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PROJECT MONITOR - PART II

FINAL REPORT

Conservation in
Small Business:
An Exploratory Study

DEPARTMENT OF ENERGY
Contract No. EC-77-C-01-8702

AC01-77CS10220

Submitted by
THE RESEARCH INSTITUTE FOR ENERGY POLICY

University of Pittsburgh

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August 1979

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CONSERVATION IN SMALL BUSINESS: AN EXPLANATORY STUDY

Project Monitor undertook more than a study of energy conservation among household consumers of energy in Allegheny County. On an exploratory basis, we also examined the energy conservation attitude and behavior of small samples of small business owner/operators in the County. Two general types of small businesses were selected for study--manufacturing concerns and retail stores. In each case, we chose to focus upon certain types of enterprises only, specified by the type of product manufactured or sold. For the retailers, moreover, the sample members were determined by first restricting the sampling frame to about ten commercial areas of the county. Thus, in neither case have we achieved a fully representative sample of businesses. Our results nevertheless, provide useful information on the response of these small Allegheny County businesses to the energy situation in America today and may provide some generalizable results. Because the samples were not selected to ensure representativeness of the full population and because we had precious little prior information to guide us, we cautiously label this part of the study as exploratory.¹

Including small businesses with a study of households was premised on the expectation that each of the three types of consumers could be characterized by the same decision-making model in the energy area. The model is that of a single decision-maker, or at most of several decision-makers with similar casts of mind in almost constant contact with one another, making the important choices in energy usage. The survey method seems particularly well suited to illuminating factors involved in energy usage for single decision-maker situations. Once we move beyond the single decision-maker, a situation which is particularly

¹No other published study concerning small business and energy was found in our literature reviewed. Samuel I. Doctors, *et. al.*, "The Response of Smaller Manufacturers to the Energy Environment," Journal of Small Business, Winter 1978.

noticeable in larger business firms, the survey method (though not interviewing) becomes less appropriate and more intensive methods of investigation are required to capture the interaction between critical decision-makers in the environment.

We have not subjected our business data to the same extensive analysis to which we subjected our household data. In part, this is because we have less confidence in our business data. They were not selected in a way that made them generalizable to the entire manufacturing or retail populations. Furthermore, so little seems to be known about the energy-related behavior and attitudes of these types of consumers that we were forced to design questionnaires which could explore a number of somewhat different hypotheses and which utilized several exploratory approaches to data collection, and there was no directly related literature that could be used to guide our development activities. In conducting the study, we were constantly aware of how exploratory it was--how it was more likely to sharpen our hypotheses for future work than to yield immediately useful results for policy purposes. Our reservations and expectations were borne out in subsequent analysis. Based on our analysis, we are far less able to explain the behavior of our business firms than our households. Thus, the second reason why we shall say less about the business part of the study is that we have, as expected, found less that warrants discussion at this stage. The factors which are related to small business conservation of energy remain mostly unspecified. Their detection awaits more systematic study of small businesses--guided, we hope, by what has been learned from our initial undertaking.

The results from our business study are presented in two sections. Section I discusses the analysis of small manufacturing firms, while Section II covers the analysis of the small retail firms. These two sections have basically

parallel forms. In each, our major focus is upon the relationship between a series of attitudinal, business, situational, and perceptual indicators and energy usage. This analysis is meant to cover much the same ground as the household analysis presented in the Monitor Report, Part I, but the sample sizes were substantially smaller. In each part, we also consider the impact of Project Pacesetter and of the coal strike and the general energy situation.

SECTION I

ENERGY CONSERVATION AMONG SMALL MANUFACTURING ESTABLISHMENTS

Introduction

This chapter which reports our findings on the energy conserving behavior of 92 smaller manufacturers is based on the results from personal interviews with the owner/operators of these 92 businesses. The chapter consists of five basic parts.

The first part identifies the major characteristics of our sample businesses and respondents. The second part identifies the dominant patterns in the energy conserving behavior of these firms. The third part examines the individual relationships between firm/respondent characteristics, attitudes and energy conserving behavior. The fourth part examines the collective relationship of our demographic, attitudinal and information variables and adoption of conserving options and summarizes some implications of our findings for public and private agencies seeking to motivate conserving behavior. The fifth part assesses the impact of Project Pacesetter and discusses some indications of the effects of the 1978 coal strike.

Sample Characteristics

The sample firms turned out to be uniformly small in size, with reasonably well educated owners/managers who are predominantly over 40 years in age. These firms are characterized by a wide diversity of manufacturing related functions (warehousing, distribution, service, etc.). Natural gas and electricity are by far the most significant energy sources for them.

As shown in Table 1, over 90 percent of these manufacturing firms have annual sales of 2 million dollars or less. None of the firms have annual sales in excess of 5 million dollars. These relatively small sales figures are, of course, reflected in low employment levels. Approximately 65 percent of the firms employ less than 20 full-time employees (see Table 2). It is evident that our sample can be termed small manufacturing firms.

The two principal similarities among personal characteristics of our respondents are educational attainment and age level. Over 93 percent have at least a high school education and over 30 percent are college graduates (see Table 3). Our respondents are fairly evenly distributed with respect to age, (see Table 4): 25 percent are under 40 and 25 percent are over 60 years in age. Age level and educational attainment are not correlated.

Thirty percent of the firms report that one individual within the firm is generally consulted about energy related matters. In over 80 percent of these firms, that individual is the president/manager/owner. In the remaining firms the person charged with energy related responsibilities most often reports to the president/manager/owner.

As shown in Table 5, the purposes for which the different energy sources are utilized follow a consistent pattern. Over 95 percent of the firms reportedly used natural gas for plant protection heating, comfort heating and air condition and 72.5 percent used natural gas in their manufacturing processes.

Table 1

SALES VOLUME OF SAMPLE FIRMS

	Sales Level				
	Less than \$500,000	\$500,000- \$1,000,000	\$1 - \$2 million	\$2 - \$3 million	\$3 - \$5 million
% of Firms	60.5	15.1	16.3	5.8	2.3

Table 2

FULL-TIME EMPLOYEES

	Employee Levels					
	1-9	10-19	20-29	30-39	40-49	over 50
% of Firms	44.0	21.0	9.9	15.4	2.2	6.6

Table 3

EDUCATIONAL ATTAINMENT OF SAMPLE RESPONDENTS

	Educational Level					
	Grade School or Less	Some High School	High School Grad/Technical	Some College	College Grad	Post Grad
% of Respondents	4.6	2.3	34.5	27.6	25.3	5.7

Table 4

AGE DISTRIBUTION OF RESPONDENTS

	Age Levels				
	Under 30	30-39	40-49	50-59	60-69
% of Respondents	12.5	12.5	21.6	28.4	25.0

Table 5
UTILIZATION OF ENERGY SOURCES

<u>Purpose Used</u>	<u>Energy Sources</u>			
	<u>Electricity</u>	<u>Gas</u>	<u>Oil</u>	<u>Other</u>
Plant Protection Heating	1.1	95.5	4.0	
Comfort Heating	4.6	95.4	1.1	
Air Conditioning	0.0	98.4	1.6	
Running Equipment/Machinery	88.9	2.2	0.0	8.9
Heating for Manufacturing Process	17.6	72.5	2.0	7.9
Cooling for Manufacturing Process	84.8	3.0	6.1	6.1

Electricity is utilized by over 84 percent of firms for running equipment/ machinery and for cooling in the manufacturing process. It is apparent that our sample firms are not dependent on fuel oils and other energy sources (e.g., coal, kerosene, propane) for their energy needs.

We also questioned firms about some of their manufacturing related activities. Thirty firms (33 percent) are engaged in warehousing/storage, 23 (25 percent) in distribution and delivery, 25 (27 percent) in service and repair, and 17 (18 percent) in assembly.*

The ability of firms to interchange fuels and electricity indicates flexibility in the utilization of energy sources. Over 30 percent of the sample firms indicated they can substitute alternate energy sources for natural gas, (see Table 5). Electricity and propane are about evenly split as the energy sources which are substituted.

*Some firms were engaged in more than one activity, thus, the total is more than 92. The percentages are based on the sample size of 92.

It is evident from the above that these enterprises can safely be classified as small manufacturing firms. It also seems safe to suggest that because of their small size their decision-making processes are dominated by a single individual--the owner/manager. Thus, these firms fall within the domain of organizations we wished to investigate (i.e., firms where one individual would probably have sole responsibility for all the firm's major decisions).

Energy Conservation Patterns

A total of twenty-one (21), energy related activities (the preponderant proportion of which are energy conserving in nature) were investigated and will be discussed in this section. These activities were originally chosen to provide a mix of activities with different characteristics (e.g., different levels of required investment, etc.). We report here our categorization of these energy related activities and describe the extent to which conservation options have been adopted or rejected within each category.

We used two major criteria to categorize these energy related activities. The level of investment category is subdivided into three groups: (a) activities which generally do not require any investment; (b) activities which would normally require only a slight expenditure of resources, and (3) activities which in most instances would necessitate a considerably greater commitment of resources than would be the case in (b) above (see Figure 1).

The generic nature of the energy activities as shown in Figure 2 was also categorized into three groups: (a) heating, lighting and ventilation activities; (HVL) (b) insulation related activities, and (c) miscellaneous activities. The last group of activities might be best defined as those which do not fall within (a) or (b). The intent of this grouping of activities is to facilitate the investigation of the relationship between levels of required investment and different types of energy use activities and energy conserving behavior.

