OIL BURNER RETROFIT

FOCUS GROUP RESULTS

Prepared for

The Department of Energy

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The viewpoints that comprise the findings and major conclusions of this report are those of the focus group discussants and not those of the Department of Energy or its contractor, Market Facts, Inc.

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SECTION I

INTRODUCTION

This is a report of the focus group research on oil burner development prepared for the Department of Energy as part of the commercialization program. The purpose of this research is to evaluate the potential for commercialization of oil burner retrofit, determine the barriers to development of this retrofit, and to judge what actions are required by the Federal Government to promote commercialization.

The research reported herein discusses the issues of commercialization as examined by a focus group consisting of key individuals from various organizations involved in oil burner retrofit development. The report addresses the following questions:

- Is oil burner retrofit feasible for commercialization?
- What is the nature and extent of the market for oil burner retrofit?
- What barriers and opportunities are critical to the commercialization of oil burner retrofit?
- What actions, if any, should be taken by the Federal Government to bring about successful commercialization of oil burner retrofit?

These questions are examined from the perspective of the respondents in the focus group. Their attitudes, perceptions, opinions and knowledge provide the basis for the data and conclusions presented in this report.

A. BACKGROUND

Recent energy "crises" of various types, combined with growing public awareness of the depletion of natural resources and the deterioration of the environment, have led to increased efforts to discover alternative energy sources and new methods of conserving energy.

The petroleum shortage is an example of an energy crisis. The United States is increasingly dependent on uncertain foreign oil supply. This fact was underscored by the Arab oil embargo of 1973-74. Total imports of petroleum products have grown from approximately 20 percent of our requirements in 1970 to nearly 50 percent in 1977. According to long-range government projections, if present consumption trends continue, domestic and and world sources combined may not be adequate to meet the expected U.S. demand for petroleum.

Faced with these and other energy problems, the Federal Government and the Department of Energy (DOE) have become increasingly involved in the area of energy consumption and conservation. The result of this involvement has been the promulgation of a growing body of regulations, on the one hand, and the active support of the research, development and implementation of energy technologies, on the other hand. These activities will ultimately have a tremendous impact on American society with strong implications for economic, physical, social and psychological issues.

In the area of energy conservation, a number of technologies have been supported. Some examples of these technologies are given to illustrate their impact. High-efficiency electric motors have already been developed in private industry. DOE is considering what actions could be taken to increase their use by the nation's industries since these motors account for a substantial proportion of the electricity we consume. The further development of electric or hybrid vehicles could reduce the amount of gasoline consumed, thus decreasing our dependence on foreign oil imports. Retrofitting home oil furnaces with the more efficient flame retention heads could reduce fuel oil consumption. In light of recent oil shortages during harsh winters, this conservation measure could have a broad impact on the economy as a whole in addition to reducing the owner's fuel bills.

There is a need to develop new sources of energy that will reduce our vulnerability to energy crises and foreign

energy supplies. The variety of sources is illustrated by the following examples. The development of shale oil resources could provide a substantial supply of domestic oil. The installation of low-head hydropower plants in existing dam sites could provide a widespread source of clean energy that would have minimal effect on the environment. The development of wind energy technology is another source of new energy that could reduce oil consumption by replacing some of the use of oil-fired generating plants.

To further these goals of energy conservation and development, the Department of Energy is conducting a program of commercialization for a number of energy related technologies. The intent of this program is to promote conservation of energy and use of new energy sources by bringing these technologies to the market place. By encouraging the widespread use of the appropriate technologies, DOE can attain the goal of energy efficiency.

The commercialization program requires that DOE evaluate a number of energy technologies in terms of their commercialization potential. The particular questions that need to be answered for each technology are these:

- Is the commercialization of this technology feasible?
- What is the extent and nature of the market for this technology?
- What barriers or opportunities can be identified as critical to the commercialization effort and what is the relative importance of each?
- What actions, if any, should the federal government take to promote commercialization of these technologies?

