

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behavior with Level 1 being the most proximate to behavior and Level 6 the most distant. These factors represent only a subset of those possible but ones which are utilized in the analysis.

Thus a possible causal order can be introduced between variables with situational factors preceeding personal determinants in time. Table 1 moves back in termsof level of generality. Overall, the personal determinants are assumed to be the most proximate to behavior while situational factors provide the context of such behavior. For relatively recurring behaviors, personal determinants should provide the strongest influence. As the behavior becomes more constrained by resource and opportunity factors, situational dtermiants should take preimminence. Thus we can hypothesize that curtailment behaviors are more strongly influenced by cognitive factors while efficiency improvements primarily by situational determinants.

The model assumes that an "attitude-to-behavior" relationship is appropriate for examining conservation actions in the household context. A behavior-attitude model would place behavior directly consequent of the situational factors while personal determinants would represent after the fact rationalizations. As Liska (1984) notes, both models are plausible. In a cross sectional survey, it is impossible to test the sufficiency of either model. The view taken in this chapter is that sufficient research exists supporting the contention that changing energy attitudes, normative beliefs and knowledge can bring about a change in behavior. Thus, the assumption of an attitude-behavior relationship is appropriate for developing the relevant policy implication of this work.

Methods

The previous discussion suggests examining possible causal order among both situational--household structural and sociodemographic, and personal--beliefs, attitudes, norms and knowledge, determinants of energy conservation behavior. Situational variables for this analysis have been introduced at an earlier point. Four structural variables are included: (1) age of dwelling, (2) number of rooms, (3) square footage, and (4) an appliance index. All of these household factors are strongly correlated with energy use (Ritchie et al.,1981). Sociodemographic factors include: (1) income, (2) education, (3) age, and (4) number of people in the household. Again, sociodemographic factors are considered the most exogenous to behavior and logically prior to the household variables.

Several personal or cognitive factors are included in the analysis. These are broken down into four basic levels: (1) general energy beliefs, (2) household conservation beliefs, (3) attitude and beliefs directed toward specific behaviors, and (4) facilitating factors--perceived difficulty and knowledge of conservation behavior.

For the general energy beliefs four different variables were constructured. These include:

Environmental Concern--(two items): "The environment must be protected, even if this means the price of goods and services rise," and "In this country we are not doing enough to protect the natural environment." Items are in a Likert type format with categories ranging from "Strongly Disagree" to "Strongly Agree" (intercorrelation r=.31).

Seriousness--(two items): "The energy situation has changed considerably in the past decade. How serious do you think the present situation is?" and ". . . How serious do you think the energy situation will be in the next ten years?" Categories are in a Likert type format ranging from "Very Serious" to "Not Serious at All." Don't know responses and missing data were excluded from the analysis.

Suffering--(one item): "All things considered, do you feel that changes in the cost and supply of energy in the last decade have made your life: (five catgeories were provided)--"A lot worse than it was, a little worse than it was, had no effect, a little better than it was, a lot better than it was." Items were reverse coded where analysis required.

General Concern--(one item): "Conserving more energy in United States is." A five point semantic differential is provided with polar extremes of "Very Good" and "Very Bad."

Household Conservation Orientation includes four different scales developed from the factor loading of 15 different belief items. All items are in a Likert type format with categories ranging from "Strongly Agree" to "Strongly Disagree."

Conservatin Ethic--(five items): "It's important to save energy even if it doesn't save much money," "Most individuals could use less energy if they were more thrifty around the house," "I have a moral obligation to try and save energy," "My own conservation will help supplies last longer," "It's appropriate for residents of Knoxvile to try and save energy." Cronback's alpha for this scale is in the acceptable range (alpha=.72).

Self Concept--(two items): "I'm the kind of person who is careful in how they use energy," and "The energy situation is one that I watch pretty carefully" (intercorrelation r=.51).

Health Concern--(two items): "While others may tolerate turning down their thermostat, my own needs for warmth are high," and "It's essential to my health and well being for the house to be well heated in the winter" (interrcorrelation r=.35).

Disgruntled Conserver--(two items): "I tried to save energy but it made no difference on my energy bill," and "It's useless to try and save energy since the utility bill will raise my rates if I do" (intercorrelation r=.43).

The energy knowledge, Attitude(act) and Attitude(obj), and specific expectancy value components are from the previous chapter. In addition, three items tapping perceived difficulty of each of the three individual behaviors analyzed thus far (i.e., thermostat setback, adding insulation, water heater turndown) are included. Each of these three behaviors is rated by the respondent utilizing a five point semantic differential scale with categories ranging from "Extremely Easy" to "Extremly Hard." All three items are used in a summed scale when general behavior scales are analyzed (Cronbach's alpha=.54).

Finally, all three general classes of behavior analyzed earlier will be included. These are curtailment behavior, efficiency improvement and efficiency behavior.

Statistical Procedure. Path analysis will be employed for examining intercorrelations among variables represented in the model. Path analysis is a procedure for estimating the relative weight or influence of factors in a hypothetical causal model (Bohrnstedt and Knoke,1982:417). For this analysis, direct causal effects were determined from a regression model on behavior including all variables in the model. From these only the betas significant at the .05 level or greater are selected as indicating a direct causal path. The R^2, when reported in the table, refers to the variance attibutable to these direct causal effects only. In addition, indirect causal effects were obtained by regressing all model components prior to the causal level of the direct effect (see Table 1). Again, indirect effects are calculated only from those variables significantly ($P<=.05$) related to the direct causal effect. An indirect path is thus calculated by multiplying the two beta coefficients. Correlated effects; i.e., indirect effects which pass through variables at the same causal level, are not reported. Where a factor has an indirect effect through two or more intervening factors, separate indirect effects are reported in the table for each intervening variable. These are combined in the discussion when appropriate.

The model represented in Table 1 cannot actually be tested with cross sectional data as it implies temporal order among variables. However, the analysis should be useful as a basis for examining the plausibility of the model.

Results

The first issue looked at in the results examines how demographic, household structural and general belief variables affect household conservation beliefs. The argument discussed earlier suggested that such factors set certain limitations on behavior directly but may also affect the cognitive factors themselves. If this is the case, we should expect to find items correlated with one another between levels of the model.

Table 2 reports the direct and indirect paths between the structural, demographic and general energy beliefs for four household conservation beliefs. Looking first at the direct effects, the results indicate a weak to moderate relationship between general energy beliefs and more specific beliefs regarding energy use in the home context. The primary determinants of such beliefs appears to be other belief factors. Number of people in the home and respondent's age have some direct influence, particularly on health consequences of lowering home temperature. Income and home ownership influence the household belief factors

Table 2 Direct and Indirect Causal Paths Explaining Household Conservation Beliefs.

	Energy Beliefs			
	Self Concept	Conservation Ethic	Health Concern	Disgruntled Conserver
Direct Effects[1]				
General Concern	.16	.29	____	-.16
Environ. Concern	____	.27	____	____
Number People	____	____	.13	____
Age	.20	____	.28	____
R^2	.06	.21	.08	.08
Indirect Effects				
General Concern				
Income	.02	.04	____	-.02
Ownership	____	.06	____	____
Environ. Concern				
Income	____	.04	____	____

[1] All direct paths significant at the .05 level or greater.

through their influence on general concern and environmental awareness.

Indirect effects from factors prior to the direct effects are also reported. Income exerts the greatest indirect on behavior through both general concern and environmental concern (combined indirect effect=.08). The results suggest that the R^2 reported in the table is due primarily to the direct effects.

The data provide some support for the claim that beliefs about one's energy use in the home are affected by more general definitions of the energy problem. The size of the betas indicate a moderate association. However, the association is strong enough to suggest that changing general definitions of the energy problem may be helpful in encouraging conservation at the individual level.

The data also suggest that efforts to change such beliefs will be mediated to some extent by household structural and demographic factors. One finding in particular which supports Black et al.'s (1985) research is the relationship between ownership and concern for the energy problem (beta=.22, not reported). This suggests that home ownership itself may help to stimulate concern for the energy problem, perhaps because these individuals have more control over the decisions affecting their energy use.

However, it may also be that home ownership places individuals in a social context which encourages proconservation norms (see Black et al.,1985).

<u>Predicting Specific Conservation Actions</u>

The second issue raised earlier was whether the influence of demographic and structural factors is mediated by the cognitive model--attitudes, knowledge, beliefs and perceived difficulty. This problem is important as it may provide a more complete understanding of the role of situational determinants of conservation behavior. As we indicated earlier, we would expect such factors to play different roles depending on the criterion behavior under investigation.

Table 3 reports the direct and indirect paths from the situational and personal determinants of three individual conservation actions. Looking first at the direct effects, the data indicate that all three behaviors are influenced by both situational and personal factors. For these behaviors, the bulk of explanation is due primarily to attitude and belief factors. For thermostat setback (column one), the direct effects reported by Table 3 include factors from each of the different levels of the model--education, perceived suffering, energy knowledge, perceived

Table 3 Direct and Indirect Causal Paths Explaining Three Individual Conservation Behaviors

	Thermostat Setback	Turndown Water Heater	Adding Insulation
<u>Direct Paths</u>			
Attitude(act)		.16	.15
Energy Knowledge	.22	___	___
Perceived Difficulty	-.39	.25	.24
Perceived Suffering	-.15	___	___
Environ. Concern	___	___	.14
Appliance Index	___	.18	.34
Income	-.16	___	___
R^2	.28	.14	.12
<u>Indirect Paths</u>			
Attitude(act)			
Perceived Diff.		.07	___
Energy Knowledge		___	.02
Self Concept		___	-.01
Conservation Ethic		___	.02
General Concern		___	.05
Environ. Concern		___	___
Perceived Suffering		___	___
Energy Knowledge			
Disgrunt. Conserver	-.05	___	___
Perceived Suffering	-.04	___	___
Perceived Difficulty			
Health Concern	-.07	___	___
Environ. Concern	___	-.05	___
Perceived Suffering	___	___	.04
Perceived Suffering			
Rooms	-.02	___	___
Appliance Index			
Income	___	.05	.09
Home Ownership	___	.10	.18

[1] All direct paths significant at the .05 level of greater.

difficulty and Att(act). These five variables account for 28 percent of the variance on behavior. In general, the results suggest that the influence of situational factors is through the personal determinants. The most important direct effect in the model is from perceived difficulty, a factor which is not mediated by either Att(act) or the expectancy value construct.

The data also support the contention that a certain degree of integration exists between different cognitive levels. The general belief factors are weak to moderately correlated with household conservation beliefs and in the expected direction. Houshold conservation beliefs appear to have an indirect influence on behavior through their effect on difficulty, knowledge, expectancy value and Att(act). The model thus confirms to some extent a degree of belief-attitude organization with regard to energy cognitions. Contrary to claims made by Olsen (1981), Milstein (1977) and others, general beliefs impact behavior but through their effect on more proximate cognitive factors.

Second, the findings suggest that for a relatively discretionary and recurring behavior, the personal factors provide a reasonably good explanation. Energy knowledge and perceived difficulty are correlated as expected--those who find the behavior to be more difficult are less likely to engage in the behavior, while those who know more about energy conservation are more likely to do so.

As indicated earlier, as the behavior becomes less discretionary; i.e., more constrained by situational factors, we would expect the influence of personal determinants to decline. Columns two and three report data relevant to this point. Water heater turndown is presented first as we would expect it to stand somewhere in between thermostat setback and adding insulation in terms of situational constraints affecting behavior. The primary direct paths affecting water heater turndown are Att(act), perceived difficulty and apppliance index explaining 14 percent of the variance in behavior. While the majority of direct paths are personal, appliance index and indirectly home ownership influence behavior now more than in the case of thermostat setback.

Column 3 reports the path model for adding insulation. The significant direct paths are appliance index, Att(act), perceived difficulty, as well as environmental concern explaining 12 percent of the variance in behavior. These paths suggest that while personal factors have remained constant from the previous model, the influence of appliance index has increased (beta=.34). This finding indirectly implicates home ownership.