Figure 1

ENERGY USE ACTIVITIES

Conserve
 Might Conserve
 Reject Conservation

0 10 20 30 40 50 60 70 80 90 100

Turn off exterior lights

Use spot lighting

Lower thermostat

Fans rather than A.C.

Use ducts and fans

Timers on light switches

Let A.C. at 80°F

Set thermostat at 65°F

Water heaters at low temp.

Shut off heat in unused areas

Weatherstripping doors/windows

Use roof/attic insulation

Insulate pipes/ducts

Install storm doors/windows

Change design of products

Recover waste heat

Bring management/employees together

Convert to alternate fuels

Turn off idle machinery

Regular maintenance for kilns/furnaces

Change Packaging

Figure 2
 ALTERNATE ENERGY USES: DEGREE OF REQUIRED INVESTMENT
 PERCENTAGE OF FIRMS ENGAGING IN ACTIVITY

Ten of the activities in Figure 1 involve heating, lighting and ventilation. In the case of six (6) of these activities (turning off exterior lights, lowering thermostat by 8 degrees or more in winter when plant is closed, using fans rather than air conditioning, setting thermostat at or below 65° F during winter, setting water heaters at their lowest temperature settings and shutting off heat in unused areas) energy conserving behavior is practiced by a clear majority. Given the high proportions of respondents already reporting energy conserving behavior among these activities and the small percentage (in no case greater than 18 percent) indicating they might consider adoption of these practices, the subset of HVL activities would provide little return by way of enhanced energy conserving behavior for energy conservation program efforts.

In the case of four activities (using general overhead lights, installing ducts and fans to recycle warmer air, placing timers on light switches in little used areas and recovering waste heat) those reporting they have not adopted these practices outnumber those who report they have done so. Approximately 45 percent or more of the respondents indicated they would not consider these conserving activities. For whatever reasons, respondents appear to be particularly against the adoption of these energy saving practices. One reason might be that for this group of four HLV activities, a greater degree of management initiative and commitment of time and resources is generally required than for the six HVL activities discussed earlier. This latter group of (six) activities would seem to be easier to implement than the former group. In view of the high percentage of respondents reporting they would not consider these activities and the generally small percentage (below 15 percent) indicating they would consider these activities, there is relatively little potential for public/private programs to initiate energy conserving behavior. Federal and

private campaigns seeking to initiate and/or influence a substantial amount of energy conservation will have to look for other conserving facilities.

One such set of activities may be different kinds of insulation. Four insulation related activities are shown in Figure 1. In only one, (weatherstripping doors and windows), did more respondents indicate conserving behavior than not. In the remaining three, those who reject the conservation option outnumber those who report that they conserve by an average of two to one. More significantly, from the perspective of influencing conserving behavior, 32 percent suggest they would consider weatherstripping doors and windows, 20 percent would consider insulating heat-carrying pipes and ducts, 18 percent would consider bringing roof or office insulation up to manufacturer's recommended levels, and 28 percent would consider installing storm doors and windows. A substantial set of small manufacturers are therefore already contemplating different forms of insulation. Thus, insulation related activities would constitute a profitable focus for federal agency and private campaign efforts to spur conservation behavior. In the context of these firms' energy conservation decision-making, some form of incentive, and/or better information (e.g., a tax incentive, information on specific savings due to insulation investments) may be all that is needed for resources to be committed to investment in insulation activities.

Within the category of miscellaneous energy use activities, two energy conserving options are related to product design. In both cases, there is very little potential for energy conserving behavior. Over 75 percent of our respondents suggest they would not change the design of their products to reduce processing energy requirements or change packaging to reduce energy use. Not more than 12 percent would consider adopting either of these approaches

to the reduction of energy use. These responses may be an indication that small manufacturers consider themselves locked into their present energy consuming patterns. This is not suggested by the small percentage (5 percent) who have converted to alternate fuels and the small percentage (10 percent) who would consider doing so. Of course, they may also be a reflection of a perception that product design and packaging (and related issues) are considerably more significant for the firms overall viability than marginal (or even large) improvements in energy efficiency. The latter point may be particularly true in the case of firms where total energy consumption is a very small portion of total operating costs.

As previously indicated, we have examined these energy related activities in terms of their required level of investment. As shown in Figure 2, we have categorized these activities into those which do not require any commitment of resources, those which require a small resource commitment and those which require the most resource investment.

For the activities which do not require any resource expenditure, a majority report conserving behavior along each one. Bringing management and employees together is the only activity where more than 15 percent (23 percent) indicate they might adopt the conservation option. Where energy conservation does not necessitate depletion of capital resources and the involvement of management time, these small manufacturing firms have already taken action. Thus, efforts to impact energy conserving behavior in these types of firms would be better directed toward conservation activities where the potential for influence is manifestly greater.

In terms of management action, a different picture emerges when we consider conservation activities which require (even) a small level of investment. Of the seven activities in this category, a majority report

performing the activity in only one case (regular maintenance of boilers and furnaces). A majority indicated it was either "very unlikely" or "they would not consider" performing three of these activities (using ducts and fans, placing timers on light switches, and installing storm doors and windows). From the perspective of a pocket of potential conserving behavior which might be influenced by public/private conservation programs, in only three of these seven activities do more than 15 percent of the respondents suggest they might consider the conservation option (two insulation activities which have already been discussed - weatherstripping doors and windows and installing storm doors and windows - and installing ducts and fans to recycle warmer air). Although the potential for improving energy conserving behavior is very high if measured by the number of respondents who indicate non-adoption of these conservation options, the small proportion indicating active consideration of these activities suggests that small manufacturers may propose many difficult problems for external agents attempting to influence their energy conserving behavior. It would seem that this may be especially the case where those firms are faced with financial investments in order to improve energy efficiency; in many cases these firms are asked to make investments in energy conservation where the potential savings due to such investments are highly uncertain.

This picture is even more disturbing when we consider those energy conserving activities which require the most investment. If we disregard insulation options, over 70 percent indicate they would not consider these activities. Recovering waste heat is the only activity where more than 15 percent suggest they might consider its adoption.

In summary, it seems safe to suggest that as the level of required investment increases, our respondents demonstrate a stronger reluctance to engage in energy conserving behavior. It suggests the need for the transmission

of information on potential savings due to specific conserving activities, the compatibility of such investments with existing technologies, etc. If the data base upon which small manufacturers make energy related decisions is sparse and incorrect, and their perception of potential energy savings misconstrued, the dissemination of such energy related data may be one means of correcting these obstacles to energy efficiency improvement behavior.

However, if the general picture painted in our discussion on energy related attitudes is reasonably accurate, it is doubtful if the distribution of such information will be sufficient in and of itself to initiate or spur conserving behavior. It should create awareness of and hopefully interest in a range of conserving options on the part of small manufacturers. What these small businessmen may then require is some agency or source external to the firm to whom they would have ready access for future information, judgments and experience.

FIRMS' CHARACTERISTICS AND CONSERVING BEHAVIOR

One means of explaining firms' propensities to adopt or reject energy conservation options is to examine relationships between firms' characteristics (i.e., SIC classification code, energy intensity, sales level, etc.) and whether they have performed specific conserving activities. In order to relate these firm characteristics to the conserving behavior of our small manufacturers, it was necessary to group the conserving activities studied into meaningful and logical categories. These categories or indices would then become the dependent variables in the regression equations.

One of the major indices established was an index of energy conserving activities performed by each firm. An activity was considered to have been

performed if the respondent indicated that it was among those that the firm's staff ". . . are doing and have done and intend to continue or would do again" or ". . . are doing and have done but will probably not continue to or do again." These responses were mutually exclusive for each activity; thus, double counting of activities did not arise.

The most pervasive finding from our examination of the relationship between firms' characteristics and conserving behavior is that the larger the sales volume, the greater the number of energy conserving activities performed ($P < .01$). This relationship is also evident ($P < .05$) in the case of energy conserving options which require the most investment. These findings suggest that firm size is a critical determining factor in the adoption of energy conserving behavior, especially where an outlay of financial resources is required. This is a plausible explanation of conserving behavior if we accept the proposition that firms with larger sales volumes are more likely to have a higher level of discretionary resources for investment in such activities as energy conservation or that there may be some economy of scale in some of the investments required.

An implication of these findings with particular import for public agencies is that there may be a threshold level, in terms of firm size, below which small manufacturing businesses can be expected to engage in little if any conservation activity where financial expenditures are involved. This again may be due to lack of capital or simply the pressures of surviving as a viable economic unit. In any case, in terms of potential energy savings and the likelihood of poor response, as well as the previously mentioned fact that a substantial majority of firms have already undertaken easy to implement efforts (i.e., activities which do not require any investment), it may not be worth

the effort for federal agency and private campaigns to attempt to initiate energy conserving behavior in these very small (and possibly marginal) enterprises.