Since the technologies that are candidates for this program vary widely in their technical maturity and economic circumstances, the answers to these questions will have a substantial impact on the course of the commercialization processes.

B. RATIONALE FOR FOCUS GROUPS

The commercialization program is now at the stage of evaluating the commercialization potential of various energy technologies. As a means of guidance in decision-making, DOE requires comprehensive input from key individuals associated with these technologies. Such individuals include representatives from government, industry, and environmental groups whose knowledge and expertise enable them to provide input to the decision-making process. The complexity of the issues and interrelationships surrounding those energy problems makes the contributions of such qualified people essential.

The focus group methodology is ideally suited to such an information gathering effort. A focus group brings together a number of individuals whose discussion of the relevant issues is led by a trained moderator. The rationale for such a group discussion is that the interaction of the respondents will produce a more thorough understanding of the topic than would interviews conducted individually. This effect is due in part to each respondent's contribution to the others as well as to the nature of the leadership exerted by the moderator.

The information needs of DOE require input to policy decisions from outside DOE. Such input is best obtained by identifying target populations of organizations and individual roles within those organizations. From these populations, qualified respondents can be selected who represent a variety of opinions about and attitudes toward the commercialization of a particular technology. Such representation helps assure

coverage of the commercialization issues from many viewpoints - developers, manufacturers, distributers, purchasers and users.

The reader should be aware that focus groups have certain critical limitations that must be kept in mind when interpreting data derived from this technique. One must be cautious in making generalizations and drawing definitive conclusions from any qualitative research data, since the information obtained is not only based on a small number of cases, but relies upon a volunteer sample. Such a sample could not be statistically representative of its assumed universe even if it were many times larger. As a result, these findings should be viewed primarily in the context of discovery, offering working hypotheses to be validated with quantitative techniques, if that is the desired goal.

Overall, this report should be read as primarily qualitative, providing insights into perceptions and knowledge of these technologies. The major questions to be answered by the research will describe WHAT, HOW and WHY participants know, think and feel about the issues, with less emphasis to be placed on HOW MANY know or think and feel in given ways. As a result, not every respondent would agree with each conclusion of the report.

Finally, the conclusions presented in this report and the findings on which they are based represent Market Facts' objective analysis of the information derived from the focus group respondents. That is, they do not represent any particular point of view held by Market Facts. Instead, the report is based on the knowledge, perceptions, attitudes and opinions of the respondents as brought forth in the focus group.

C. PROFILE OF GROUP

The research reported herein concerns oil burner retrofit development. The meeting was held in New York City. The meeting took place from noon to 3 PM on August 4, 1978. Dr. Morris Gottlieb served as moderator.

There were 11 respondents present at the focus group representing the following types of organizations and viewpoints:

- Residential heating research and testing
- Heating equipment wholesaler
- Distributor of temperature controls
- Manufacturer of temperature controls
- Hydronic equipment trade association
- Manufacturers of residential and commercial oil burners
- Oil companies
- Oil dealer trade associations

SECTION II

SUMMARY AND MAJOR CONCLUSIONS

This section of the report presents the major conclusions of this research. These conclusions are based on what participants view as the necessary actions and incentives to implement a program of oil burner retrofit development. As such, these conclusions reflect the barriers and actions that represent DOE's conceptions of the commercialization issues.

To summarize the major points of discussion, the respondents feel that:

- This technology is ready for immediate commercialization
- A major barrier is consumer awareness and knowledge of the potential savings possible from oil burner retiofits
- Another major barrier is the lack of volidity of present certification procedures in relationship to actual operating costs from an in-place unit.