Table 3 also reports the indirect causal effects. Again most of the indirect effects are rather small. The strongest indirect belief factor is environmental concern, with a combined influence on thermostat setback through Att(act) and perceived difficulty of .10. The individual indirect effects from the belief factors, while small, may combine to have more substantial impact on behavior. For adding insulation, the strongest indirect effect is for home ownership. This factor influences both water heater turndown and adding insulation.

These results support some of the earlier observations. First, situational influences on attitude and specific behaviors is primarily through home ownership. The latter variable helps account for a large part of the influence of such sociodemographic variables as income and age. Homeowners tend to be more concerned about the energy problem which is an important factor influencing sensitivity to conservation norms and beliefs in the residential context.

Second the analysis demonstrates a moderate relationship between general concern for saving energy, environmental protection and felt suffering as a consequence of energy prices and those energy beliefs and attitudes more proximate to behavior. While the implication of this finding will be discussed more fully in the next chapter, it does suggest that changing beliefs relating to the energy "situation" could be useful in bringing about attitude change.

Third, the analysis suggests that energy knowledge and energy attitude are interwoven. This result may indicate that disseminating energy knowledge may require concommitant efforts at attitude change if such programs are to be successful. Finally, while the analysis cannot demonstrate the temporal relation between the difficulty and attitude variables, it does suggest that the two are rather strongly correlated. In future analysis, the difficulty dimension should be included as part of the expectancy value construct.

The next section examines three conservation indices--curtailment, efficiency behavior, and efficiency improvement. Two basic questions are posed: (1) whether the relevant situational and personal determinants of a behavioral index are different from those reported for individual behavior, and (2) whether differences between the three classes of behavior exist with regard to relevant predictors.

Predicting General Conservation Behavior

The third question posed earlier focused on examining situational and personal factors operating for different conservation actions. In particular, do differences in conservation activities assume different personal and situational determinants? The preceeding section focused on specific conservation actions only. However, energy conservation programs should be able to anticipate likely program impacts for the larger class of conservation activities.

The analysis of the models for individual actions suggested that the influence of personal factors on conservation tends to decline the more constrained the behavior becomes. Table 4 examines both sets of factors for the three general behavioral indices discussed earlier. These regressions exclude Att(act) as well as its associated expectancy value contruct. A general expectancy value construct was included in the equation when computing the beta coefficents. However, in none of the three models is it significantly associated with other personal factors or behavior.

Column one reports the path model for curtailment behavior. The significant direct paths include perceived difficulty (a composite index), energy knowledge, perceived suffering, income and number of rooms in the home explaining 17 percent of the variance of behavior. This finding is interesting as it suggests that both personal and situational factors influence behavior.

Table 4 Direct and Indirect Causal Paths Explaining Three General Conservation Activities.

	Curtailment	Efficiency Behavior	Efficiency Improvement
<u>Direct Effects</u>[1]			
Energy Knowledge	.18	___	.16
Perceived Difficulty	-.14	___	___
Self Concept	___	-.27	___
Perceived Suffering	-.20	___	___
Appliance Index	___	-.26	.41
Number Rooms	-.14	-.19	___
Income	.16	-.27	___
Age	___	___	-.18
Education			
R^2	.17	.15	.15
<u>Indirect Effects</u>			
Energy Knowledge			
Disgrunt. Conserver	-.04	___	-.04
Perceived Suffering	-.03	___	-.03
General Concern	.04	___	.04
Perceived Difficulty			
Environ. Concern	-.02	___	___
Number People	.02	___	___
Self Concept			
General Concern	---	-.04	___
Age	___	-.05	___
Perceived Suffering			
Number Rooms	.03	___	___
Number Rooms			
Income	.04	-.05	___
Appliance Index			
Ownership	___	-.14	.22
Income	___	.07	.11

[1] Direct effects significant at the .05 level or greater.

Curtailment activities appear to be primarily determined by personal variables. This finding is significant as it suggests that changing the personal characteristics of consumers; i.e., attitudes, beliefs and knowledge, may have its most significant impact on such behaviors. The primary resistance to changing curtailment behaviors are perceptual. However, we might expect that increasing curtailment of energy services will arouse greater opposition among individuals as it entails lifestyle change. The data would suggest the need for grounding such appeals in the larger belief orientations of the individual. Individuals may be willing to make personal sacrifices when they see these as relevant to a larger concern. The energy "crisis" may have been too confusing to some individuals for such a "larger concern" to emerge. Perhaps this is one reason for the lack of a consistent relationship between attitudes, beliefs and behavior reported in the literature.

Column two reports the path coefficients for both personal and situational factors on efficiency behavior. We would expect this behavior to more strongly correlate with situational factors as some of these entail more efficient use of appliances. The results support this view. The direct paths on behavior include appliance index, self concept, and number of rooms explaining 15 percent of the variance in behavior. Now the primary determinants of behavior appear to be situational, although personal factors play some direct and indirect role. Again, number of rooms is negatively related to behavior (beta=-.19). To the extent that number of rooms accounts for some of the variance due to income, this latter finding suggests that increasing resources may lead to greater inefficiency in the home.

Finally, column three reports the personal and situational factors affecting efficiency improvements. Most of the direct effects on behavior are due to situational determinants. The direct paths include age, appliance index, energy knowledge, and education explaining 15 percent of the variance of behavior. The shift to primarily situational determinants is expected as these behaviors represent one shot investments that are constrained by resources and opportunity factors. The primary determinant is appliance index (beta=.41), again underscoring the indirect effect of home ownership (beta=.22).

The data also reaffirm Black et al.'s (1985) contention that home ownership plays an important role in stimulating concern for the energy problem. However, as we saw earlier (Chapter III) renters were slightly more likely to engage in efficiency behavior than owners. Thus whereas ownership may stimulate concern, other factors apparently keep this concern from being translated into increased efficiency behavior. This may be due in part to the fact that the range of possible conservation actions is more constrained for renters than home owners. Home owners are able to direct energy conservation awareness into efficiency improvements. This may have the effect of siphoning off concerns for engaging in other conservation behaviors. Efficiency improvements likewise allow the home owner to maintain a conservation "self concept" without concommitantly changing their lifestyle.

While the role of personal factors on efficiency improvements indirect, it is important to note the link between conservation knowledge and general/home conservation beliefs. It is not too ironic that those most dissastisfied with prior conservation efforts, as well as those who have suffered most as a consequence of the crisis, apparently have less knowledge of conservation matters. Also, more positive attitude toward conservation is associated with conservation knowledge. The data thus indicate that increasing energy knowledge as a means of encouraging efficiency improvements will be facilitated by a proconservation attitude and perhaps inhibited by a negative attitude and experience of conservation. While the role of such factors is still indirect--that is, mediated by knowledge, the results suggest the need for altering conservation attitudes when trying to increase conservation knowledge.

The results also indicate that changing energy attitudes and knowledge alone may not be a very effective behavioral strategy for encouraging efficiency improvements. The usefulness of such factors is still constrained by household context as well as disposable resources for affecting behavior change. While it is possible to have increased the role of personal determinants in the model--e.g., by including other attitudinal factors, it is probably more difficult in general to predict nonrecurring behavior. This is not to say that under more ideal experimental conditions, changes in attitudes could be strongly linked to adoption of efficiency improvements. A cross sectional survey is unfortunately limited with regard to examining the role of cognitive factors in efficiency improvements over time.

Discussion

Several conclusions can be drawn from the analysis. Conservation behavior is linked in rather complex ways to both situational and personal dimensions of energy use. The data support the contention that attitude change can bring about behavior change for certain kinds of actions. Once situational effects are taken into account, attitudes and other cognitive factors influence behavior. The implication here is that conservation programs need to target specific conservation actions individuals can do, both in terms of practical knowledge, as well as encouraging attitudinal commitment.

While this relationship is strongest for specific behaviors, the analysis demonstrates the relevance of changing general beliefs for affecting the larger class of conservation activites. The role such determinants play varies considerably however, between types of conservation behavior, supporting analysis from previous chapters. Attitudinal approaches to conservation will be most effective for curtailment types of activities and least effective for conservation improvements. However, it is important to note that the evidence does not preclude the possibility that personal factors could have a more direct role for efficiency improvements.

Second, the evidence supports the earlier contention that a certain degree of belief/attitude organization exists among residential energy consumers. General beliefs and values relevant to the energy problem influence both household conservation beliefs as well as those cognitive factors more proximate to behavior. The size of the intercorrelations suggest weak to moderate relationship between different cognitive levels. However, these findings are signficant as they suggest that whereas general energy beliefs do not usually influence behavior directly, they are instrumental in helping establish a receptivity to conservation in the home context.

While it is tempting to assess earlier work on the direct link between general energy beliefs and behavior as misplaced, we must also consider that in the time which has elapsed since the oil embargo, individuals have had greater opportunity to develop a more coherent; i.e., cognitively organized, view of the energy problem and its implication for personal behavior. As W. I. Thomas notes, to "define the situation" is also to define one's role in it. Thus consistency between beliefs, attitudes and behavior may be more likely to occur in the "routine situation" (Hewitt,1979) of the post crisis energy period. Contrary to Olsen (1981), Milstein (1977) and others assertions, beliefs, values and attitudes may have greater significance now for helping define solutions to prevalent energy problems.

Third, the data clarifies the relationship between situational factors, personal factors and behavior. By and large, for curtailment and most efficiency behaviors, the role of situational factors tends to be indirect. The influence of factors such as age, income and education, where direct, tends to be rather weak. In this sense, such factors result constrain behavior but do not affect it in a positive sense. Home ownership is to some extent an exception. However, while homeowners are more concerned about the energy problem and perhaps more conservation minded, they are not necessarily more conservative for all kinds of activity.

The path models presented here represented only one plausible approach to understanding the link between situational and personal influences on conservation behavior. The role such research may have for conservation programs is to provide a better basis for defining the relevant determinants of conservation and designing behavioral change strategies accordingly. Future research utilizing longitudinal data needs to further address how the influence of both sets of factors change over time as well as to establish a more refined causal order among variables.

CHAPTER SIX

SUMMARY AND POLICY DISCUSSION

Overview of the Study

This study has examined a number of key issues in conceptualizing the relationship between situational and personal characteristics of residential energy consumers and conservation behavior and energy use. The review of literature suggested three primary problems within the energy consumer literature in need of further examination: (1) the role of conservation knowledge in residential behavior, (2) the impact of consumer attitudes, beliefs and values in guiding behavior, and (3) how best to model the relevant cogntive and noncognitive determinants of conservation behavior.

Chapter III examines the first problem. The literature review suggested that energy knowledge may have important consequences for behavior as well as affect the attitude behavior relationship directly. It was thus appropriate to examine the influence of energy knowledge prior to the elaboration of questions two and three. In addition, increasing knowledge of conservation activities is a primary dimension of energy conservation policies aimed at the residential consumer. An analysis of the influence of energy knowledge may help such programs anticipate likely program impacts.

Utilizing data from a mailed questionnaire of Knoxville area residents (N=286), the results for chapter III indicate that the direct effect of conservation knowledge appears to be rather moderate as a whole. Knowledge of conservation activity is not strongly correlated with behavior, although some variation exists between types of behavior. Thermostat setting and efficiency improvement generally do appear to be affected by energy knowledge, although weakly.

The primary function of energy knowledge may be indirect; i.e., how the savings potential of specific conservation actions are perceived. The results indicate that while individuals have a fairly accurate picture of the relative savings potential of specific conservation activities, considerable variation exists. In particular, the savings potential of "visible" conservations actions, such as turning off lights, is overestimated while it is underestimated for less dramatic activities, particularly lowering the thermostat and lowering water heater temperature. This may be due in part to the fact that the majority of individuals examine only the dollar amount on their utility bill and thus do not pay careful attention to changes in kilowatts of usage. However, the conventional utility bill does not provide sufficient evidence to monitor changes in household conservation behavior effectively. This is compounded by the fact that seasonal fluctuation and other extraneous factors may be acting on total energy use. The results indicate that energy knowledge and behavior factors account for 11 percent of the variance in energy use between similarly situated households.