Those firms which have assigned some individual to be consulted about energy related matters also demonstrate a propensity to engage in a greater number of activities. This relationship is especially strong ($P < .005$) for HLTV (heating, lighting and ventilation) activities. Although no relationship is evident with respect to insulation activities, with conservation options which do not require any investment or those which require minimal capital expenditure, the existence of an individual who is regularly consulted on energy matters is related ($P < .055$) to performance of conservation options which require the most investment. The implication of this finding is that public and private agencies should seek to influence small manufacturing firms to assign energy efficiency as the responsibility of a specific individual/position in order to provide a more receptive organizational milieu for external agencies attempting to promote energy conserving behavior.

IMPACT OF ATTITUDES ON CONSERVING BEHAVIOR

Each respondent was presented with a series of statements concerning energy related and other issues and was asked whether he agreed or disagreed with each of the statements.

In order to explore the relationships between attitudes and energy conserving behavior, we developed indices of the individual attitude measures. Each index refers to a set of related activities. Our attempts to develop indices based on factor analyses of the attitude measures proved unfruitful. No meaningful combinations of significant relationships among the individual attitude measures emerged from the factor analysis.

As a consequence, our only alternative was to establish attitude indices based on conceptual grounds. That is, we developed indices based on groupings of the individual attitude measures which we hypothesized would be conceptually and empirically related. Although not all of the resultant indices are composed of individual attitude measures which are empirically (significantly) related, this approach does allow us to test for relationships between groups of conceptually related attitude measures and energy conserving behavior.

Table 6 shows the attitude indices and their individual components. The indices are mutually exclusive; an attitude measure included in one index provides a single score for an individual by integrating his responses to a set of attitude measures. For instance, the attitude index, perception of the energy problem, represents a combination of two attitude measures, "America will never run out of energy resources" and "scientists will find solutions to our energy problems before any serious hardships occur." The combination of those two attitude measures provides a rough score of how seriously each respondent considers the energy problem.

All of the attitude indices were regressed against each of our categories of energy conserving activities (see Table 7). Few significant results emerge from this part of the analysis; none of the regression equations themselves are significant. In general, our attitude indices appear to be relatively poor predictors of firms' propensities to perform energy conserving activities. What is reported here are those indices which account for the most variance in the set of regression equations.

Perception of the energy problem is the only attitude index which is significantly related ($P < .10$) to the activity index, number of conservation options performed. If those who consider the energy situation is real and serious are more actively engaged in implementing conservation activities than

Table 6
COMPOSITION OF ENERGY ATTITUDE INDICES

Energy Attitude Index	Energy Index Components
Perception of the Energy Problem	<ul style="list-style-type: none"> a) America will never run out of energy resources. b) Scientists will find solutions to our energy problems before any serious hardships occur.
Energy Objectives	<ul style="list-style-type: none"> a) Reducing energy costs is a top priority for my firm right now. b) Guaranteeing an uninterrupted supply of fuel and electricity is a top priority for my business.
Innovation Propensity 1	<ul style="list-style-type: none"> a) Before I make more of an effort to save energy I want to make sure my competitions are doing likewise. b) I don't know what more I can do to reduce my company's use of fuel and electricity.
Innovation Propensity 2	<ul style="list-style-type: none"> a) My firm commonly tries out new things before my competitors do. b) I don't know what more I can do to reduce my company's use of fuel and electricity.
Energy Management	<ul style="list-style-type: none"> a) My firm would make a great mistake if it changed its manufacturing operations because of the energy situation. b) It is impossible for my firm to project our energy usage three years from now.
Perceived Attitude of Employees	<ul style="list-style-type: none"> a) My employees only care about energy conservation when they are affected by the measures taken. b) Unions can be expected to be generally resistant to businesses energy conservation measures.

Individual/Social Esteem/Sacrifice

c) My employees tend to view lowered temperatures in the plant as simply a way of cutting costs at their expense.

a) Most people feel that improving one's mind and maintaining health are more important than having really nice things like a fancy house and car.

b) People should be willing to do whatever the President asks to save energy.

c) Most people feel a person is a success if he is able to buy a big house and car and to travel when he wants.

Attitude Toward Government

a) The energy problem would not have occurred if business had been left alone by government.

b) Government regulations prevent my firm from doing more to save energy.

c) Many of the people running the federal government are crooked.

d) The federal government wastes most of the money we pay as taxes.

e) The federal government is run by a few big interests looking out for themselves.

f) President Carter can be trusted to do what is necessary to deal with the energy problem.

Table 7

REGRESSION RESULTS: ATTITUDE INDICES AGAINST ACTIVITY INDICES

Attitude Indices	Activity Indices	No. of Activities Performed	HLV Activities	INS	MIS	No. Investment Required	Minimal Investment Required	Most Investment Required
Perception of the Energy Problems		0.19	0.14	0.16	0.09	0.15	0.15	0.08
Energy Objectives		0.08	-0.03	-0.07	0.19	0.07	0.07	0.00
Energy Management		0.02	0.02	-0.13	0.11	0.10	0.10	-0.05
Perceived Attitude of Employees		-0.03	-0.06	0.03	-0.05	0.06	0.06	-0.14
Attitude Toward Government		-0.05	-0.14	0.09	-0.08	-0.08	-0.08	-0.12
Innovation Propensity 1		0.09	0.02	0.09	0.08	-0.18	-0.18	-0.23
Innovation Propensity 2		0.14	0.06	0.13	0.09	-0.01	-0.01	0.22
Individual/Social Esteem/Sacrifice		-0.13	-0.3	-0.15	-0.22	0.02	0.02	-0.23
Overall R ²		0.09	.06	0.08	0.13	0.06	0.06	0.14
Constant		0.63	0.54	0.87	0.13	0.41	0.28	0.59
F (8,83)		1.11	.066	0.66	1.56	0.67	0.67	1.73

Table 8

REGRESSION RESULTS: ALL VARIABLES AGAINST ACTIVITY INDICES

Variables	Activity Indices	No. of Activities Performed	HLV Activities	INS Activities	MIS Activities	No. Investment Required	Minimal Investment Required	Most Investment Required
Perception of Energy Problem		0.24 ^{xx}	0.23 ^{xx}	0.16	0.12	0.23	0.12	0.25 ^{xx}
Energy Objectives		0.08	-0.04	-0.18	0.31 ^{xx}	0.14	0.23	-0.13
Energy Management		-0.02	-0.05	-0.09	0.07	0.00	-0.11	-0.00
Individual/Social Esteem/Sacrifice		0.09	-0.01	0.12	0.13	0.12	-0.21	0.23 ^{xx}
SIC Code		-0.00	-0.07	0.26 ^{xx}	0.19	-0.05	-0.26	-0.10
Information Sought		-0.11	-0.11	-0.03	-0.10	-0.14	-0.77	0.03
Sorority of 1976 Winter		0.08	0.15	-0.15	-0.00	0.04	0.76	-0.11
Knowledge of Community Programs		0.04	-0.09	0.23	0.11	-0.00	0.26	0.17
Existence of Energy Boss		0.17	0.18	0.22	0.13	0.20 ^{xx}	0.19	0.36 ^{xxx}
Net Sales		0.20	0.10	0.05	0.31 ^{xxx}	0.22	0.15	0.11
Education Level		-0.14	0.01	-0.19	-0.10	0.06	-0.32	-0.02
Knowledge of Energy Matters		0.03	-0.14	0.13	0.02	-0.22	0.90	0.14
Attitude Toward Government		-0.11	-0.11	0.03	-0.17	-0.13	-0.20	-0.00
Innovation Propensity 1		-0.11	-0.16	0.08	-0.08	-0.29	0.11	-0.01
Innovation Propensity 2		0.06	-0.05	0.18	0.02	-0.07	0.14	0.05
Attitude Toward Employer		0.01	0.00	-0.02	-0.01	0.15	-0.18	-0.06

Variables	Activity Indices	No. of Activities Performed	HLV Activities	INS Activities	MIS Activities	No Investment Required	Minimal Investment Required	Most Investment Required
R ²		0.22	0.19	0.21	0.31	0.25	0.18	0.25
Constant		0.53	0.63	0.24	-0.23	0.37	0.42	-0.16
F(16,58)		1.03	0.85	0.99	1.63	1.22	0.83	1.23

those who believe it is fictional and non-significant, public agency programs intending to influence conserving behavior may find it productive to document the criticality of the energy situation for small manufacturers. If the precariousness of the energy situation is demonstrated to be potentially adversely related to the economic self-interest of small manufacturers, it is likely from the above finding that they will demonstrate a greater propensity to adopt conserving behavior.

None of the attitude indices are significantly related with either the HLV index or the insulation activities index.

The three indices, perception of the energy problem, individual/social esteem/sacrifice and innovation propensity, account for 2.2 percent, 3.4 percent and 3.9 percent (a total of 9.5 percent) of the variance in the equation where the energy conserving activities which require a slight investment is the dependent variable. When we consider that innovation propensity (2.1 percent) is the only attitude index which explains more than 2 percent of the variance in the equation for those activities which do not require any investment, this may suggest certain attitudinal characteristics which are reflected in decisions to devote some modicum of expenditure to energy efficiency improvement.

For those conserving activities which require the most investment, perception of the energy problem and perceived attitude of employees account for 3.4 percent and 8.3 percent of the variance, respectively. Small manufacturing businesses with owners/managers who show concern with the energy problem and who are unwilling to allow themselves to be swayed by the unfavorable conservation views of their employees, can be expected to engage in more conserving activities which require some investment. If this finding is a valid interpretation of the data, external agencies wishing to influence energy conservation decision-making should shape their messages to emphasize

the criticality of the energy situation and the need for small business owner/managers to show strong leadership in initiating energy conservation activities.