The following government actions are perceived as necessary by the respondents:

- A program of consumer education that would emphasize the expected mmetory savings from retiofits
- Provide the consumer with criteria to protect against problems with incompletent or unethical dealers
- Establish a more valid certification program to measure boiler and burner efficiency in actual use
- Certify trained servicemen as qualified technicians
- Provide tax credits and/or bonus to homeowners as incentives to retiofits.
- Continue and improve funding of innovative home heating technology marketed by oil dealers

A. FEASIBILITY OF COMMERCIALIZATION

The following three energy-saving options that call for off-the-shelf technology are deemed to be ready for immediate commercialization:

1. Optimizing firing rates (OFR)
2. Replacing existing burners with high-speed flame-retention head burners (FRB)
3. Replacing existing (inefficient) boilers and furnaces with new more efficient units (RU)

B. NECESSARY ACTIONS AND INCENTIVES FOR COMMERCIALIZATION

1. Consumer Education

A massive advertising and educational campaign should be supported by DOE to:

- Make the consumer aware of the potential for substantial savings from a qualified heating system inspection and tune up and appropriate retrofits where necessary
- Educate the consumer about the factors that improve fuel economy and give him a realistic idea of what kind of gains he can reasonably expect
- Provide him with understandable criteria and guidelines (in the form of checklists) that will enable him to judge and critically evaluate dealer recommendations and protect himself against incompetent or deceptive practices.

2. Establish Definition and Certification of Accepted Equipment and Practices

The current process of certifying boilers and burners should be reviewed by an independent body such as the Brookhaven National Laboratory. A revised system of inspection should be adopted taking on-site performance into account. Certification should be supported by formal requirements for FHA loans and the like. Trained servicemen should be certified as qualified technicians.

Others felt that it should be restricted to indicate compliance with minimum industry standards.)

3. Financial Support

The most feasible and effective form of financial support was considered to be a tax credit. (One of the oil dealers cited a survey conducted among his customers to support this view).

Some form of low interest loan should be developed and supported by DOE and/or the states. (One suggestion was that in states where expenditures on retrofits were subject to sales tax, the states should set aside a portion of the sales tax revenue for this purpose.)

4. Evaluation of Savings Achieved

A scientifically correct test should be conducted to measure the savings achieved by retrofits in an actual use setting. Such a test should include the installation of recording instruments that would make it possible to account for gains in part load as well as steady state efficiency.

The group was anxious to go on the record as being enthusiastic about the potential of the retrofit market -- both in terms of the options included in the demonstration program and in terms of intensive research and development of new technology ("For each buck spent on retrofits, spend a buck on research for new technology"). Though increased funding of innovative technology, the industry feels it will not be "left out" of new developments (such as the heat pump).

SECTION III

MAJOR FINDINGS

This section of the report presents the detailed results of the focus group. These results are the basis for the conclusions drawn in the previous section.

A. ENERGY-SAVING OPTIONS FOR RESIDENTIAL OIL-FIRED HEATING EQUIPMENT

Three energy-saving options that call for off-the-shelf technology and are deemed to be ready for immediate commercialization are:

1. Optimizing firing rates (OFR)
2. Replacing existing burners with high-speed flame-retention head burners (FRB)
3. Replacing existing (inefficient) boilers and furnaces with new more efficient units (RU)

The first of these options can be expected to result in the reduction of firing rates in many cases with consequent fuel savings. However, there are limitations: all burners can't be reduced in firing rates with the same gain in efficiency. Nor will firing rate reduction always save fuel. In many cases firing rates cannot be reduced at all. For example, reducing the firing rate may not be efficient in a steam system because of the need to produce a sufficient head of steam. (According to the Brookhaven National Laboratory (BNL) representative and to the Hydronics Institute representatives). In general a decision to reduce the firing rate requires some judgment and a careful consideration of the system requirements. For this and other reasons it might be advisable to consider OFR as part of a system tune-up rather than as a separate technique.

On the other hand, there was complete agreement in the group that replacement of an old burner with a high-speed flame-retention burner would result in a 15-20 percent

saving on combustion efficiency.