Responding to question two has entailed examining two theoretical approaches to predicting behavior--Fishbein and Ajzen's theory of reasoned action, and Triandis' multicomponent view of behavior. Both models assume that the most proximate determinant of behavior is the intention to perform this behavior. Triandis adds that prior habit as well as "facilitating" factors, such as difficulty associated with the behavior, enter into the prediction of action. Intention is itself determined by a combination of attitudinal factors, normative beliefs and other dimensions. While both models are similar in how they conceptualize social behavior, they assume different level of "volitional control" over the behavior and thus place different emphases on the role attitudes and other cognitive determinants play.

The primary question posed here has been to test the comparative utility of either model for predicting individual conservation behavior. This issue is addressed in Chapter IV. Generally, the findings indicate that conservation activities are influenced by individual cognitive factors. The size of the attitude-behavior association suggests that individuals do act toward conservation behavior in terms of how such behaviors are defined. Individuals with a more positive evaluation of conservation generally and of specific behaviors in particular tend to be more likely to have made efforts to conserve energy in the home, all other things being equal.

With respect to the two models, results indicate that they are relatively equivalent when the behavior is under consumer's control. This is especially true for "curtailment" activities. It is here that cognitive determinants play the largest role. While the variance explained is approximately equivalent between the two approaches, the Triandis model may be more useful in specifying a range of possible factors which may be operative. For efficiency improvements and efficiency behaviors, the Triandis model is clearly superior. Here the focus of causality moves more toward resource and opportunity than cognitive factors, at least for this analysis. As the behavior becomes less routine--for example, adding insulation, the behavior is due more to household structural and demographic factors. Attitude and belief factors continue to be important but have a more indirect role.

Overall, the Triandis model, while less parsimonious, is more effective in explaining behavior as it allows for the specification of a range of possible factors affecting behavior. The primary advantage of the Triandis model, however, may be for predicting behaviors that: (1) have a larger social normative than attitude component affecting behavior, or (2) require more than motivation to perform; e.g., behavior relevant knowledge or material resources. When it is certain that the behavior is relatively under the actor's control, the Fishbein/Ajzen model may be sufficient to achieve a fairly high level of prediction.

Chapter V addresses the problem of causal order. The primary purpose of this analysis is to: (1) examine how such situational factors as household structural and sociodemographics influence energy attitudes and beliefs, and (2) examine to what extent general energy beliefs provide a "context" for more proximate attitude and belief determinants of behavior. The first issue is relevant for understanding the social positioning of energy opinions, while the second issue pertains directly to whether changing general defintions of the energy "problem" might affect behavior, at least indirectly.

The results indicate that home ownership is important both as a "resource" factor affecting the range of behavioral options as well as influencing conservation beliefs directly. Homeowners tend to be more committed to personal conservation--perhaps as a consequence of having more control over their behavior, and to view the energy problem as more serious. However, whereas ownership may stimulate more concern, other factors apparently keep this concern from being translated into increased conservation for all categories of behavior. Sociodemographic factors play primarily an indirect role, functioning through the household or cognitive variables.

A second finding is that general energy beliefs do play a role in guiding behavior. However, while exceptions to the rule exist, general beliefs are best thought of as indirect. Such general belief orientations as environmental concern and general conservation awareness appear to have a weak to moderate (betas range from .15 to .30) effect on the more proximate attitude and belief determinants of behavior. This finding suggests that some degree of belief "integration" exists between general and specific levels of energy belief. While such integration does not imply a coherrent belief ideology, it does suggest that changing general definitions of the energy problem could have consequences for behavior, although small.

Overall, Chapters III, IV and V provide a view of conservation behavior and energy use which assigns a moderately important role to consumer energy beliefs, attitudes and values in guiding behavior. They also affirm the role household situational and demographic factors play in proving a context for such behavior. At least some individuals have come to accept conservation in the home as a viable part of their self concept and as a means to other valued social ends--such as protecting the environment or slowing national energy growth. For others, thermal comfort and convenience may be overriding concerns. Both views appear to be affected by beliefs about conservation behavior as well as household structural and demographic factors. The data thus suggest that while changing attitudes, beliefs or energy knowledge could encourage proconservation activity, "situational" factors will affect the scope such efforts are likely to have.

The following section endeavors to draw out the implications of this research for structuring residential conservation programs and for larger issues of energy policy directed at the residential consumer. This will be accomplished first by examining conservation program recommendations implicated by the study. The last section of this chapter will place such recommendations in the context of broader energy policy questions.

<u>General Energy Policy Recommendations</u>

As Sonderegger (1978) as well as Verhallen and van Raaij (1981) indicate, routine household behaviors have a substantial impact on individual energy use, accounting for as much as forty percent of the difference in energy consumption between similarly situated households. For this reason, most conservation campaigns involve some element of changing household behavior, whether this is engaging in more efficient use of appliances, curtailing some energy services, or changing behavioral routines--as in shifting use patterns to off-peak periods (see Van Liere et al.,1982).

The results of this study support the notion that attitude change could be useful in encouraging residential conservation. These findings indicate that attitudinal differences between consumers account for between 4 and 23 percent of the variance in behavior, or approximately 8 percent of the variance in energy consumption. The total difference in energy consumption accounted for by both attitudes and behavior controlling for household situational variables is approximately 16 percent.

The research reported here suggests at least six strategies for encouraging residential conservation. The most important of these being that:

1. Persuasive conservation campaigns should focus on changing general attitudes and beliefs toward conservation.

The data support the claim raised earlier that general definitions of the energy problem can provide a context for energy conservation. As Table 2 in Chapter 5 indicates, general energy beliefs can be important in helping shape attitudes toward specific conservation actions, particularly environmental awareness and perceived suffering as a consequence of the energy crisis. The influence of such general energy beliefs is best thought of as indirect; i.e., they influence more proximate determinants of behavior. Contrary to Olsen (1981), Milstein (1977) and others, receptivity to social cues to conserve and the evaluation of conservation actions are influenced by how individuals define the energy problem. In the years since the oil embargo, individuals have had more opportunity to integrate such general belief orientations with preferences for certain energy policy options and to a limited extent, conservation behavior in the home.

This is not to say that residential consumer views of the energy problem represent a coherent and integrated system of beliefs. They do not. But neither are such belief systems absent of a certain degree of structure and rationality. The contemporary energy debate between "hard" and "soft" approaches to resolving future energy needs (Barbour et al.,1982) has not evolved at the public level yet such that these represent two clearly contrary approaches. Individuals who favor conservation may also favor increased energy production and economic growth as measures of "progress." Still, it is clear that broader and more abstract definitions of the energy situation inform specific conservation attitudes and behavior.

Conservation programs can build on this by reinforcing values which would be functional to encouraging conservation. The analysis suggests that at least one belief orientation--environmental concern, is directly related to other conservation attitudes as well as behavior. The popularity of conservation for some is that it helps reinforce valued "identities" which are "situated" in the home context. Being conservation minded, frugal, efficient or materially simple are activities which help reinforce this general belief orientation. Strengthening such values is an important dimension of evolving a "conservation ethic" in the larger culture. As Olsen (1978) indicates, the development of a nationwide conservation ethic is necessary for maintaining the viability of the conservation movement, particularly during periods of declining energy prices when conservation appears superfluous. Such a general conservation ethic could include a decreased emphasis on materialistic aspiration, equitability in the energy system, consumer autonomy and the viability of the natural environment (see Morrison and Lodwick,1982). In lieu of a definition of the energy problem focusing on its price and availability as the most dominant concerns, a conservation ethic might emphasize the disammenties of utilizing too much energy; e.g., acid rain, pollution, toxic waste, and resource dependency (see Ehrlich et al.,1977).

It is obviously not enough to change the symbolic values associated with energy to adequately encourage conservation. The results suggest that the best predictors of conservation behavior are relatively specific attitudes toward that behavior. Therefore:

2. Persuasive conservation campaigns should target behaviors for change as well as attitudes toward those behaviors.

The results indicate that while attitudes toward specific action may not always be the strongest predictor of behavior, they are the most consistent. Furthermore, such attitudes have a moderately strong relationship to the "expected value" or outcomes associated with the three behaviors examined (average r=.44). A two pronged effort at such behavior change is implied by the analysis. First, conservation campaigns should focus on changing expected outcomes associated with specific conservation actions. This strategy involves changing incorrect assumptions or beliefs which individuals have about particular actions. For example, the data suggest that consumers need to be provided with appropriate information about the relationship between household temperature and health (see Table 6 Chapter 3; see Rohles,1981). For those conservation actions which are relatively accessible to most individuals; e.g., thermostat setback, individuals should be provided with clear information on the cost and benefits of the action. This should include a relatively clear idea of what savings can be expected on the average, as well as substitute behaviors which have equivalent savings. The perception that "small" behavioral changes are insignificant needs to be overcome. Changes for any one behavior are not likely to result in large savings. Thus an emphasis should be placed on a particular subset of activites which together could result in larger savings. Here again, the social significance of even small personal savings can be emphasized, such as averting building costly new generation equipment. The assumption guiding the latter strategy is that changing the expected outcomes of the behavior will change the affective component associated with the intention to perform a given action.

The usefulness of such information may depend in part on the credibility of the source (Stern and Aronson,1984). The analysis suggests one view, although a minority one, that the utility would compensate for any revenue lost to individual conservation by raising rates. This belief was slightly more prevalent among renters than homeowners (43 and 38 percent respectively). This finding suggests that utilities may have a credibility problem where they are the sponsors of conservation campaigns (Milstein,1977). Where it is impractical to implement the program through other channels, utilities should examine whether or not negative attitudes toward the utility might affect responsiveness to conservation appeals (see Yates and Aronson,1983). The problem may depend in part on what audience the utility is targeting (e.g., higher income homeowners versus lower income renters).

Given that the program is effective in changing expected outcomes associated with the behavior, as well as attitude, attitude consistent behavior may not necessarily ensue. Thus a second dimension of attitude change should be to increase the salience of attitude-behavior inconsistency. The point here is to raise the consumer's level of "cognitive dissonance". Increasing the salience of attitude-behavior discrepancy involves "coupling" attitudes to behavior by pointing to situations and contexts where they are relevant (Cook and Berrenburg,1981). Emphasizing the value relevance of conservation is one dimension of this. However, other methods should be used in "cuing" both attitudes and behavior. For example, utilizing "prompts" through the mass media or publicly visible places reminding people to conserve may be an effective strategy for doing so (see Geller,1982:167). Strengthing proconservation attitudes will increase the likelihood that they are "accessed" (Fazio et al.,1983) in the home context.

The results of the study also indicate that the personal determinants of behaviors vary by subclass of conservation activity. Therefore:

3. Persuasive conservation campaigns should target the particular determinants of a conservation behavior.

The data suggest that for relatively recurring behaviors changing attitudinal factors can have a reasonable payoff in behavior chnage. As the behavior becomes more constrained by resource and opportunity factors, cognitive change will be less useful in encouraging behavior. Here attention should be focused on overcoming disinclination to conserve and facilitating conservation through changing perceptions of the difficulty associated with the behavior and increasing energy knowledge. Conservation incentives, such as rebates or low/no interest loans, can be useful in providing a "foot-in-the-door" technique for overcoming prior inactivity (Stern and Kirkpatrick,1977). As Stern and Aronson (1984) note, once individuals have overcome inactivity with a relatively small behavior, they are more likely to make a larger commitment to conservation. The movement from smaller to larger conservation activities is likely to occur given that the behaviors are ". . .clearly described, inexpensive and relatively easy" (Stern and Aronson,1984:71).