OVERALL REGRESSION RESULTS

The final part of this study examines the relative impact of the different types of factors discussed in this report (i.e., the attitude indices, demographic factors, etc.) on energy conserving behavior in small manufacturing firms. The purpose of this section is to determine the ability of these factors collectively to predict conserving behavior.

As might be expected from the discussion in the two previous sections, perception of the energy problem and existence of an individual who is regularly consulted on energy matters are the two factors most related to firms' propensities to adopt conservation options. The severity of previous energy problems experienced by firms, propensity to innovate, individual esteem and social sacrifice are other factors which emerge as important.

The findings are a result of regressing all of the factors analyzed in this report against each of the energy conserving categories discussed earlier (see Figures 1 and 2). The total list of factors included the attitude indices, firm characteristics and demographic variables, and an information acquisition index which measures the number of sources from which respondents have received useful information. (See Table 8)

The attitude index, perception of the energy problem, is the only variable which is significantly related ($P < .05$) to the number of conserving options which firms have performed. Though the relationship is not significant, the existence of someone who is clearly responsible for energy related matters accounts for 5 percent of the variance in the regression equation where number

of conserving options performed is the dependent variable. The information index accounts for 3 percent of the variance.

From these results and our general discussion of the relationship between attitude indices and energy conserving behavior, it is clear that a concern with the seriousness of the energy situation is a major contributing factor to the adoption of energy conserving behavior and practices by small manufacturers. The implications of this observation have already been identified and will shortly be further discussed.

For HLV activities, perception of the problem is again the only variable which is significant ($P < .05$). The existence of an individual who is charged with energy responsibility, the severity of the impact of the previous winter's energy difficulties and industry affiliation (i.e., 4 digit SIC classification) account for 4.2 percent, 2.4 percent and 2.4 percent of the variance, respectively.

As with our other categories of conserving activities, a variety of factors seem to contribute to the adoption of HLV options. However, the two factors which were most evident in our discussion of all conservation options adopted are also most conspicuous for HLV options.

When we consider insulation activities a new factor emerges as most significant. SIC classification code is significantly related to performance of conservation options. The more energy intensive our sample firms, the more prone they are to implement insulation activities. An interesting question is raised by this relationship: Why do energy intensive firms adopt insulation options rather than any of our other categories of conservation activities? A plausible answer may be that the more energy intensive firms recognize some potential for energy savings. It would also seem safe to suggest that our insulation options could also be performed by non-energy intensive firms and probably with largely similar results in terms of energy savings.

Whatever the reason for this relationship, it appears appropriate for public agencies to attempt to stimulate insulation activities in the more energy intensive small manufacturing firms.

For those activities which do not require any investment, the existence of an individual who is charged with energy responsibilities is most significant ($P < .05$). This is further evidence of the importance of firms establishing an organizational base for energy efficiency improvement.

In the case of those activities which require a slight investment, perception of the energy problem, severity of the previous winter's energy impact, and the respondent's educational level account for a total of 11.5 of the variance in the regression equation. None of these variables are statistically significant. It is interesting to note that educational level is the only demographic characteristic of our respondents which accounts for more than 2 percent of the variance in any of these regression equations. Age, educational level, etc., do not seem to be good predictors of energy conserving behavior. There is not, therefore, much potential for public and private agencies to segment their audience within the small manufacturing community based on the demographic characteristics of these firms' owners/presidents. Firm characteristics (SIC code, sales level, energy intensity, etc.) provide more fruitful bases of segmentation for public and private agencies wishing to develop differential strategies in their approaches to influencing conserving behavior among small manufacturers.

As with many of our previous results, the existence of an individual who assumes responsibility for energy related matters is most significantly ($P < .02$) related to performance of those conservation options which require the most investment. This variable in conjunction with attitude indices, perception of the energy problem and individual esteem and social sacrifice account for 18.3 percent of the variance. The latter two variables are significant at $P < .05$.

It is clear from much of our regression analysis results that an awareness and understanding of the potentially negative impact of the energy situation on their economic viability is related to the implementation of conserving options by small manufacturing firms' owners/managers. Thus, in order to stimulate such conserving behavior what may be required is the transmission of messages to small manufacturers which clearly demonstrate the linkage between the energy problem and their economic welfare. As evidenced by the discussion on respondents' energy related attitudes/perceptions, many small manufacturers have already perceived such a relationship.

In more specific terms, as a means of generating interest in energy conservation, public and private agencies must disseminate specific knowledge (i.e., cost data, potential savings, implementation modes, follow-up sources of information/advice, etc.) concerning the range of possible conservation options. This would seem to be vitally necessary for the conservation activities which demand capital resources and management time.

Some insights into desirable modes of communicating energy related information also emerge from our data analysis. Doubt can be cast on the effectiveness of non-personal communication means. To sell small manufacturers on the idea of devoting scarce resources to energy conservation may require a number of mechanisms including wide scale distribution of printed material (demonstrations, use of conservation engineers, trade associations, etc. Such an approach to disseminating information seems unavoidable when we consider that a majority of our respondents found many existing sources of energy information not very useful.

existing sources of energy information not very useful.

In view of the large majority of firms that have already implemented HLV (heating, lighting and ventilation) options and/or those options which do not require any capital outlay and the significant relationship between firm size

(i.e., annual sales) and the adoption of those conservation options which require the most investment, there may very well be a threshold level in terms of firm size below which makes little sense for public and private agencies to attempt to stimulate the adoption of conservation activities which necessitate capital expenditures.

The Effects of Project Pacesetter

An integral purpose of this study was to provide a framework within which the effects of Project Pacesetter might be monitored. A measurement system of this kind requires data collection at a number of points in time. Since we have to date only surveyed small manufacturers at one point in time, this data should serve as a bench-mark or reference point for future evaluation efforts. However, a description and a tentative assessment of the data will be provided here.

To measure Project Pacesetter's effects we sought to estimate the extent to which it had reached its potential audience within the community of small manufacturers. With this purpose in mind we asked our respondents if any of the groups or organizations to which they or other management members of their firm belonged had encouraged them to save energy or been involved in any way they knew with programs for energy saving. Fifteen percent of our respondents could identify such groups or organizations and their affiliated energy saving programs. The principal groups identified were Chamber of Commerce, trade and/or industry associations and community groups.

However, when these group/association activities are assessed in terms of direct Pacesetter impact or conscious involvement in Pacesetter we observe that Pacesetter had at the time of our survey failed to reach these individual small manufacturers. None of our respondents reported involvement in what they understood to be Pacesetter activities and none indicated that anyone in their family or anyone they knew was involved.

In order to gauge more directly the impact of Project Pacesetter, we asked our respondents if they recognized the name as "a community action program mainly associated with energy." Fifteen percent indicated that they did. We also questioned those who recognized Pacesetter to tell us what they thought it to be. Few respondents were able to provide any level of detail or insight regarding the nature of Pacesetter other than our suggestion that it was "associated with energy."

Recognition questions in surveys generally yield low response rates in this sense, and in this case there is evidence that it is in actual fact lower than the 15 percent figure indicates. As well as Project Pacesetter, we asked our respondents if they could identify three other community programs involved in energy conservation in Pittsburgh. Table 9 indicates the percentages who could. In one case, project Action, recognition was substantially higher than for Pacesetter. For Project Save, it was somewhat lower. Project Conserve received almost identical recognition. It should be pointed out that there are no programs for energy conservation in the Pittsburgh area bearing these names. Project Conserve was a state initiated energy conservation program which did very little in the Pittsburgh area. There is a non-energy related federal program called Action. Project Save was our wholly fictitious creation.

The greater recognition of Action and the approximately equivalent recognition of Save and Conserve underscores the limited and uncertain understanding of Pacesetter. Unquestionably, Pacesetter has made an impact on very few of our respondents.

These findings must be examined within the context of the nature of the Pacesetter campaign at the time of our studies. Pacesetter had moved away from its earlier focus of large scale mass media advertising and was now concentrating on direct involvement with groups/organizations/associations. Thus, much more indirect than direct impact is to be expected. Also, individuals may be unknowingly participating in Pacesetter sponsored activities. The impact

Table 9

RECOGNITION OF PROJECT PACESETTER IN
COMPARISONS WITH FICTIOUS PROGRAMS

Project Action	32.6
Project Pacesetter	15.2
Project Conserve	15.2
Project Save	10.9

of these caveats on our findings would need to be explored in further research.

Impact of the Coal Strike

The 1977-78 winter coal strike had a minimal direct impact on our small manufacturing sample. The only major difficulty encountered was production interruptions in a few cases. The indirect effects of the coal strike are more difficult to discern but it is apparent that they were also few.

The lack of direct impact is not surprising in view of the fact that less than 5 percent of the sample firms used coal as either a primary or secondary energy source. Only two firms have the facility to use coal as a back-up alternate fuel to natural gas.

When asked in what ways, if at all, their business had been affected by the coal strike and the shortages of coal, approximately 60 percent of the respondents indicated they saw no strike impact. The most common problem experienced by those manufacturers who perceived a strike impact was an impeded work flow--reduced hours of operations, cut backs and delays in orders, and general disruptions in their production schedules. Few manufacturers mentioned higher costs. More might have mentioned this factor had they been asked a little later, since coal strike induced electricity cost increases reached consumers after our surveys were completed.