The representative from the Massachusetts Better Homes Heating Council declared that a tune-up of the firing rate and the installation of a flame retention burner head could be expected to bring a furnace/boiler operating at 55 percent efficiency up to the high 70's. In cases where this is not possible a more efficient furnace can be expected to increase the current efficiency by at least 20 to 30 percent. However, this saving is conditioned upon the efficiency of the new installation, with a range of almost 20 percent from the least to the most efficient replacement. In general, a new installation is likely to be much more efficient than a 10-20 year old system was when it was new because of the advances by the industry in the past 10 years or so. However, its actual efficiency depends to some degree on the competence of the installer.

B. OTHER TECHNOLOGIES

Other technologies under consideration by the industry are:

1. Conversion from steam to hot water

   The New England representative reported that his organization was exploring the feasibility of conversion from steam to more efficient hot water systems to yield incremental gains in energy conservation.

2. Stack dampers

   He also reported that his organization had investigated the savings that might be afforded by stack dampers -- especially in terms of off-cycle efficiency -- and come to the conclusion that they did not warrant emphasis in the program since the

saving would be of the order of only about two percent.

3. Heat Reclaimers

This option was also given a low priority on the grounds that such off-the-shelf options would reduce stack temperature below the level where sizable incremental efficiency gains could be expected from reclaimers.

4. Temperature Controls

The distributor and control manufacturing representatives feel that the use of currently available temperature controls can result in substantial energy savings at low cost. Although controls such as timed thermostats are strictly speaking outside of the topic, they could take into account the home occupancy patterns, inside-outside temperature differences and other specific home factors to reduce fuel consumption.

5. The Oil-fired Heat Pump

The representative of the New York oil dealer association stated that the weight given to the gas and electric powered heat pump represented a threat to the oil heat industry and strongly urged a massive research and development program for an oil-fired heat pump by the DOE. On the other hand he also invoked the support of the BNL representative in the claim that the heat pump did not offer any energy savings over the conventional system.

Throughout the discussion the BNL representative and others stressed the need for critical definition and use of the "efficiencies" used in evaluating different options and even in evaluating different products. For example, the candidate options consider mainly combustion efficiencies, yet the total system involves conduction efficiencies which may have an even greater influence on the total cost than the combustion factors. Moreover, the efficiencies vary with the conditions of use.

Seasonal efficiencies are the measures that indicate the true cost of fuel to the user. The conditions of actual use may be simulated in the laboratory and prediction of seasonal efficiency made using linear models to produce more valid certification procedures that reflect the true cost of operation.

All three groups--dealers, wholesalers, manufacturers -- and the trade association representative agreed that the technology and equipment were "on-the-shelf" and ready to go, that they supported an aggressive retrofit program and that they were ready to undertake a demonstration program given sufficient DOE support.

C. PERCEIVED PROGRAM BARRIERS

1. Consumer Awareness and Perceptions

The principal barrier facing the retrofit program is the consumer's ignorance of the potential cost savings that he would derive. To some extent this may be due to the fact that, in contrast to his automobile, his heating system is likely to be a low interest, low visibility item. To an even greater extent it can be attributed to the difficulty of measuring the efficiency gain and translating it into a bottom line dollar figure because of the many variables involved in making an appropriate before-after comparison.

Efficiency gains can be translated into dollar savings per year directly only under exactly similar conditions for the period before and the period after the retrofit

- the same degree days
- the same conditions of use
- the same condition of the non-retrofitted parts of the system .

The consumer is unable and probably unwilling to make all the adjustments necessary for a valid comparison. Yet, according to the BNL representatives one may normally expect a variation of 20 percent from one year to the next in fuel use for the same system.

Even if these variables were equal before and after this retrofit it would be difficult to certify the efficiency gains in a particular case because of variation in the quality of equipment and installation.