While incentives may accelerate the adoption of some conservation actions, they can't be expected to maintain the behavior over time (Geller et al.,1982). The assumption behind material incentives is that rewarding behaviors are more likely to be undertaken. However, incentive programs have not demonstrated an unequivocal effectiveness in encouraging behavior (Heberlein and Warriner,1983). Even where they have proven useful in encouraging conservation, the effects of the program may be short lived; this may be due in part to size of the incentive relative to the "cost" of conserving (Cook and Berrenburg,1981:84). Increasing the material incentive must be balanced against the energy savings accrued. In at least one program, rebates to consumers had to be discontiued as their cost exceeded the savings achieved (McClelland and Cook,1980). Perhaps more importantly, by appealing to individual "self-interest," incentive programs may discourage the development of proconservation attitudes by emphasizing the utilitarian dimension of saving energy.

Perceived difficulty of the behavior may be one of the most important perceptual influences for some kinds of behavior. For all three of the specific conservation actions examined (i.e., thermostat setback, water heater turndown, and adding insulation), perceived difficulty had a significant influence. Conservation campaigns are limited but not ineffectual in changing such perceptions. "Thermal preference" and concern for health are obviously important factors affecting individual response to conservation. Recognizing this, conservation programs should focus on ways the consumer can compensate for lower heating temperatures through appropriate clothing. For example, the "clo" value of clothing which rates its insulation value can be provided. Individuals who have changed the clo ratings of their clothing report lowered household temperatures without a subsequent loss of comfort (Geller et al.,1982). Here, such "curtailment" activities might be more effectively billed as household efficiency. Where thermal comfort is the predominant interest, the focus should be on those efficiency behaviors and improvements which afford conservation without a loss of energy services.

The results indicate that general energy conservation knowledge is correlated with behavior for at least some types of conservation activity. Thus:

4. Persuasive conservation campaigns should focus on increasing general conservation knowledge.

The data indicate substantial gaps in the public's knowledge of energy use. For example, only half of the respondents knew what their water heater temperature was set on. Results reported in Chapter 3 suggests that knowledge factors account for about 5 percent of the variance in energy use and approximately 8 percent of the variance in behavior.

Three strategies for alleviating this problem can be suggested. First, efforts should be made at clarifying what actions are available for individuals to do in their particular context. Results from Chapter 3 indicate that while the majority of individuals have made efforts to conserve, a number of potentially helpful low cost activities could be encouraged. These include: (1) turning down water heater temperature, (2) adding a flow restricting shower head, (3) adding a clock timer to the water heater, and (4) turning the dishwasher off before the dry cycle. The basic problem for the consumer is that all energy choices have a characteristic "invisibility" to them (Stern and

Aronson,1984); individuals are not in the position to evaluate the consequences of their actions for increasing or decreasing energy use. An energy "survey" which provides a thorough checklist for individual households could accomplish this goal. Another means is the use of an energy audit by a trained professional or house "doctor" (Stern et al.,1981). The actual penetration level for such programs has been rather low, however, ranging between 2-5 percent of owner-occupied housing (Stern et al.,1981). Lack of program awareness, which usually is far less than a majority, accounts for part of the low diffusion rate. However, audit services may be criticized for not always providing information that the consumer can use. This situation may be particularly indicative of self-administered audits where the customer returns the survey to the sponsoring agency for computer analysis.

Second, results suggest a need for providing greater consumption information feedback to the consumer than is presently contained in the utility bill. This analysis indicates that the utility bill is inadequate for monitoring changes in behavior, regardless of whether one examines the kilowatt amount or dollar amount. Utilities should: (1) disagregate bills by end use; i.e., space heating, lighting, water heating, etc., (2) provide "raw" kilowats or BTUs used and "adjusted" kilowatts which take into account seasonal fluctuation for that month, and (3) provide a monthly or base amount to compare current bills against. Experiments utilizing the so called "smart meter" (EURDS,1979) have demonstrated the feasibility of the first suggestion. Disagregating the bill would provide clearer information to the consumer of what impact particular conservation activities are having. This would undoubtedly reinforce behavior among those interested in saving energy. Adjusting kilowatt hours by seasonal fluctuation would provide individuals with a progress report of conservation efforts over a shorter period of time. The latter type of information has the advantage of being within the technical ability of most utilities. In addition, energy measurement units; such as kilowatts, BTUs, joules, etc., need to be explained more fully. Other evidence indicates that such feedback mechanisms could result in a 10-20 percent energy savings (Geller et al.,1982:180).

Finally, the results suggest that there may be utility in increasing general energy and conservation knowledge. The "function" such knowledge could serve would be to provide a cognitive compliment to the value commitments discussed earlier. Such knowledge would further anchor behavior change in larger belief and value systems of the individual, as well as provide a more enlightend public basis of support for national energy policies.

The preceeding recommendations have focused on attitude, values and knowledge. Changing such individual attributes can be furthered by reinforcing social influences on behavior. Therefore:

5. Persuasive conservation campaigns should find means to arouse normative support and institutionalize social commendation for conservation actions.

The results indicate that while normative beliefs were not consistently related to behavior, individuals are aware of normative pressures to conserve more energy in the household context. Social support variables exaplain between 1 and 3 percent of the variance in behavior, and approximately 2 percent of the variance in energy use. While this figure is small it may underestimate the potential impact of normative support for behavior. As Stern and Kirkpatrick (1977:13) note, ". . . public commitment can have a powerful long-term influence on socially valued behavior, even in the absence of incentives or surveillance."

The means for achieving such social support is not directly suggested by the study. Prior research suggests several avenues; e.g., increasing the public visibility of the behavior (Pallak and Cummings,1976), increasing the role of the neighborhood or community in implementing and monitoring the program (Stern and Aronson,1984), providing group level incentives for conservation, as in master metered apartments (McClelland and Cook,1980), or utilizing community leaders as role models for diffusing particular conservation innovations (Darley and Beniger,1981). However, the primary social support factor must still be family, neighbors and friends. These agents provide the most proximate social controls over individual behavior. The research reported here suggests that the latter interpersonal influences are most important for recurring and simple behaviors. Normative influences were weakest for efficiency improvements--a finding supporting Stern et al.'s (1983) results.

Finally, as Fishbein and Ajzen and Triandis suggest, behavioral intention mediates the actual influence of cognitive factors on behavior. Thus:

6. Persuasive energy conservation campaigns should facilitate a publicly stated intention to conserve energy.

This recommendation can be considered part of developing social support for conservation. However, it derives its justification from the fact that individuals are more likely to perform a behavior when they intend to. Encouraging intention to conserve entails providing the opportunity for the consumer to perform certain behaviors, agree to participate in a particular program, or work toward a specific reduction of energy consumption. This strategy serves two functions: (1) providing concrete objectives which the consumer can measure conservation progress against, and (2) creating a basis for interaction between the consumer and the sponsor agency.

In summary, several components of a successful conservation program have been suggested. These include arousing personal values relevant to conservation behavior, changing attitudes toward specific behaviors and increasing the salience of attitude-behavior discrepancy, changing the expectations associated with the outcomes of specific behaviors, providing more detailed consumption feedback, encouraging public commitment to specific conservation objectives and encouraging behavioral intention to conserve. However, even an agressive conservation campaign will not "reach" certain elements of the population. The poor represent a special case. Conservation programs designed to assist primarily homeowning suburbanites will not impact greatly on the poor. Carrying the conservation message to the latter groups requires packaging programs which appeal to their more pressing needs; such as neighborhood revitalization and safety, continuity in energy supplies, personal budget control, and locality development (Hutch and Whitehead,1981). A number of community based programs have demonstrated the feasibility of encouraging conservation while at the same time serving the larger needs of the poor (Stern et al.,1981).

The following section examines what role the attitude concept plays in energy policy relative to other approaches for encouraging residential conservation behavior.

The Role of Attitude in U.S. Energy Policy

Earlier it was suggested that the most important problem facing energy policy is how best to encourage conservation. Having provided an analysis of situational and personal determinants of behavior and energy use, it is possible to evaluate conservation strategies for encouraging conservation against the more prevalent view of increasing energy prices. These two approaches represent the primary models directed at the residential consumer. As such, the effectiveness of either model has been the subject of considerable debate (Heberlein and Warriner,1983).

As Landsberg (1979) notes, energy policy to date has focused primarily on pricing, hardware and regulatory approaches to "demand-side" management of energy use. The economic model of conservation assumes that behavioral adaptations at the consumer level will occur when the appropriate price "signals" (Mause,1980) are relayed to the consumer. Thus the primary objective of energy policy should be to bring energy prices up to a level which adequately reflects their "marginal" or replacement costs. The "necessity" of this is reflected in current rate structures. Residential consumer electricity rates are often subsidized by higher municipal and commercial rates. In addition, the rate charged to the consumer remains constant throughout the day despite the fact that peak load energy costs may be higher than the normal base load as a consequence of bringing more expensive generations systems on line. The real costs of energy production are further shielded from the consumer because of the use of "declining block" rates which discount costs the more energy which is used (EURDS,1978). Thus, reforming rate structures would discourage use--assuming that energy demand is a function of price. This approach to encouraging energy conservation represents what Schnaiberg (1980) refers to as a "planned scarcity" policy. As Landsberg (1979:xvii) notes:

> The central message of this report is that energy--expensive today--is likely to be expensive tomorrow and that society as a whole will gain from a resolute effort to make the price that the user pays for energy, and for saving energy, reflect its true value.

Support for this view comes from American experience following the embargo. It is generally recognized that increasing energy prices have played an important role in stimulating residential conservation (Hirst et al.,1983). As Milstein (1977) notes, increasing energy conservation is generally cited as the number one reason for conserving among consumers.

While energy consumption is "elastic" to some degree (Morell,1981), this study and others suggest that the price adjustment strategy is limited. The results indicate that three factors in particular inhibit greater efficiency at the individual level: (1) thermal comfort and concern for health, (2) lack of behavior relevant knowledge for affecting change, and (3) lack of control over decisions affecting energy use. Thermal comfort is a "personal" factor which has psychological, biological and sociological antecedents. Psychologically, individuals associate certain thermal ranges with health and well being. It is not likely that raising energy prices will disabuse consumers of this perception. As Rohles (1981) notes, thermal preference is also affected by respondent's age; older individuals may have the need for higher home temperatures due to a greater risk of hypothermia. Finally, stage in the life-cycle places different demands on energy use, particularly in the early child bearing stage (Fritsche,1981). All three factors reduce the elasticity of energy consumption.

Second, the pricing model assumes a near perfect diffusion of relevant conservation information necessary for affecting behavior change. This research suggests that even after a dozen years of higher energy costs, significant gaps in consumer conservation knowledge still remain. Many individuals still operate within a "folk" model (Kempton and Montgomery,1982) for assessing energy costs and conservation investments. Such a folk assessment results in individuals placing greater efforts on conservation activities which may not have the highest payoff. Where individuals lack appropriate knowledge for improving energy efficiency and retrofit, it is more likely that they will respond to higher energy costs through curtailment (see Curtin,1976; Cunningham and Cook-Lopreato,1977) which is the least effective savings strategy (Yates and Aronson,1983). Increasing prices would undoubtedly increase hardship, but it is less likely to improve energy efficiency.

This outcome may be especially true for those who have less control over the decisions affecting their energy use; i.e., renters. Higher energy prices would penalize renters as their conservation options are severaly limited. Renters are not in the position to improve home retrofit or appliance stock of their dwelling, especially where the pay back period goes beyond the renters planning horizon. Some efficiency improvement can be made; for example, adding insulation to windows, filter change and caulking. In the absence of other conservation alternatives, renters would compensate for higher energy prices through curtailing energy or other desired services.

These points question the efficiency of the price model for allocating the social costs of increasing conservation. It is arguable (from the perspective of the price model) that Americans have not made greater efforts to conserve because they have been shielded from the real costs of energy. For example, even after a quadrupling of oil costs at the barrel, the real (i.e., adjusted by consumer price index) cost of a gallon of gas in 1975 was 55.8 cents, down from 57.6 cents in 1960. This situation changed significantly in 1980 with the gallon price increasing to to $1.25. The point being, however, that the real social impact of increasing energy prices was delayed considerably, largely the result of goverment price regulation (Walter and Zentner,1978).