For the small manufacturers, the coal strike impact was minor in comparison to the natural gas shortages of the winter of 1976-1977. When manufacturers were asked whether they had experienced natural gas shortages at the time, nearly 60 percent replied that they had. This forced shutdowns for about 20 percent of all the firms in the sample. Terminations and layoffs had to be imposed for an equal number of firms. Even more firms experienced sales losses (35%) and production slow downs (26%). Only the latter was cited by a significant number of manufacturers as a coal strike result one year later. Whatever may have been the potential for harm to small manufacturers of a prolonged coal strike, that potential was not realized in over three months of disruption in coal production. A month's worth of unusually cold weather just a year before had a much greater impact.

It would seem that the sample's small manufacturers are relatively immune to direct effects of coal supply interruptions due to their lack of dependence on coal as an energy source. The potential for severe impact is considerably greater should natural gas or petroleum interruptions occur.

SECTION II

ENERGY CONSERVATION AMONG SMALL RETAIL ESTABLISHMENTS

Introduction

The purpose of this section is to identify the factors which affect decision-making concerning energy consuming activities by owner-operators of 94 small retail establishments.

This section is based on the results of personal interviews with these managers. It consists of three basic parts. The first part considers energy conservation activities using the same sort of conceptual scheme that was used for the analysis of the household data. The second part of the report is devoted to a consideration of the respondents' recognition of Project Pacesetter. The respondents' reports of the impact of the regional coal miners' strike and of

the general energy situation on their businesses are briefly described in the third and final part.

Energy Conservation Activities

The dependent variables are a series of energy conservation indicators of the same sort used in the preceding chapter. For each of these indicators, we shall consider five different sets of independent variables:

1. Respondent energy attitudes.
2. Respondent background characteristics.
3. Characteristics of the retail establishment.
4. Respondent recognition of Project Pacesetter, and reported coal strike and general energy impact on the retail establishment.
5. Establishment usage of energy.

For purposes of this analysis we shall rely on a simple linear-regression model.

In the course of the interviews the respondents were asked whether they had or were currently engaged in each of twenty energy-related activities. In some cases a positive response (indicating engagement) may be interpreted as a conservation orientation. In others, a negative response (non-engagement) is indicative of a conservation orientation. After inverting the codes for the latter activities, the dichotomized responses were grouped into six categories or types of conservation activities. Then we simply counted the number of conservation responses and divided by the number of valid responses. The activities included in each of the categories, together with the mean scores for each activity and for the category as a whole are listed in Table 11.1. A seventh indicator, which we call General Conservation, simply counts all conservation responses divided by all valid responses.

The most frequently mentioned conservation activity involved shutting off interior lights after hours. The least frequently mentioned activity was the insulation of the water heater.

TABLE 11.1

SELF-REPORTED ENERGY CONSERVATION, RETAILERS

% Reporting ActivityLIGHTING

Non-incandescent lights	80%	
Decorative lighting	80	
Interior lights after hours	91	Index Mean = 3.6
Overhead lighting	60	
Light switch timers	48	

WINTERIZATION

Weatherstripping	37	
Heat pipe insulation	32	
Storm doors and windows	24	Index Mean = 1.2
Insulation		

HEATING

Keep storerooms cold	78	
Lower thermostat 5°	76	
Winter thermostat set at 65	47	Index Mean = 2.5
Regular furnace maintenance	41	

AIRCONDITIONING

Fans instead of air conditioning	31	
Set summer A/C thermometer at 80	21	Index Mean = .64

WATER HEATER

Set water heater temperature at low	47	
Insulate water heater	9	Index Mean = .56

MISCELLANEOUS

Discuss energy conservation with employees	70	
Reduced business hours by 15% or more	19	Index Mean = 1.2
Recycle warm air	10	

GENERAL CONSERVATION MEAN = 9.8 activities

In general, the group of activities concerning the conservation of light was most frequently mentioned while those involving the water heater were least frequently mentioned. The activity groups fall into two clearly differentiable categories: lighting and heating both have relatively high average scores, while the remaining four are substantially lower. On the whole, however, the respondents report that they engage in about half of the conservation activities about which we inquired.

The interviews included questions concerning at least five sets of factors which we supposed might have some affect on the retail establishments' likelihood of engaging in conservation activities. Using a simple linear regression model, we shall first examine each of these sets separately. Then we shall select those individual factors which have statistically significant effects for inclusion in a single linear regression equation.

Respondent Attitudes

Early in the interview, we presented the respondents with a series of statements concerning energy-related and other issues and asked the respondents whether they agreed or disagreed with each of the statements. For purposes of analysis, the responses were then directionally adjusted and grouped into six additional indicators. For each indicator, the directionally appropriate responses were then summed.

The standardized regression coefficients for the seven equations are reported in the first panel of Table 11.2. With only one exception (Miscellaneous Conservation Activities), the attitudinal indicators fail to explain a significant proportion of the variation in reported conservation behavior. Furthermore, only four of the individual coefficients are statistically significant.

Cynicism contributes directly to reported conservation of air conditioning, and a positive business orientation is inversely related to reported miscellaneous conservation activities. In other words, those who express cynicism

TABLE 11.2
EXPLAINING RETAILER CONSERVATION, INITIAL ESTIMATES^a

	<u>General Conservation</u>	<u>Lighting</u>	<u>Winterization</u>	<u>Heating</u>	<u>Air Conditioning</u>	<u>Water Heating</u>	<u>Miscellaneous</u>
<u>Attitudinal Variables</u>							
Nonmaterialistic Lifestyle							
Cynicism About Politics					.19		
Energy Optimism							
Conservation				.24*			
Business Orientation							-.23*
Energy Situation							.21
R ²	(.03)	(.03)	(.03)	(.08)	(.08)	(.07)	(.10)
<u>Demographic Variables</u>							
Age	.31*	.26*		.28*	.26*		
Race			.24**				
Sex				.25*			
Education							
Energy Knowledge							
R ²	(.13)	(.09)*	(.09)	(.17)*	(.09)*	(.07)	(.06)

^aThe regression coefficients are standardized or Beta coefficients. They are presented only when significant at least at the .05 level and are starred when significant at the .01 level. R² are starred for equations which attain significance at the .05 level.

TABLE 11.2

(continued).

	<u>General Conservation</u>	<u>Lighting</u>	<u>Winterization</u>	<u>Heating</u>	<u>Air Conditioning</u>	<u>Water Heating</u>	<u>Miscellaneous</u>
<u>Establishment Variables</u>							
Floor Space							
Number Outlets							
Number Employees						-.35	
1977 Net Sales		.36*					-.33*
R ²	(.02)	.36*	(.04)	(.04)	(.05)	(.09)	(.11)*
<u>Energy Usage Variables</u>							
Comfort Heat Source		.22*	.20	.17			
A/C Source							
Refrigeration Source		-.20		.33*			.25
Hot Water Source							
Cook-Bake Source				-.31*			
Energy Shortage							
Gas Shortage							
Electricity Shortage				.20*			
% Energy Costs					.23		.26
Electric Bill							
Gas Bill							
R ²	(.10)	(.12)*	(.06)	(.16)*	(.14)*	(.07)	(.13)*

Table 11.2

(continued)

	<u>General Conservation</u>	<u>Lighting</u>	<u>Winterization</u>	<u>Heating</u>	<u>Air Conditioning</u>	<u>Water Heating</u>	<u>Miscellaneous</u>
<u>Perceptual Variables</u>							
Pacesetter Recognition							
Coal Strike Impact							.21*
Business							-.20*
Cost	.28*			.36*			
Operations	.23*	.17	.25*				-.23*
Cut Back					-.21*	-.21	
Miscellaneous						.36*	-.23*
Non-energy					.18		.20*
General Energy Impact	.25*	.40*			.29*		.63*
Business		.24*					
Cost	-.26*	-.22*			-.25*		-.39*
Operations							-.34*
Cut Back					-.22*		-.25*
Miscellaneous		-.19					
Positive				.22*			-.41*
Non-energy	.18*		.21*	.26*			-.30*
R ²	(.22)*	(.14)*	(.13)*	(.22)*	(.14)*	(.13)*	(.40)*

towards government tend to restrict the use of air conditioning while those who are dependent upon and optimistic about their business tend not to engage in miscellaneous conservation activities.

Those who express concern about the current energy situation and its effects on their business also engage more frequently in miscellaneous conservation activities. Finally, those who express an attitudinal interest in conservation tend more frequently to report attempts to conserve energy for heating purposes. In general, however, respondents' attitudes as measured here have only minimal effects on their likelihood of engaging in conservation activities.

Respondent Demographic Characteristics

Data concerning four respondent characteristics were collected in the course of the interview: age (to the nearest year); race (dichotomized into white and non-white); sex; and education (grouped into four categories--high school or less, some college, completed college; and post-graduate). In addition, we asked the interviewers to estimate "How much" the respondent "knows about energy," in terms of four categories--"Very little," "Some," "A great deal," and "Exceptional."

The standardized coefficients for the resulting regression equations are reported in the second panel of Table 11.2. Three of these equations are statistically significant, and one of the equations accounts for slightly more than 17 percent of the variance.

Furthermore, respondent age plays a statistically significant role in three of the individual equations as well as the equation for the sum of all conservation activities. The older the respondent, the more likely he is to engage in conservation activities. All three of the individual conservation activities primarily involve cost savings as opposed to activities which involve investments. White respondents are more likely to report engaging in "Winterization"

activities, which require investments. Although the majority of the respondents were males, sex does play a statistically significant role in the respondents' engagement in heat conservation activities. Males are more likely to report attempts to conserve heat than are female owner-operators of small retail establishments.

It is noteworthy that neither education nor estimated knowledge of energy issues has a statistically significant effect on respondents' participation in energy-conservation activities. Indeed, four of the five largest coefficients (none of them significant) are negative. That is, those who are less educated, or tend to know less about energy tend more frequently to report engaging in energy conservation activities.

In summary, then, older respondents tend to be more energy-conservative, especially when this involves attempts at cost saving. Whites tend to be more willing to engage in investment-intensive activities than are nonwhites.

Retail Establishment Characteristics

The third set of factors concerns the retail establishment itself. Two of the variables pertain to the physical plant (amount of floor space and number of outlets, dichotomized into one and more than one outlet); one concerns the number of employees; and the fourth concerns the establishment's 1977 net sales.

The results of this analysis are reported in the third panel of Table 11.2. As in the case of the attitudinal indicators, only the equation for miscellaneous conservation activities is statistically significant. Only three of the individual coefficients are statistically significant, and none involve the physical plant size.

The number of persons employed on a full-time basis attains significance for water heater conservation. Smaller establishments are more likely to attempt conservation than are larger establishments. The standardized coefficients for 1977 net sales reach statistical significance in two cases: light conservation and miscellaneous conservation activities. In the lighting case, the coefficient

is positive indicating that larger establishments tend more frequently to keep their light usage low. Where miscellaneous activities are concerned, on the other hand, the sign is negative indicating that lower sales firms tend more frequently to engage in conservation.

In general, then, the size of the retail establishment has little bearing on its propensity to engage in energy conservation activities.

Energy Usage

Included in the interviews were several questions concerning the establishments' sources of energy for various purposes; whether, in the past two years they had experienced a shortage of any of their primary sources of energy; the proportion of operating costs which were energy-related; and the size of their energy bills. All of these variables were included in one set of equations which are reported in the fourth panel of Table 11.2.

Each of the variables relating to establishments' sources of energy has been dichotomized based on the frequency with which various sources were mentioned. Thus, most establishments reported using natural gas for purposes of comfort heating. All other sources were collapsed into a second category. Similarly, most establishments reported using gas for purposes of heating their water and for baking or cooking. All other sources were, once again, collapsed into a second category. Electricity was most frequently mentioned as the source of energy for air conditioning and refrigeration. All other sources (including nonuse) were collapsed into a second category in both cases.

Of the six equations concerning types of conservation activities, four are statistically significant. Furthermore, with the exceptions of those activities pertaining to the conservation of energy for purposes of heating water and the general conservation measure, there is at least one variable in each equation which makes a statistically significant contribution.

The interpretation of these results is far from clear in most cases. For example, four variables make statistically significant contributions to the

explanation of heat conservation activities: the source of energy for heating (gas versus other), the source of energy for refrigeration (electricity versus other), and the experience of an electricity shortage all contribute positively; the source of energy for cooking and baking (gas versus other) contributes negatively. While the first of these makes some intuitive sense (comfort heating source), it is the weakest of the four explanatory variables. The most obvious explanation for this (i.e., rising gas prices) is offset by the inverse contribution of cooking and baking source which also involves gas as the primary source.

Again, the equation for light conservation activities involves two variables at statistically significant levels. Those who use gas as a source of comfort heating tend more frequently to report light conservation attempts, while those who use electricity for refrigeration tend to conserve light less frequently. Since those who use electricity for refrigeration would, on intuitive grounds, seem more likely to be sensitive to the size of their electricity bill, and therefore more likely to attempt to conserve, this result contradicts what we would expect.

Although the variables pertaining to energy usage do tend to make statistically significant contributions to the explanation of energy conservation activities, the results are difficult to interpret and in some cases counter-intuitive. Clearly, more detailed analysis of retailers' behavior is necessary.

Pacesetter Recognition and Energy Impact

The final set of variables to be considered involves the respondents' recognition of Project Pacesetter and their responses to two open-ended questions concerning the impact of the recent coal miners strike and of the general energy situation. Although subsequent sections of this portion of the report will be devoted to the consideration of these factors, our objective here is to determine the extent to which they affect the respondents' propensity to engage in energy conservation activities. The results of this analysis are presented in the

bottom panel of Table 11.2

As we shall see, five of the respondents indicated that they recognized the name 'Project Pacesetter.' As a result, the dichotomized indicator makes no contribution to the explanation of respondents' propensity to engage in conservation activities.

At the beginning of our interviews, we asked the respondents, "In what ways" they had "been affected by the recent coal strike" and, secondly, "by other problems related to energy." To aid analysis we constructed a series of dichotomized variables for each question to indicate whether the respondent reported an effect together with seven indicators of the substance of their remarks. Since no one reported that the coal strike had had a positive affect on their business, this reduces to thirteen the total number of variables in this set.

All of the regression equations are statistically significant, three at the .001 level: the equation for heat conservation, the equation for miscellaneous activities and the equation for General Conservation. As in the previous case, however, the substantive interpretation of these results is not entirely clear. For example, engaging in light conversation is positively associated with reports of the coal strike impacting on the establishments' operations and, quite strongly, with whether the respondents' reported that the general energy situation has had an impact of any sort on the respondents' business establishment. However, it is inversely associated with three of the substantive indicators of general impact: business, costs, and miscellaneous impacts.

Again, but from a different perspective, we would expect that those who reported that their costs have been affected by the energy situation would be more likely to engage in energy conservation. But all six of the coefficients for this variable are negative. That is, those who report cost effects tend less frequently to report engaging in energy conservation activities.

Let us restrict our attention to the two variables which indicate whether an impact was reported. The variable pertaining to the coal strike enters into only one of the equations--miscellaneous activities. In other words, whether an establishment was impacted by the coal strike has little or no bearing on their propensity to conserve.

Whether a respondent reported being affected by the general energy situation, on the other hand, enters into three of the equations for individual clusters as well as the equation for General Conservation. In each case, the contribution is positive. That is, those who report being impacted are more likely to engage in conservation than are those who do not report an impact.

In summary, then, whether the respondents recognized Project Pacesetter and whether they perceived and reported a coal strike impact had no measured affect on their likelihood to engage in conservation activities. On the other hand, the respondents' reports of being impacted by the general energy situation do seem to have a relatively strong association with their propensity to conserve.

Summary Regression Equations

In the previous section we considered each of five sets of factors which we supposed might have an effect upon small retailers' propensity to engage in conservation activities. In this section we shift our attention to only those which demonstrate statistically significant effects relative to a given type of energy conservation. Using these variables, we derive the best fitting linear regression equation for each of the various types of energy conservation activities and for General Conservation. It is important to note at this point that we have not included the indicator of 1977 net sales in any of the following equations due to the unusual amount of missing data.

The standardized coefficients for the best fitting regression equation for light conservation activities are reported in Table 11.3. The equation includes

Table 11.3

EXPLAINING LIGHT CONSERVATION, FINAL EQUATION^a

Comfort Heating Source	.17*
Refrigeration Source	-.23*
Gas Shortage	-.18*
Coal Impact-Operations	NS
General Impact	.42*
- Business	-.16
- Costs	-.26*
- Miscellaneous	-.18*
Respondent Age	.24*
R ²	(.32)*

^aThe regression coefficients are standardized or Beta coefficients. They are presented only when significant at least at the .05 level and are starred when significant at the .01 level. R²s are starred for equations which attain significance at the .05 level, and NS signifies not significant at .05 level.

nine variables, three from the set pertaining to energy usage, five from the set concerning energy impacts and one from the set of respondent characteristics. Eight of the coefficients are statistically significant, as is the equation as a whole, which accounts for nearly one-third of the total variance in lighting conservation.

Substantively, however, the result is somewhat difficult to interpret. The largest coefficient concerns whether the respondent reported being impacted by the general energy situation. Thus, those who reported an impact tend also to more frequently report engaging in energy conservation. But the three indicators of specific types of impact which enter into the equation all have negative signs. Thus, those who report an impact on the business, on costs and

miscellaneous impacts all tend less frequently to report engaging in light conservation activities.

And indeed, as we noted previously, one of the variables seems at face value to have an impact which is counter-intuitive. Those who use electricity for purposes of refrigeration report engaging in light conservation activities less frequently than those who use an alternative source or who do not use refrigeration. Since lights also involve electricity, it would seem that such retailers might be more sensitive to rises in electricity costs and hence be more likely to engage in electricity conservation activities. However, these data suggest just the opposite.

The best fitting linear regression equation for winterization is comprised of four variables which account for a little more than 16 percent of the variance (Table 11.4). Three of the variables derive from the energy usage set (Source of Comfort Heating -- gas versus other) and the energy impact set (Coal Impact -- Operations and General Impact -- Non-energy), all of which are positively associated with Winterization type conservation activities. Of these, though, the coefficient for comfort heating source does not attain the minimum level for significance and is not entered in the table.