However, even if the price model is pursued--as it probably will be (Landsberg and Dukert,1981), econometric analysis suggests that energy prices would have to be doubled to achieve a 10 percent reduction in use (Stern and Gardner,1981). Unless these changes were abrupt, a significant lag period would occur before such savings would be manifest (Craig et al.,1976). It is also likely that prices would have to be adjusted continually to avoid long term psychological adjustment to new rates. In any case, the latter figure falls short of what can be expected from encouraging conservation through attitude change, prompts, information feedback and consumer education.

Even if 10 percent is a plausible estimate of potential energy savings, the distributional impacts of raising energy prices must also be considered. Increasing energy costs will undoubtedly impact on the poor and working class negatively (Hutch and Whitehead,1981). This is especially true as energy costs, both direct and indirect, constitute a much larger share of their income than the well off (Morrison,1978). Discussion of increasing prices has included concern for equity in energy policy--such as the so-called "lifeline" rate which provides a modicum of usage at an ostensibly lower rate. However, it is doubtful that pricing strategies designed to ameliorate the regressive effects of such increases would offset higher prices for all such consumers (Blocker,1984). In addition, differential rates designed to assist the disenfranchised are likely to raise equity claims among other consumers, both residential and commercial.

Thus, from a social psychological viewpoint, the assumptions of the pricing strategy do not adequately reflect the realities faced by the residential consumer. It assumes that individuals are rational information utilizers, and further, that they will minimize loss and maximize gain. The beneficial effect of raising energy costs must still "work" through the agency of human perception. Without an extremely abrupt and socially undesireable price change, the individual impact will be both mediated by situational and personal determinants and lag considerably behind policy expectations. Increasing energy costs won't necessarily encourage better energy efficiency nor motivation to consume less energy. Finally, the price model can't be expected to alter patterns of consumption which have become ingrained in American culture.

The emphasis on price mechanisms to affect energy efficiency is not surprising considering the dominance of the "commodity" view of energy in American society. As Stern and Aronson (1984) note, underlying the commodity view of energy is the notion that efficiency and market values represent the criteria for how energy policies are judged. This research suggests that for "planned scarcity" policies to be effective, they must account for those "human factors" affecting likely aggregate response; such as, lack of behavior relevant knowledge, perception of the utility, difficulty of the behavior, etc.

Individual and group responses to energy are more complex than economic models of human behavior allow, yet much of the evidence for the latter is ignored by energy policy makers (Stern and Aronson,1984). This reflects not only the hegemony of market considerations in energy policy, but the "failure of consensus" (Yankelovich,1983) in achieving a coordinated national program of energy conservation. While this is due in part to the antiregulatory political mood of the eighties reflected in Reagan's energy policy (Katz,1984), it is also clear that the energy "problem" has not been an issue which has galvanized an active public constituency. From the public's view, considerable "collective ambiquity" (Smelser,1962) has existed and still persists as to how the problem is to be defined; i.e., a question of too much or too little, too costly or too cheap. As Yankelovich (1983) notes, individuals struggling to make sense of the energy "crisis" found it difficult to develop a coherrent view. Conscientious individuals who did conserve often found they had to pay higher prices as utilities compensated for lost revenue. While President Carter was declaring the energy crisis "the moral equivalent of war," the CIA claimed it was a hoax. And oddly, as oil prices increased, so did its availability at the pump. It is somewhat surprising in retrospect that in this "problematic definition of the situation" (Hewitt,1979), attitudes predicted conservation behavior at all.

The public definition of the energy problem which finally did emerge was one emphasizing its price. Thus with decline of energy prices due to the collapse of OPEC and increased efficiency, the energy crisis for many has ceased to exist (Zinberg,1983). Gallup no longer even includes energy as one of its "Most Important Problems." This turn of events is unfortunate. As Craig et al. (1976) note, energy supply and demand interface with other issues of national signficance not directly dependent on the price of oil--trade imbalance, resource dependency, environmental disammenities of energy production, trade competition with less energy intensive economies, depletion of nonrenewable energy resources, and not least of all, national security.

To the extent that these dimensions of the energy problem can be conveyed to the public, they represent a basis for building a policy consensus on the energy issue outside of the strict confines of the commodity view. Yankelovich (1983) believes that such a coorientation of views between public and leadership may be emerging. Opinion polls demonstrate public concerns for environmental protection, resource dependency abroad and the need for adopting "alternative" fuels for our longterm energy needs. Proponents of both "soft" and "hard" energy paths accept the need for increased conservation, at least in the transition period to the latter alternatives (Dunlap and Olsen,1984).

However, significant ideological and value cleavages exist and will persist for some time to come. It is technologically feasible to describe alternative energy futures, but perhaps impossible to resolve the vested interests in maintaining or changing the energy status quo. The solution or solutions to the energy problem are inextricably intertwined with a complex of social values which cannot be maximized all at once. Resolving these competing social values may be the real energy crisis. The concluding comment of a Kennedy School conference report on the energy problem in 1980 underscores this problem:

> It may be that we simply cannot do the things suggested: gain long term consumer acceptance of smaller and less powerful cars; develop a synthetic fuels industry that will change the environment and character of now isolated regions; raise utility rates for current customers to save money for their children; or relieve our economy of decades of successive encrustations of regulation. . .
>
> Our ability to communicate, debate and understand energy problems and the inherrent clash of interests and values they precipitate may be at the heart of gaining consensus on what needs to be done. Resolution of these conflicts may be as critical to our energy future as economics and technology. It may, in fact, represent the ultimate challenge posed by the energy problem (In Yankelovich,1983:36).

Consumer "education," as advocated earlier, may be insufficient to resolve such basic value conflicts. However, it does represent a significant component of changing individual conservation behavior and including the public in any consensus building efforts. Energy price increases per se cannot be expected to tip public support toward conservation and away from a consumption ethic, as the decade of the seventies attests.

At base, however, energy value conflicts are rooted in the larger institutional contradictions of American society. The dominant actors in the energy debate, including to some extent those energy regulatory bodies of the federal government, have a short term vested interest in maintaining the "treadmill of production" (Schnaiberg,1980). Both energy companies and local utilities do not have a significant material stake in conservation. The federal government, responding to the needs of large energy companies and utilities, has tended to emphasize an energy picture focusing primarily on encouraging energy production, rather than changing demand. The latter would entail challenging the taken-for-granted consumption ethic underlying American culture and the production ethic underlying American energy business. This latter role is one that the federal government is not likely to take through at least most of this decade.

Without a coordinated national energy conservation policy, we can expect conservation efforts at the individual level to reflect a policy of "laisez-faire". Where utilities are faced with growing electricity demand and deficient generating capacity, conservation "investments" may represent the least-cost strategy for meeting future needs. Depending on the public utility policies of the area, some utilities can include conservation investments in the overall rate base, thus giving them greater material incentive to conserve. Where the opposite is true--stable or declining electricity demand and excessive generation capacity as is the case in much of the North East, utilties may be faced with "marketing" electricity and increasing consumer rates (Morell,1981).

The problems facing such utilities represents what Garret Hardin (1967) has refered to as the "tragedy of the commons"--a situation of individual self seeking in a limited environment which eventually brings ruin to all. In the absence of mandatory public utility regulations, "conservation-minded" utilities could find themselves in the situation where a change in the local production-consumption relationship would dictate the need for a marketing rather than conservation strategy; that is, in the absence of another energy crisis. If as Hardin notes, "freedom" is the recognition of necessity, we have the choice now to impose restraints on our self seeking before circumstance dictates that they be imposed on us. The cost in the short term of not doing so may simply be a continuation of the social and environmental disammenities of an energy intensive society. The long term consequences may be to again find ourselves vunerable to the shifting geopolitics of energy. Unfortunately, it may take the latter to renew America's commitment to conservation.

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APPENDICES

APPENDIX A

HOME ENERGY QUESTIONNAIRE

1. Over the past decade, energy costs and supply have been important issues. All things considered, do you think that changes in the energy situation over the past decade have affected Americans negatively, positively, or had no effect (CIRCLE THE NUMBER OF YOUR ANSWER)?

   1 VERY NEGATIVE EFFECT
   2 SOMEWHAT NEGATIVE EFFECT
   3 HAD NO EFFECT
   3 SOMEWHAT POSITIVE EFFECT
   5 VERY POSITIVE EFFECT

2. All things considered, do you feel that changes in the cost and supply of energy in the last decade have made your life:

   1 A LOT WORSE THAN IT WAS
   2 A LITTLE WORSE THAN IT WAS
   3 HAD NO EFFECT
   4 A LITTLE BETTER THAN IT WAS
   5 A LOT BETTER THAN IT WAS

3. The following set of questions is about your attitude toward a number of problems facing the nation. We are interested in how <u>you</u> feel about each of these. There are no wrong or right answers. Please indicate whether you strongly agree, mildly agree, mildly disagree, or strongly disagree (PLEASE CIRCLE THE NUMBER OF YOUR ANSWER).

	STRONGLY AGREE	MILDLY AGREE	MILDLY DISAGREE	STRONGLY DISAGREE	DON'T KNOW
To have economic growth and a high standard of living, we must increase our energy consumption.	1	2	3	4	5
The environment must be protected, even if this means the price of goods and services rise.	1	2	3	4	5
Continued economic growth is needed to improve Americans' standard of living.	1	2	3	4	5
The public needs to be involved in energy development in their community or region of the country.	1	2	3	4	5
Americans can have a better quality of life even if we are using less energy.	1	2	3	4	5
More efficient use of present energy sources, rather than developing new sources, will help solve future energy problems.	1	2	3	4	5
Future energy needs can be provided for in a market free from government interference.	1	2	3	4	5

	STRONGLY AGREE	MILDLY AGREE	MILDLY DISAGREE	STRONGLY DISAGREE	DON'T KNOW
Only through developing renewable energy resources such as solar and wind power can we solve future energy needs.	1	2	3	4	5
In this country we are not doing enough to protect the natural environment.	1	2	3	4	5
Scientists can solve any problem we might face if given enough time and money.	1	2	3	4	5

4. The energy situation has changed considerably in the past decade. How serious do you think the present energy situation is?

1 VERY SERIOUS
2 SOMEWHAT SERIOUS
3 A CONCERN BUT NOT SERIOUS
4 NOT SERIOUS AT ALL
5 DON'T KNOW

5. Some people believe that we can expect other changes in the future. How serious do you think the energy problem will be in the next ten years?

1 VERY SERIOUS
2 SOMEWHAT SERIOUS
3 A CONCERN BUT NOT SERIOUS
4 NOT SERIOUS AT ALL
5 DON'T KNOW

6. Here is a list of some aspects of the energy problem that others have considered important. In the first section circle the response if you think the item applies to the present situation only. In the right hand section mark the space provided if you think it will be a problem ten years from now. (BE SURE TO MARK EACH ITEM FOR EACH SECTION).

	PRESENTLY A PROBLEM?			10 YEARS FROM NOW?		
	AGREE	DISAGREE	NOT SURE	AGREE	DISAGREE	NOT SURE
Individuals are using too much, not conserving enough	1	2	3	1	2	3
Too much dependence on foreign oil	1	2	3	1	2	3
Too much government regulation of energy companies	1	2	3	1	2	3
Electricity/heating costs are too high	1	2	3	1	2	3
Cost of building power plants too high	1	2	3	1	2	3

	PRESENTLY A PROBLEM?			10 YEARS FROM NOW?		
	AGREE	DISAGREE	NOT SURE	AGREE	DISAGREE	NOT SURE
Environmentalists make it too difficult to find new sources of energy	1	2	3	1	2	3
Acid rain (due to burning coal)	1	2	3	1	2	3
Not enough generation capacity to satisfy future energy needs	1	2	3	1	2	3
Too much control by energy companies	1	2	3	1	2	3

What do you see as the most important issues related to the current energy situation?_______________

____

7. The following set of questions asks you how you feel about using energy in you home. Please indicate whether you STRONGLY AGREE, MILDLY AGREE, MILDLY DISAGREE, or STRONGLY DISAGREE with each.