The fourth variable in the equation is Respondents' Race, with the positive sign indicating that whites tend to engage in these sorts of activities more frequently than do nonwhites. While it is difficult to interpret the implications of the previous variables, this last result is quite satisfying, on intuitive grounds. The items included in the Winterization cluster all involve a monetary investment which is relatively large in some cases, for example, wall and roof insulation. It seems possible, given factors such as the current social structure and the locations of these minority businesses that nonwhites would have less ready access to such capital.

Table 11.4

EXPLAINING WINTERIZATION CONSERVATION, FINAL EQUATION^a

Comfort Heating Source	NS
Coal Impact-Operations	.22*
General Impact-Non-Energy	.20*
Respondent Race	.19
R ²	(.16)*

^aThe regression coefficients are standardized or Beta coefficients. They are presented only when significant at least at the .05 level and are starred when significant at the .01 level. R²s are starred for equations which attain significance at the .05 level, and NS signifies not significant at .05 level.

Heat Conservation

The regression equation for heat conservation involves ten variables (Table 11.5). Seven of the variables derive from the energy usage (four variables) and energy impact (three variables) clusters. All seven of these variables enter at statistically significant levels.

Once again, however, the results are difficult to interpret. The smallest of these seven coefficients is that for 'Comfort Heating Source' -- gas versus other, and the coefficient for 'Cooking-Baking Source' (again, gas versus other) is negative in sign: that is, those who use gas tend to report less heat conservation than those who do not. Furthermore, it is those who report having experienced a shortage of electricity who tend to report engaging in heat conservation more frequently, as opposed to those who report having experienced a gas shortage, which does not enter into the equation. But gas is by far the most frequent source of comfort heating.

All three of the impact coefficients are positive, but one of the variables pertains to non-energy impacts and a second indicates a respondent's report that the general energy situation has had a positive affect on business. The

Table 11.5
EXPLAINING HEAT CONSERVATION, FINAL EQUATION^a

Comfort Heating Source	.16
Refrigeration Source	.23*
Cooking-Baking Source	-.19*
Electric Shortage	.19*
Coal Impact-Cost	.27*
General Impact-Positive	.22*
-Non-Energy	.20*
Respondent Age	NS
Respondent Sex	NS
Conservation Attitudes	NS
R ²	(.39)*

^aThe regression coefficients are standardized or Beta coefficients. They are presented only when significant at least at the .05 level and are starred when significant at the .01 level. R²s are starred for equations which attain significance at the .05 level, and NS signifies not significant at .05 level.

third coefficient pertains to the coal strike, in terms of the cost impact on electricity which we generated from coal.

Two of the three remaining variables are drawn from the cluster of respondent background characteristics: age and sex. Neither is statistically significant, however. The last variable in the equation is an indicator of respondents' energy conservation attitudes. Like the two background characteristics, contribution is not statistically significant.

Air Conditioning Conservation

Eight variables included in the summary regression equation for air conditioning conservation, all at statistically significant levels (Table 11.6).

Table 11.6

EXPLAINING AIR CONDITIONING CONSERVATION, FINAL EQUATION^a

Air Conditioning Source	-.19*
Gas Shortage	.26*
Coal Impact-Cut Back	-.24*
-Non-Energy	.15
General Impact	.24*
- Costs	-.26*
- Cut Back	-.21*
Respondent Age	.25*
R ²	(.29)*

^aThe regression coefficients are standardized or Beta coefficients. They are presented only when significant at least at the .05 level and are starred when significant at the .01 level. R²s are starred for equations which attain significance at the .05 level, and NS signifies not significant at .05 level.

As in previous cases, most of the variables derive from energy usage (two variables) and energy impact clusters (five variables). The remaining variable is respondent age which, as in previous cases, is positively associated with reported conservation activities.

The variable indicating the course of energy for air conditioning (electricity versus other or no air conditioning) enters the equation, with the negative sign indicating that those who depend upon sources other than electricity, or who do not use air conditioning are more apt to engage in conservation activities. In short, those who have electricity air conditioning--which is the predominant form -- tend not to conserve. This result, together with some of the other results of this portion of the Project Monitor study, suggests that the energy situation has not induced those who rely on electricity as an energy source to engage in conservation activities.

The interpretation of the remaining variables in the equation is a good deal less clear. For example, those who indicated that they have experienced a gas shortage tend more frequently to report attempts to engage in conservation with regard to air conditioning. Those who report that they have had to 'cut back' on their businesses' operations as a result of the coal strike or the general energy situation tend less frequently to report engaging in conservation of air conditioning. Once again, then, although the equation purportedly explains a respectable proportion of the variance (some 29 percent), the results are not substantively clear.

Water Heater Conservation

This equation is comprised of only three variables: two substantive indicators of reported coal strike impacts and the number of persons employed on a full-time basis (Table 11.7). This last is the only substantively interpretable result, with the negative sign indicating that smaller establishments are more apt to attempt to engage in activities to conserve energy for the purposes of heating water.

Miscellaneous Conservation Activities

There are ten variables in this equation, one from the energy usage cluster and nine from the energy impact cluster (Table 11.8). The latter nine variables are all statistically significant, as is the equation as a whole which accounts for more than one-third of the overall variance.

As has been the case with all of the equations which we have considered thus far, however, the results are not immediately interpretable substantively. The coefficients for the two variables which indicate simply whether a respondent reported an impact from either the coal miners' strike or the general energy situation are both positive and relatively strong. However, the coefficients for the two indicators of the nature of the coal strike impact and the five

Table 11.7

EXPLAINING WATER HEATER CONSERVATION, FINAL EQUATION^a

Coal Impact-Cut Back	NS
-Miscellaneous	.35*
Number of Employees	-.26*
R ²	(.18)*

^aThe regression coefficients are standardized or Beta coefficients. They are presented only when significant at least at the .05 level and are starred when significant at the .01 level. R²s are starred for equations which attain significance at the .05 level, and NS signifies not significant at .05 level.

Table 11.8

EXPLAINING MISCELLANEOUS CONSERVATION, FINAL EQUATION^a

Refrigeration Source	NS
Coal Impact	.32*
- Business	-.27*
- Miscellaneous	-.22*
General Impact	.44*
- Cost	-.28*
- Operations	-.21*
- Cut Backs	-.19*
- Positive	-.36*
- Non-Energy	-.27*
R ²	(.34)*

^aThe regression coefficients are standardized or Beta coefficients. They are presented only when significant at least at the .05 level and are starred when significant at the .01 level. R²s are starred for equations which attain significance at the .05 level, and NS signifies not significant at .05 level.

indicators of the nature of the general energy impact are all negative. This result leads us to suspect that we may be encountering severe methodological problems. Unfortunately, however, the consideration of these problems would take us far beyond very limited scope of this brief report.

General Conservation

The final dependent variable to be considered here simply counts all of the conservation activities included in this study. The summary regression equation is reported in Table 11.9. It includes six variables, five from the energy impact cluster and respondent age. As in previous cases, older respondents are more likely to engage in conservation activities than are younger respondents. The coefficient for this variable is the largest of the six which enter the equation.

Of the five energy impact variables, two pertain to the coal strike. One of these is positive and significant (operations), while the second is negative and not significant (cut back). Those who reported that the coal strike had affected their operations tended somewhat more frequently to report engaging in conservation activities. This is essentially what should be expected: those who perceive an impact should conserve more.

The remaining three variables concern the effects of the general energy situation. All three of the coefficients are statistically significant and two are positive. Thus, respondents who reported a general energy impact tended also to report engaging in conservation activities. This result parallels that reported above for perceived impact of the coal strike. However, those who mentioned increased costs -- which is one of the most important affects of the energy situation -- tended to report conservation activities less frequently.

Conclusion

Using the model employed in this analysis, we are able to account for upwards of one-quarter of the variance in small retailers' energy conservation activities. The single exception to this general rule is the equation relating

TABLE 11.9
 CONSERVATION GENERAL CONSERVATION, FINAL EQUATION^a

Coal Impact-Operations	.18
- Cut Back	NS
General Energy Impact	.26*
- Costs	-.30*
- Non-Energy	.17
Respondent Age	.33*
R ²	(.27)*

^aThe regression coefficients are standardized or Beta coefficients. They are presented only when significant at least at the .05 level and are starred when significant at the .01 level. R²s are starred for equations which attain significance at the .05 level, and NS signifies not significant at .05 level.

to the conservation of energy for purposes of water heating which accounts for only about 18 percent of the variance. In each case, though, the regression equation attains significance.

Substantively, however, the results are quite difficult to interpret. The respondents' attitudes toward energy-related issues contribute little if anything to the explanation. Nor is there any consistently strong association with the characteristics of the establishments included in this study.

There is a relatively consistent tendency for older respondents to more frequently report engaging in conservation activities than younger respondents, especially for light, heat and air conditioning. Perhaps the older generations are more familiar with scarcity and the need to conserve. White respondents more frequently report capital intensive sorts of energy conservation activities than do nonwhites, which may reflect their differential access to the requisite capital.

In general, however, each of the regression equations reported here are dominated by variables included in the energy usage and energy impact clusters, and especially the latter. While this may appear to be intuitively satisfying, upon closer inspection the results are quite difficult to interpret. At face value, many of the independent variables appear to have little relation to the conservation activities with which they are statistically associated. In other cases the relations actually seem to be counter-intuitive. For example, those who use gas for purposes of baking and cooking tend to report heat conservation activities less frequently than do those who use an alternative source of energy or who do not bake or cook. And yet, gas is by far the dominant source of energy for heating. Again, those who report cost impacts from the general energy situation tend to report fewer energy conservation activities than do those who did not mention such impacts. And yet energy costs are among the most frequently mentioned types of impact.

In the end, then, there does not seem to be any clear pattern of factors which are associated with retail establishments' reported energy conservation activities. This may indicate that such activities are relatively randomly distributed in the population of small retailers. In comparison with the household analysis, retailers' levels of conservation are far less explicable. This is a puzzle which remains to be solved in more extensive studies of energy conservation at the retail firm level.

From a policy decision-making standpoint, such negative conclusions are not completely without value. Programs to induce voluntary conservation -- such as Project Pacesetter -- have had little or no impact on our respondents. This may be a result of the low visibility of this program, since only five of the respondents indicated any sort of recognition of the Project Pacesetter title. Nevertheless, those who did recognize the program had little or no more propensity to conserve energy. Also, we might expect those who perceive

themselves as being impacted by the general energy situation to be more likely to attempt to conserve. While this appears to be the case in general, there is no clear evidence as to how this might be occurring. That is, few of the substantive indicators of the respondents' remarks make positive contributions to the explanation of the variance in conservation activities. Furthermore, those which do contribute, positively or negatively, appear to have little face-value relationship to the conservation activities, as noted above. In short, at least two of the forces which might be expected to promote conservation (community campaigns and experiences of energy problems) do not appear to have affected the retailers in our study. This suggests that they may be, as a group, quite resistant to influence from energy policies.

RESPONDENT RECOGNITION OF PROJECT PACESETTER

Introduction

One of the original objectives of this study was to assess the impact of Project Pacesetter. The purpose of Project Pacesetter was to induce the residents of Allegheny County -- one of the most energy intensive areas of the country -- to voluntarily reduce the amount of energy which they consume. Through spot 'advertisements' in the mass media, billboards, group contacts and selected demonstrations, Pacesetter has attempted to increase awareness of the energy problems and to disseminate methods of conserving energy. For reasons expressed fully in Chapter 12, our study can assess only certain aspects of the Pacesetter campaign. For this chapter, we focus on the small retailers' simple recognition of Project Pacesetter.

Pacesetter Recognition

Immediately following the questions concerning the impact of the energy situation on the respondents' businesses, we presented the respondents with four purported project titles. In addition to Project Pacesetter, we included

"Project Action," "Project Save," and "Project Conserve." The additional project titles were included in an effort to control for respondent guessing. The "Action" title actually refers to the national volunteer program "ACTION," while the title "Save" is entirely bogus. The title "Conserve" refers to the state energy conservation program.

As described in Table 11.10, only five of ninety-four respondents indicated recognition of Project Pacesetter. Indeed, more of the respondents indicated recognition of the three other project titles. In short, Project Pacesetter has negligible recognition among the community of small retailers in Allegheny County.

Four of the five instances of recognition appear to be genuine: that is, they indicated recognition of Project Pacesetter but of no other program. The fifth respondent indicated recognition of Project Action as well. However, when we asked the respondents to describe what they understood Project Pacesetter to be, only one of the five "recognizers" was able to give fully adequate description. The other four "recognizers" were able to give only partially adequate descriptions.

All in all, we can only conclude that few retailers were conscious of Project Pacesetter and that even among them awareness was very dim. Much more awareness was achieved among household respondents. Measured against this benchmark, then, it appears that Pacesetter has made a negligible impact on the operators of small retail establishments in Allegheny County.

Characteristics of Those Who Recognize Project Pacesetter

Clearly, five cases do not provide a sufficient base for the conduct of reliable statistical analysis of the differential characteristics of those who indicated recognition of Project Pacesetter. But, for exploratory purposes, we have attempted to determine whether these five respondents share any particular characteristics.

Table 11.10

RECOGNITION OF PROJECT PACESETTER AND
FICTITIOUS CONSERVATION PROGRAMS, RETAILERS^a

Pacesetter	5.3
Action	8.5
Conserve	7.4
Save	8.5

^aEntries are the percent of all members of the sample who recognized the program.

Although nearly one-half of the respondents have completed their high school education or less, all five of those who indicated recognition of Project Pacesetter have completed at least some college. Since Pacesetter is primarily an educational campaign, this result is intuitively satisfying.

Other than their level of education, however, those respondents who indicated recognition of Project Pacesetter did not share any common characteristics. Their establishments are of varying sizes, whether measured in terms of net sales, number of employees or number of outlets. The establishments are located in different parts of the County, and they sell different sorts of products and services. In short, other than being relatively well-educated, those few respondents who recognize Project Pacesetter are randomly distributed in the population of small retailers.

Attitudes Toward Energy-Related Issues and Recognition of Pacesetter

One final attempt to assess the impact of Project Pacesetter involves the relationship between the respondents' energy-related attitudes and whether or not they recognize Project Pacesetter. Once again, our analysis is severely restricted by the fact that so few of the respondents indicated recognition.

The respondents' attitudes toward energy-related issues were measured by a series of statements with which they were asked to agree or disagree. The items were then grouped into six clusters, directionally adjusted and cumulated. These variables are discussed more fully in the first section of this chapter.

With but one exception, there is no statistical difference between those who do and those who do not recognize Project Pacesetter in terms of their attitudes toward energy-related issues. The single exception involves the attitudes toward lifestyle. Those retailers who indicate recognition of Project Pacesetter tend to have somewhat lower scores on this cluster than do those who do not recognize Pacesetter. This indicator has been constructed so that a higher score indicates a greater concern for energy conservation. Thus, the relationship is puzzling.

Conclusion

On the basis of the data presented here, we must conclude that Project Pacesetter has had little impact on the energy-related activities and attitudes of small retailers in Allegheny County. Very few of the respondents recognize the Project, only one of the respondents was able to give an adequate description of the Project, and there is substantially no difference between the attitudes of those who recognize and those who do not.

REPORTED IMPACTS OF THE GENERAL ENERGY SITUATION AND THE 1978 COAL MINERS STRIKE

The purpose of this portion of the report is to describe the respondents' perceptions of the impacts which the general energy situation and the 1978 coal miners strike have had on their respective retail businesses. These questions were posed without any probes or lists of possible impacts. At

the beginning of each of the interviews, we simply asked the respondents how their businesses had been "affected by the recent coal strike" and, secondly, "by other problems related to energy." The key phrases of the responses were recorded verbatim. We then developed a coding scheme based on these responses. For purposes of analysis, we have collapsed the forty-odd initial response categories into eight more general categories.

In the reports of these data it should be noted that many of those who responded included references to more than one effect. Thus, the sums of the substantive categories do not equal the totals of those who reported an effect.

Impact of the 1978 Coal Miners Strike

Over two-thirds of the respondents (68 percent) did report that they had been affected by the recent coal strike. Over a third of the respondents indicated that they had experienced a decrease in their volume of business and nearly one quarter said that they had had to reduce the number of hours they are open.

As in the case of general energy impacts, between 10 and 15 percent of the respondents mentioned increased costs and impacts on their operations, with somewhat more mentioning costs. The remaining three types of affects were mentioned by fewer than 10 percent of the respondents.

The primary effects of the coal miners strike, then, seem not to be directly energy-related. Indeed, some of the effects reported may actually be a result of the extremely cold weather in combination with, or in fact apart from, the coal miners strike.

In saying this, however, it is necessary to keep in mind that these interviews were conducted shortly after the termination of the strike. The effects on consumers' utility bills, especially for electricity, had not as yet become apparent. Furthermore, either as a result of utility company and/or

governmental planning and emergency activities, very few of the respondents reported actual shortages of energy.

Impact of the General Energy Situation

A little more than half of the respondents (52 percent) indicated that they have been affected by "other problems related to energy". Although no single type of effect predominates, two categories were mentioned by 14 and 13 percent of the respondents, respectively.

In short, on the basis of these data, small retailers in Allegheny County seem to have been affected slightly more than householders by the general energy situation. Yet, many perceive that they have not been affected. Furthermore, what effects are reported are rather widely distributed over the range of possible effects. Some are really not adverse energy-related effects, thus driving the percentage experiencing some hardship down to below 50 percent.

Conclusion

Apparently the impact of the coal miners strike on small retailers in Allegheny County was quite different from the impact of the general energy situation. More respondents reported being affected by the coal strike than reported being affected by the general energy situation. Secondly, while the coal strike reportedly has affected retailers' volume of business and lead to some reduction of store hours, respondents were more prone to indicate that it was the general energy situation that had affected their costs and their methods of operation.

In general, neither the coal strike nor the general energy situation have had any singularly substantial impact on the small retailers of Allegheny County. For sure, more than a third reported that their volume of business had been affected by the coal strike, and nearly a quarter reported that they had reduced store hours. But these are undoubtedly short-term sorts of affects (indeed, only 8 and 5 percent, respectively, report these affects in general), and they can be attributed only indirectly -- and perhaps partially -- to the coal strike itself.