	STRONGLY DISAGREE	MILDLY DISAGREE	MILDLY AGREE	STRONGLY AGREE	DON'T KNOW
It's important to save energy even if it doesn't save much money.	1	2	3	4	5
While others might tolerate turning down the thermostat in the winter, my own need for warmth is high.	1	2	3	4	5
Consumers have the right to use as much energy as they want and can pay for.	1	2	3	4	5
It's appropriate for residents of of America to try and save energy.	1	2	3	4	5
If the price of home energy were less I would probably use more.	1	2	3	4	5
Most individuals could use less energy if they were more thrifty around the house.	1	2	3	4	5
I have a moral obligation to try and save energy.	1	2	3	4	5
It's essential to my health and well being for the house to be well heated in winter.	1	2	3	4	5
I tried to conserve energy but it made no difference on my bill.	1	2	3	4	5

	STRONGLY DISAGREE	MILDLY DISAGREE	MILDLY AGREE	STRONGLY AGREE	DON'T KNOW
My own energy conservation will help supplies last longer.	1	2	3	4	5
Energy problems are caused by people like me using too much energy.	1	2	3	4	5
It appropriate for residents of Knoxville to try and save energy.	1	2	3	4	5
I'm the kind of person who is careful in how they use energy.	1	2	3	4	5
It's useless to try and save energy since the Utility will raise my rates if I do.	1	2	3	4	5
The energy situation is one that I watch very carefully.	1	2	3	4	5

8. Listed below are a number of ideas that have been put forth as ways of providing for this country's energy needs. How important do you think each of the following ways of supplying energy should be in the next ten years (CIRCLE YOUR ANSWER).

	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	NOT SURE
Build plants that can convert coal to natural gas and oil	1	2	3	4
Allow more drilling for oil and natural gas on government land	1	2	3	4
Expand underground mining for coal	1	2	3	4
Develop economical solar collectors	1	2	3	4
Convert oil shale to synthetic crude oil	1	2	3	4
National or local conservation programs	1	2	3	4
Expand the use of wind power	1	2	3	4
Relax auto emission rules and standards to save gasoline	1	2	3	4
Expand strip mining for coal	1	2	3	4
Import more oil and natural gas from overseas	1	2	3	4
Develop geothermal energy sources	1	2	3	4

	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	NOT SURE
Relax emission standards for power plants to burn high sulfur content fuel	1	2	3	4
Expand the use of biomass conversion	1	2	3	4

9. In this section, please provide us with some information on how you use energy. First, for each of the following items indicate how often you or members of this household have done a particular behavior <u>in the past month</u> (LEFT HAND COLUMNS). Also indicate which of the items you intend to do in the <u>next week</u>.

	HOW OFTEN IN THE PAST MONTH?				INTEND TO DO THIS WEEK?	
	VERY OFTEN	SOMEWHAT OFTEN	NOT VERY OFTEN	NOT AT ALL	YES	NO
Turn out lights when not in use	1	2	3	4	1	2
Turned heat down during day while away from home	1	2	3	4	1	2
Washed only full loads in clothes washer	1	2	3	4	1	2
Closed fireplace damper when not in use	1	2	3	4	1	2
Limit shower time	1	2	3	4	1	2
Watched less T.V. (to save energy)	1	2	3	4	1	2
Washed only full loads in the dishwasher	1	2	3	4	1	2
Hung clothes to dry rather than used clothes dryer	1	2	3	4	1	2
Set back thermostat at night	1	2	3	4	1	2
Turned dishwasher off before dry cycle	1	2	3	4	1	2
Changed washing machine cycle to use less hot water	1	2	3	4	1	2

10. Now, for each of the following items indicate whether you have done this activity already or plan to sometime in the next few months. (IF NOT APPLICABLE TO YOUR DWELLING, INDICATE THIS RESPONSE).

	HAVE DONE ALREADY	PLAN TO IN FUTURE	DO NOT PLAN TO IN FUTURE	NOT APPLICABLE
Replaced water heater with a more efficient one.	1	2	3	4
Turned down water heater thermostat	1	2	3	4
Added insulation to the attic and/or walls	1	2	3	4
Installed thermopane windows	1	2	3	4
Replaced heating system with more efficient one	1	2	3	4
Purchased thermal drapes	1	2	3	4
Installed weatherstripping on doors and/or windows	1	2	3	4
Added clock timer for water heater or thermostat	1	2	3	4
Purchased wood burning stove	1	2	3	4
Installed storm windows	1	2	3	4
Purchased solar water heater	1	2	3	4
Put plastic on windows	1	2	3	4
Added insulation blanket for water heater	1	2	3	4
Added a flow restricting shower head	1	2	3	4

11. People have many ideas about energy use around the house. For each of the following items indicate whether your AGREE or DISAGREE with each.

	AGREE	DISAGREE	DON'T KNOW
Most of the winter utility bill is for space heating	1	2	3
"R Value" refers to heat loss in a fireplace	1	2	3
Lowering the thermostat to 65 degrees will make most people more susceptible to flu and colds	1	2	3
An open damper in the fireplace has no effect on heating loss	1	2	3
Clock thermostats cannot be used for water heaters	1	2	3

	AGREE	DISAGREE	DON'T KNOW
You must turn the thermostat down at least 5 degrees to save any energy	1	2	3
The Energy Efficiency Ratio (EEF) is a number that rates energy efficiency for similar appliances	1	2	3
A 40 watt bulb uses less energy than a 60 watt bulb	1	2	3
Frost free refrigerators use less energy than manual defrost ones	1	2	3
Flow restricting shower heads don't really save energy	1	2	3

12. In the next section we are interested in your attitudes toward a few specific energy use behaviors. First, on a scale of 1 to 7, where a rank of 1 means saves you very little energy and 7 means you save a lot of energy, rate each of the following activities.

	SAVES YOU VERY LITTLE						SAVES YOU A LOT
Using less lighting in the house	1	2	3	4	5	6	7
Turn the thermostat down 2 or 3 degrees	1	2	3	4	5	6	7
Turn water heater down to 120 degrees	1	2	3	4	5	6	7
Put insulation in attic or walls	1	2	3	4	5	6	7
Put weatherstripping around doors/windows	1	2	3	4	5	6	7
Use appliances less	1	2	3	4	5	6	7
Replace old heating equipment with new	1	2	3	4	5	6	7

13. Now, for each of the following behaviors, indicate how likely or unlikely you think the stated outcomes listed below it are to occur. For example, how likely do you think it is that turning your thermostat down at night would save on your utility bill?

	VERY LIKELY	SOMEWHAT LIKELY	NEITHER	SOMEWHAT UNLIKELY	VERY UNLIKELY	DON'T KNOW
SETTING BACK THERMOSTAT AT NIGHT						
Save on utility bill	1	2	3	4	5	6
Be uncomfortable	1	2	3	4	5	6
Be healthier	1	2	3	4	5	6
Make family members unhappy	1	2	3	4	5	6
Be satisfied trying to save energy	1	2	3	4	5	6

ADDING INSULATION	VERY LIKELY	SOMEWHAT LIKELY	NEITHER	SOMEWHAT UNLIKELY	VERY UNLIKELY	DON'T KNOW
Save on utility bill	1	2	3	4	5	6
Have less money to spend on other things	1	2	3	4	5	6
Cost more than it would save	1	2	3	4	5	6
Increase the resale value of house	1	2	3	4	5	6
Satisfaction trying to save energy	1	2	3	4	5	6
TURNING DOWN WATER HEATER TO 120 DEGREES						
Save on utility bill	1	2	3	4	5	6
Not enough hot water for bath/appliances	1	2	3	4	5	6
Would not get dishes or clothes as clean	1	2	3	4	5	
Satisfaction trying to save energy	1	2	3	4	5	6
MORE ENERGY CONSERVATION IN THE UNITED STATES						
Make United States less dependent on foreign oil	1	2	3	4	5	6
Help the environment	1	2	3	4	5	6
Lower our standard of living	1	2	3	4	5	6

14. Now, looking at the same items please indicate how desirable or undesirable the stated outcome would be. Some of these ratings may appear obvious to you; for example, running out of hot water is undesirable. In such cases we are interested in knowing HOW undesirable you think it is.

	VERY UNDESIRABLE	SOMEWHAT UNDESIRABLE	NEITHER	SOMEWHAT DESIRABLE	VERY DESIRABLE
SETTING BACK THERMOSTAT AT NIGHT					
Saving on utility bill	1	2	3	4	5
Being uncomfortable	1	2	3	4	5
Being healthier	1	2	3	4	5
Family members unhappy with temperature	1	2	3	4	5
Satisfaction trying to save energy	1	2	3	4	5
ADDING INSULATION					
Saving on utility bill	1	2	3	4	5

	VERY UNDESIRABLE	SOMEWHAT UNDESIRABLE	NEITHER	SOMEWHAT DESIRABLE	DESIRABLE
Having less money for other things	1	2	3	4	5
Costing more than it would save	1	2	3	4	5
Increasing the resale value of my house	1	2	3	4	5
Satisfaction trying to save energy	1	2	3	4	5
TURN DOWN WATER HEATER TO 120 DEGREES					
Saving on utility bill	1	2	3	4	5
Not enough hot water for baths/appliances	1	2	3	4	5
Not getting dishes or clothes as clean	1	2	3	4	5
Satisfaction trying to save energy	1	2	3	4	5
MORE ENERGY CONSERVATION IN THE UNITED STATES					
Making United States less dependent on foreign oil	1	2	3	4	5
Helping the environment	1	2	3	4	5
Lowering our standard of living	1	2	3	4	5

15. The following items make use of a rating scale with seven places; please make a check in the place that best describes your opinion. Please place your mark in the middle of the spaces, not on the boundaries. Also, for each statement please rate how CERTAIN you feel about about your opinion.

Setting back thermostat at nighttime is: GOOD_______: _______: _______: _______: _______:BAD
extremely slightly neither slightly extremely

How certain are you? CERTAIN_______: _______: _______: _______: _______:UNCERTAIN
extremely slightly neither slightly extremely

Adding insulation is: GOOD_______: _______: _______: _______: _______:BAD
extremely slightly neither slightly extremely

How certain are you? CERTAIN_______: _______: _______: _______: _______:UNCERTAIN
extremely slightly neither slightly extremely

Turning down the water heater to 120 degrees GOOD_______: _______: _______: _______: _______:BAD
extremely slightly neither slightly extremely

How certain are you? CERTAIN_______: _______: _______: _______: _______:UNCERTAIN
extremely slightly neither slightly extremely

Conserving more energy in the United States GOOD_______: _______: _______: _______: _______:BAD
extremely slightly neither slightly extremely

How certain are you? CERTAIN_______: _______: _______: _______: _______:UNCERTAIN
extremely slightly neither slightly extremely

16. We would also like to know how you think other people view your energy using activities. Please rate how likely others are to support your energy use behaviors. These questions are also rated on a five point scale.

Most people who are important to me think I should try to save more energy	LIKELY	______: extremely	______: slightly	______: neither	______: slightly	______: extremely	UNLIKELY
Most people who are important to me think I should weatherize my home	LIKELY	______: extremely	______: slightly	______: neither	______: slightly	______: extremely	UNLIKELY
Most people who are important to me think I should turn my water heater temperature down	LIKELY	______: extremely	______: slightly	______: neither	______: slightly	______: extremely	UNLIKELY
Most people who are important to me think I should replace existing appliances for more efficient ones	LIKELY	______: extremely	______: slightly	______: neither	______: slightly	______: extremely	UNLIKELY
Generally, I want to do what most people think I should do	LIKELY	______: extremely	______: slightly	______: neither	______: slightly	______: extremely	UNLIKELY

17. Some energy behaviors are more difficult than others for some people to do. Please rate how difficult each of the following are to you.

Nighttime thermostat setback	DIFFICULT	______: extremely	______: slightly	______: neither	______: slightly	______: extremely	EASY
Adding insulation	DIFFICULT	______: extremely	______: slightly	______: neither	______: slightly	______: extremely	EASY
Turn down water heater temperature	DIFFICULT	______: extremely	______: slightly	______: neither	______: slightly	______: extremely	EASY

We are also interested in your views on the utility that provides electricity and gas. Please answer the following.

18. Overall the quality of service I receive from KUB has been:
   1 EXCELLENT
   2 SATISFACTORY
   3 UNSATISFACTORY
   4 POOR

19. In the past six months, about how many times, if any, have you called KUB with a problem of any sort?
   1 ZERO TIMES (GO TO Q-22)
   2 ONE TIME
   3 TWO OR THREE TIMES
   4 FOUR TIMES OR MORE

20. Which of the following items best describes the nature of your call:
   1 HAD DIFFICULTY PAYING THE BILL (CALLED TO MAKE ARRANGEMENTS)
   2 BILL WAS INCORRECT (OVER-READ THE METER)
   3 BILL WAS INCORRECT (UNDER-READ THE METER)
   4 MECHANICAL OR ELECTRICAL PROBLEMS
   5 BEGAN OR ENDED SERVICE
   6 CHANGE OF BILLING ADDRESS
   7 OTHER (PLEASE SPECIFY)____________________________

21. Which of the following categories best describes your satisfaction with the utility's response to your problem:

1 VERY SATISFACTORY
2 SOMEWHAT SATISFACTORY
3 SOMEWHAT UNSATISFACTORY | IF UNSATISFACTORY
4 VERY UNSATISFACTORY | WHY?____________________

22. The following list indicates some of the programs KUB is sponsoring presently. Please indicate whether or not you have heard of the program, participated in the past but not now, presently participate, or plan to participate in the future (FIRST SECTION). Also, indicate how satisfied you are with the program(s) which you have or presently participate in.

	HAVEN'T HEARD OF PROGRAM	PARTICIPATED IN PAST (not now)	PRESENTLY INVOLVED	PLAN TO IN FUTURE	VERY SATISFIED	SOMEWHAT SATISFIED	NOT SATISFIED
Monthly budget plan	1	2	3	4	1	2	3
Tree replacement program	1	2	3	4	1	2	3
Electric appliance repair	1	2	3	4	1	2	3
Red tag meters	1	2	3	4	1	2	3
Bank draft billing	1	2	3	4	1	2	3
Third party notice	1	2	3	4	1	2	3
Special payment date for social security recipients	1	2	3	4	1	2	3
Lease purchase plan for gas water heaters	1	2	3	4	1	2	3
Fuel cost comparison	1	2	3	4	1	2	3
Gas appliance repair	1	2	3	4	1	2	3
Gas pilot service	1	2	3	4	1	2	3
24 hour general electric safety service	1	2	3	4	1	2	3

The next set of questions are about some aspects of your household which might affect energy use. Again, all your answers are strictly confidential and will never be associated with your name.

24. Do you have a thermostat for controlling the heat inside this home?

1 YES
2 NO (SKIP QUESTIONS 26, 27, 28)
3 DON'T KNOW

25. Do you own or rent this dwelling?

1 RENT
2 OWN
3 OTHER

26. At what temperature is the thermostat usually set in the winter while you are home before you go to bed?

temperature__________

27. At what temperature is the thermostat usually set while you are sleeping?

temperature__________

28. At what temperature is the thermostat usually set when no one is at home (for example, when you are at work)?

temperature__________

29. What is the fuel for the main heating system in this dwelling?

1 NATURAL GAS
2 ELECTRICITY
3 BOTTLED GAS
4 FUEL OIL
5 COAL
6 SOLAR ENERGY
7 WOOD—chords of wood used per winter

number__________

8 KEROSENE HEATER—GALLONS USED PER MONTH

gallons__________

9 OTHER SOURCE (SPECIFY)__________
10 HAVE NO HEAT

30. Do you have a washing machine?

1 YES
2 NO

If yes, how many times is it used per week?

number__________

31. Do you have a clothes dryer?

1 YES
2 NO

If yes, is it gas or electric?

1 GAS
2 ELECTRIC

32. How many rooms are there (not counting bathrooms, foyers, hallways, or balconies)?

number__________

33. About how old is this dwelling?

1 LESS THAN 1 YEAR OLD
2 1 TO 2 YEARS
3 3 TO 5 YEARS
4 6 TO 10 YEARS
5 10 TO 15 YEARS
6 16 YEARS OR MORE
7 DON'T KNOW

34. Do you see your utility bill?

1 YES
2 NO

35. When comparing monthly bills, do you look at the cost in terms of differences in dollars, or in terms of kilowatts of usage?

1 DOLLARS
2 KILOWATTS OF USAGE

36. Do you have a water heater?

1 YES
2 NO

37. What temperature is the water heater set on?

1 temperature__________

2 DON'T KNOW

o

38. Is that an electric or gas water heater?

1 GAS
2 ELECTRIC

39. Do you have a dishwasher?

1 YES
2 NO

40. How would you characterize the dwelling in which you live?

1 TRAILER
2 DETACHED SINGLE FAMILY HOUSE
3 3 FAMILY HOUSE, 2 UNITS SIDE BY SIDE
4 DETACHED 3-4 FAMILY HOUSE
5 ROW HOUSE (3 OR MORE UNITS IN AN ATTACHED ROW)
6 APARTMENT HOUSE (5 OR MORE UNITS 3 STORIES OR LESS)
7 APARTMENT HOUSE (6 OR MORE UNITS 4 STORIES OR MORE)
8 APARTMENT IN A PARTIALLY COMMERCIAL STRUCTURE
9 OTHER (SPECIFY)__________

Finally, I would like to ask a few background questions. This information is for summarizing the results. Individuals will never be identified.

41. In what year were you born?

year ____________

42. Are you:
1 MARRIED
2 DIVORCED
3 WIDOWED
5 NEVER MARRIED (SKIP NEXT QUESTION)

43. Do you have any children?
1 YES
2 NO

If yes, how many children are presently living with you?

number ______________________________

Please indicate the ages of the children living with you

First child _________ second child _________

Third child _________ fourth child _________

Fifth child _________ sixth child _________

others ______________________________

44. Which of these best describes your usual stand on political issues?
1 STRONGLY LIBERAL
2 MODERATELY LIBERAL
3 SLIGHTLY LIBERAL
4 MIDDLE OF THE ROAD
5 SLIGHTLY CONSERVATIVE
6 MODERATELY CONSERVATIVE
7 STRONGLY CONSERVATIVE

45. Are you:
1 EMPLOYED FULL TIME
2 EMPLOYED PART TIME
3 NOT EMPLOYED OUTSIDE THE HOME
4 UNEMPLOYED SEEKING WORK
5 STUDENT
4 RETIRED

46. Your usual occupation when employed (or before retirement).

________________________ JOB TITLE

________________________ MAJOR DUTIES

46. Which of these broad categories best describes the number of square feet in your home? Do not include a garage, or unfinished basement unless these are heated.
1 LESS THAN 500 SQUARE FEET
2 501 TO 1000 SQUARE FEET
3 1001 TO 1500 SQUARE FEET
4 1501 TO 2000 SQUARE FEET
5 2001 TO 2500 SQUARE FEET
6 MORE THAN 2500 SQUARE FEET

47. Your sex is:
1 MALE
2 FEMALE

48. Your racial or ethnic group is:
1 WHITE
2 BLACK
3 MEXICAN AMERICAN
4 ASIAN AMERICAN
5 AMERICAN INDIAN
6 OTHER

49. What is your usual political preference?
1 STRONGLY DEMOCRATIC
2 MILDLY DEMOCRATIC
3 INDEPENDENT
4 MILDLY REPUBLICAN
5 STRONGLY REPUBLICAN
6 NO PREFERENCE
7 OTHER

50. What is your religious preference?
1 CATHOLIC
2 JEWISH
3 PROTESTANT (SPECIFY DENOMINATION) ____________________
4 NONE
5 OTHERS (SPECIFY) ______________________________

51. About how often do you attend religious services?
1 MORE THAN ONCE A WEEK
2 ABOUT ONCE A WEEK
3 A FEW TIMES A MONTH
4 ABOUT ONCE A MONTH
5 A FEW TIMES A YEAR
6 ONCE A YEAR
7 NEVER

52. Your highest level of education?
1 NO FORMAL EDUCATION
2 GRADE SCHOOL
3 SOME HIGH SCHOOL
4 HIGH SCHOOL GRADUATE
5 SOME COLLEGE
6 COLLEGE GRADUATE
7 SOME GRADUATE WORK
8 GRADUATE/PROFESSIONAL DEGREE

D

53. Which of these broad categories best describes you total family income before taxes for 1984.

1 Less than $10,000
2 $10,000 to $14,999
3 $15,000 to $19,999
4 $20,000 to $24,999
5 $25,000 to $29,999
6 $30,000 to $34,999
7 $35,000 to $39,999
8 $40,000 to $44,999
9 $45,000 to $49,999
10 $50,000 or MORE

We are very appreciative of the help you have given us. Your responses to this survey will help provide a basis for understanding energy use in the home. We would additionally like to compare people's responses to their actual use of energy in their home. For this reason, we have included a consent form (BELOW) asking for your permission to allow the utility to release energy use information for your home for the past few months. Again, this information will be used for scientific purposes only and will never be associated with individual persons. After you have read and signed the form, please detach it from the questionnaire.

Please take a few minutes and check that you have answered all the questions on every page. Once you have completed the questionnaire, please refold it and mail it to us in the enclosed postage-paid envelope. Be sure to include the consent form even if you have not agreed to allow the utility to release your energy use information. Once again, thank you very much for your help.

APPENDIX B

SAMPLE COMPARISONS WITH DEMOGRAPHIC DATA

This appendix examines the closeness of fit between the completed study sample and selected census demographics as well as a few other selected statistics. The sample was drawn from the customer listings of the Knoxville Utility Board. The actual method of customer selection is discussed in the introduction of this study. Like most utility boards, the area serviced is not bounded by political or county boundaries. KUB in particular services a very wide area of East Tennesseee. The counties included in this area are Knox, Anderson, Grainger, Union and Jefferson. Knox county is the center of the utility district and has the highest population concentration. For this reason, demographic comparisons have been divided into the total sample versus the aggregated statistics of the six counties. Some comparisons will be made for Knox county and a subsample of Knoxville respondents (as defined by zip code). KUB does not serive any of these couties completely. Thus census estimates provide only a crude approximation to the actual area of the utility board.

Table 1 compares age distribution between the sample and census estimates broken down by aggregate counties and Knox county. Examining columns one and two first, some

Table 1 Sample Comparison of Age with Census Estimates of Counties Adjoining the Knoxville Utility Board (percentage in parentheses).

Age	Sample (total)	Aggregate Counties	Sample (Knoxville)	Knox County Only
20-24	15 (5.3)	49456 (15.0)	13 (6.0)	35629 (15.8)
25-29	26 (9.1)	42722 (12.6)	21 (9.6)	29591 (13.2)
30-34	37 (13.0)	38288 (11.3)	30 (13.8)	25320 (11.3)
35-39	30 (10.5)	30296 (8.9)	23 (10.6)	19143 (8.5)
40-44	21 (7.4)	27233 (8.0)	16 (7.3)	17129 (7.6)
45-49	17 (6.0)	25524 (7.5)	12 (5.5)	16318 (7.3)
50-54	30 (10.5)	25179 (7.4)	22 (10.1)	16158 (7.2)
55-59	25 (8.8)	24290 (7.1)	22 (10.1)	15551 (6.9)
60-64	29 (11.5)	22692 (6.7)	25 (11.5)	14384 (6.4)
65+	55 (19.3)	54512 (16.0)	34 (15.6)	35757 (15.9)

undersampling of 20-24 years appears to have occured (5.3 percent in the sample versus 15 percent) while there is a distinct oversampling in the 60 and above categories. The middle categories appear reasonable close. The Knoxville subsample does not differ markedly from the total sample. This is due primarily to the fact that Knoxville respondents represent 76.5 percent of the completed sample. Here the oversampling of older respondents is not so obvious. Since there is a tendency for older Americans to be more energy conscious, it is likely that there is a bias toward the more energy conscious elements of the population. In this sense, the data may provide rather liberal estimate of the degree of energy consciousness in the utility district.

Table 2 compares income statistics for census estimate with the study sample. Columns one and two show that there has been an under sampling of lower income (less than $10,000) persons (20.4 percent in the sample versus 34.3). This problem undoubtedly results in mail questionnaires where lower economic status individuals are specifically oversampled. At the upper end of the scale there is a distinct over sampling. Those in the $35,000 and above categories constitute 27.7 percent of the sample versus 9.6 percent for the counties. Comparison for the Knoxville subsample and Knox county (columns 3 and 4) show very little difference for the total sample comparisons.

Table 2 Sample Comparison of Income with Census Data from Couties Adjoining the Knoxville Utility Board (percentages in parentheses).

Income	Sample (total)	Aggregate Counties	Sample Knoxvile Only	Knox County
Less than 10,000	58 (20.4)	59794 (34.3)	42 (19.3)	40966 (34.7)
10,000-14,999	40 (14.0)	29433 (16.9)	29 (13.3)	19005 (16.1)
15,000-19,999	29 (10.2)	25665 (14.7)	21 (9.6)	16558 (14.0)
20,000-24,999	33 (11.6)	19635 (11.3)	21 (9.6)	13216 (11.2)
25,000-34,999	46 (16.1)	23058 (13.2)	39 (17.9	16208 (13.7)
35,000-49,999	35 (12.3)	11095 (6.4)	27 (12.4)	7982 (6.8)
50,000+	44 (15.4)	5628 (3.2)	39 (17.4)	4240 (3.6)
Total	285	174307	218	118181

With an oversampling of older respondents it is of course indicative of a greater proportion of higher income individuals. Due to the upscale income bias, the study probably over estimates the extent of conservation behaviors actually occuring in the population, at least for those behaviors which require material resources.

Table 3 compares sample and census estimates for education. Columns one and two show a distinct oversampling of the better educated. This is true in all categories but particularly so at the upper-end of the scale. The Knoxville sample only shows an undersampling of the grade school group in particular (6.6 percent versus 25.4 percent). Again, this problem reflects on the sample estimates since age, income and education more than likely affect attitudes toward conservation in the home. Several factors probably help account for this problem. First, the study focuses on home energy use--individuals who live in apartments or who use alternative fuels (e.g., coal, wood) may not have felt that the study was appropriate for their circumstances. Indeed, many of the personal notes received via the mail or telephone calls suggests this. Second, the questionnaire was rather intellectually demanding; those who could not read or or read well would be unlikely candidates to return the questionnaire. Third, individuals in the college age category are probably more mobile and less

Table 3 Sample Comparison for Education with Census Data from Counties Adjoining the Knoxville Utility Board (percentages in parentheses).

Education	Sample (total)	Aggregate Counties	Sample Knoxville	Knox County
Grade School				
0-8 Years	35 (15.5)	72266 (24.8)	14 (6.6)	39013 (25.4)
High School				
9-11 Years	26 (9.1)	43420 (14.9)	22 (10.1)	28417 (18.9)
12 Years	69 (24.2)	90742 (31.2)	50 (22.9)	59270 (38.5)
College				
1-3 Years	61 (21.4)	37017 (12.7)	48 (22.0)	276128 (17.6)
4+ Years	85 (29.8)	47506 (16.3)	78 (35.8)	35550 (23.1)
Total	276	290951	212	153828

likely to spend time filling out the questionnaire. Such individuals, where they live away from home, are disproportionately likely to live in group quarters of some type, or renting, and perhaps less likely to define energy conservation as relevent to their particular circumstances. As Table 5 demonstrates (first and second rows) the study oversampled home owners (75.2 percent versus 63.2 percent) although not overtly so.

Finally, Table 4 and rows three and four of Table 5 examine comparisons for utility related statistics. Table 4, row one, compares the percent who indicated that they were "presently involved" in the monthly budget program at KUB (which prorates averaged utility bills over the 12 month period). The sample figure is rather close to the KUB figure (10.1 percent versus 8.1). However, the sample figure may be biased as it represents a subsample of only 24 cases whereas the total number of KUB customers participating in the program is 10,231.

To summarize here, the sample for the home energy study generally overrepresents older, better educated, high income home owners. Some of the factors contributing to this outcome are discussed. However, the sample characteristics do not raise as much of a problem here as perhaps other studies. Generally, home owners who upscale in these selected characteristics represent the most mobilizable

Table 4 Comparison Between Sample and Two Selected Utility Statistics--Percent in Monthly Budget Program and Percent Receiving Gas Service.

	Sample	KUB
Monthly Budget Program	10.1[1]	8.1
Percent Receiving Gas Service	11.8[2]	10.8

[1] Reflects an estimated percentage. The denominator (residential customers) includes an overlap between customers receiving both electric and gas service (they are counted twice). This is done to compensate for the fact the KUB denominator is contructed in the same fashion.

[2] Percent only of those individuals who signed consent forms to allow access to customer accounts.

Table 5 Percentage of Owners Versus Renters for Knox County and Sample (Knoxville residents only), and Percent of Electric versus Gas Water Heaters.

	Sample (Knoxvile Only)	Knox County
Own	164 (75.2)	74565 (63.2)
Rent	54 (24.8)	43386 (36.8)
Electric Water Heaters	205 (95.0)	108020 (85.5)
Gas Water Heaters	11 (5.1)	18336 (14.5)

portion of the population for implementing conservation programs. Lower scale residents or renters may be unable to implement energy improvements in their dwelling. Lower income home owners could conceivably profit from conservation improvements, but not be able to capitalize on such where resources are diverted to alleviating short term financial needs. Second, while the sample may not represent good point estimates of the population, the distribution of pertinent variables appears reasonable enough such that the nature of the relationships between variables is not seriously distorted.

Finally, an analysis of response rates for each of the 60 clusters (20 routes) in the sample was performed. Each of the clusters had an original N of 12 with 3 clusters per route. The purpose of the analysis was to examine whether or not the overall response rate (42 percent) was randonly distributed over the geographic area of the sample. Each of the routes were classified as either urban, mixed with a predominance of urban, mixed with a predominance of rural, and all rural. This classification is based strictly on zip code for the respondent's home address. While this method is a crude one for estimating urban/rural differences, it will suffice. Based on this classification the response rate (unadjusted) for urban is 41.4 percent, for mixed predominantly rural urban is 38.1 percent, for mixed predominalty rural is 29.2 percent and for all rural is 41.7 percent. With the exception of the last figure, the data would suggest that the urban area had a higher response rate. The last figure represents only 2 routes which could be categorized as all rural. Route 9 which includes Mascott and route 12 which includes Corryton can both be reclassified as urban although they do not have zip codes beginning with 379. Using this adjustment both routes could be put into mixed with a greater portion rural. This category's response rate would then become 35.4 percent. This data suggests one probably basis for the somewhat low overall response rate for the sample; i.e., rural routes generally did not produce has high a response rate.

Demographic Comparison Between Sample and All Electric Customers

Demographic comparisons were made between all electric customers and overall sample for possibility of bias. Table 6 examines three demographic variables for this purpose--income, age and education. Results indicate a reasonably close fit for both income and age. Some selectivity appears to be working in the case of education, however. In particular, the category grade school or less is underselected. This may be due to the possibility that such persons are more likely to be rural and served by utilities

Table 6 Comparison of Income, Age and Education for All Electric Group and Overall Sample (percentages shown)

Income	All Electric Homes	Overall Sample
less than $10,000	20.0	20.4
$10,000-$14,999	14.4	14.0
$15,000-$19,999	11.2	10.2
$20,000-$24,999	13.6	11.6
$25,000-$34,999	19.2	16.1
$35,000-$49,999	13.6	12.3
$50,000+	12.5	15.4

Age		
20-24	5.3	6.2
25-29	9.1	13.4
30-34	13.0	12.6
35-39	10.5	9.5
40-44	7.4	7.1

Table 6 (con't)

Age	All Electric Homes	Overall Sample
45-49	6.0	6.3
50-54	10.5	11.8
55-59	8.8	8.8
60-64	11.5	8.7
65+	19.3	15.8

Education		
Grade School 0-8	1.6	15.5
Some High School	13.1	9.1
High School Grad.	27.0	24.2
1-3 Years College	25.4	21.4
4 Years College	32.0	29.8

other than KUB. Thus the overall mean for education is slightly higher in the all electric group than the overall sample (5.0 versus 4.7 respectively).

APPENDIX C

GLOSSARY

Attitude(act): Attitude toward the act or behavior. In both Fishbein/Ajzen and Triandis models, this term is conceptualized as an evaluative response toward a behavior.

Attitude Certainty: Certainty to which an attitude statement is made measured in terms of a semantic differential scale.

Attitude(obj): Attitude toward the object; i.e., toward the general actvity (e.g., saving energy) as opposed to attitude toward a particular behavior (e.g., turning down thermostat) conceptualized as a general evaluation of the object.

Behavioral Intention: Respondent's intention to perform a particular behavior conceptualized by both Fishbein/Ajzen and Triandis as varying along degrees of likelihood.

Conservation Ethic: General belief scale measuring personal obligation to save energy.

Curtailment Behavior: Type of conservation activity involving a reduction of energy services (e.g., using less hot water).

Disgruntled Conserver: General belief scale measuring respondent's dissatisfaction with prior efforts to conserve.

Efficiency Behavior: Type of conservation activity involving better use of energy services (e.g., washing only full loads of laundry).

Efficiency Improvement: Type of conservation activity involving home retrofit or appliance change (e.g., adding insulation to attic).

Energy Knowledge Score: 10 item scale measuring respondent's general knowledge of residential energy use.

Expectancy Value: Beliefs regarding the expected value or utility of performing a given action, conceptualized by Triandis and Fishbein/Ajzen as the perceived probability of a given occurence resulting from the behavior multiplied by the evaluation (i.e., positive-negative) of that occurence. For Fishbein and Ajzen, expectancy value is another measure of attitude and should be highly correlated with attitudinal affect.

Folk Assessment of Conservation Behavior: Refers to either: (1) the measurement of personal energy consumption in dollars or gallons rather than standard energy units, or (2) respondent's rank ordering of energy using activities according to the perceived quantity of energy consumed.

Habit: Behavioral routine conceptualized by Triandis in terms of strength or regularity of prior activity.

Health Concern: General belief scale measuring respondent's concern for personal health consequences of lowering household temperature.

Perceived Difficulty of Behavior: Respondent's perception of difficulty associated with performing specific conservation act measured in terms of a semantic differential.

Personal Normative Belief: Respondent's felt moral obligation to save energy.

Role Belief: Belief that an action is prescribed by a particular group norm; e.g., Knoxvillians should try to save energy.

Self Concept: Individual's energy self concept; i.e., whether they view themselves as conservation minded or not.

Subjective Norm: Perception of relevant others' normative expectations, conceptualized by Fishbein/Ajzen and Triandis as the likelihood that other's expect individual to perform a given behavior multiplied by the willingness to comply with such expectations.

VITA

Carl Michael Hand was born in Beaufort, South Carolina, son of Jesse and Maria, On October 24, 1956. He attended elementary school in many states through the South, California and Hawaii. He attended Towers High School in Decatur, Georgia and graduated from Nathan Forest High School in Jacksonville, Florida in 1975.

In September 1975, he entered St. Meinrad College in St. Meinrad, Indiana. In September 1977, he entered Belmont Abbey College in Belmont, North Carolina and was graduated from that college in May of 1979 with an undergraduate major in sociology. He entered the Graduate School of the University of Tennessee, Knoxville, in September 1979. He received the Master of Arts degree with a major in Sociology in March 1982 and a Doctor of Philosophy degree in Sociology in June 1986.

He is currently an Instructor of Sociology at Tulane University, New Orleans, Louisiana.