2. Consumer Attitudes

According to the oil dealers in the group (one of which had conducted a survey of his customers), the sense of urgency for energy conservation stemming from the embargo seems to be ebbing. They tend to attribute price increases to general inflation and see no signs of a shortage. The result is not only lack of interest in making an investment in energy conservation but skepticism about government energy programs which may be manifested in a lack of low credibility for government claims of energy saving or cost reduction. The skpticism is likely to have been strengthened by the delay in enacting a comprehensive energy program. Moreover, the tax credit proposal for home insulation that came up last year buy never passed may have further weakened the government's credibility. The insulation episode, in which the prospect of a tax credit which was never realized, generated a shortage, may have
Several participants believed that some consumers would be reluctant to make an expenditure (or investment in heating improvement) that might turn out to be premature if a tax credit were granted later.

3. Cost and Financing

Cost deterrence is likely to be greatest for low income homes whose equipment is most in need of upgrading and who are least capable of making decisions of this kind on the basis of investment criteria.

Financing by the consumer of outlays under $1,000 is a barrier. Banks find loans of this size unprofitable. They also are reluctant to carry the dealers' paper because of the FTC regulation which increases the liability of the holder in due course.

Most oil dealers are not equipped to carry the financing on their own -- in contrast with the competing gas and electric utilities who can reflect financing costs in their rates.

4. Institutional Barriers

The residential heating industry is highly fractionated -- in sharp contrast with the monolithic nature of the utility competition. The dealers compete with each other; they compete against the utilities; the servicing dealer competes with the bulk dealer on one hand and with the heating, ventilating, air conditioning (HVAC) contractor on the other. The non-service dealer competition makes it difficult for him to bury the cost of services in the oil price and the HVAC contractor competition exerts price pressure on him in the sale of retrofit equipment and service.

The fractional character of the industry also limits the capability of the industry to mount large scale advertising and education campaigns.

Since the typical small dealer serves a limited geographic area, he might well be motivated to concentrate his efforts on getting the maximum revenue from his present customers. Since the service end of business is not likely to be highly profitable, his interest in fuel conservation would tend to be low--as long as he remains competitive within his industry as well as with other energy sources.
The oil dealers in this group took offense at the suggestions in an internal DOE document one of them had seen that they were not interested in achieving the optimum economies for their customers and cited their activity in promoting conservation and economy programs (including service in training and efficiency testing) as evidence to the contrary.

While their sincerity and their evidence were convincing the question about the zeal and effectiveness of the smaller dealer is still open. However, the competitive pressure from the type of large, successful, and aggressive dealer represented in this meeting can probably be counted on to bring the others into line -- at least to a minimum extent.

The oil dealers in the group insisted that they were adequately staffed with trained personnel to implement a retrofit program. However, the manufacturers pointed out that while the servicing dealers now carry about 90 percent of the service load they probably could not expand their operation to take care of a massive expansion of the retrofit business. To do this would require involving other groups such as the HVAC contractors.

In fact, even the large successful oil dealers acknowledged that during seasonal peaks they had to let inspections and retrofits go by the board in order to handle their emergency calls.

APPENDIX

Exhibit 1

Commercialization Profile For
Residential, Oil-Burner Retrofit
Program

DOE Document

BARRIERS*

	Technical/Economic		Initial Deployment		Environmental	Resource Availability	Institutional+		
Barrier Importance	1	3	4	4	2	1	1	1	1	1
Federal Actions to Overcome Barriers**	None	Long payback period for furnace/boiler replacement	Lack of consumer awareness	Dealer support - potential loss of oil sales	Oil dealer creditibility	None	None	Government (federal) - None	Government (state and local) None	Private sector - None
Information/Education										
Marketing demonstration Advertising/promotion (F and S)			4	3	4					
Information dissemination (F)			4		4					
Financial Incentives										
Loan guarantees (S)‡		2	2							
Tax credits listed in NEA (F)		3	3							
Regulation										
Standardized industry practices (S)				3						

*Ranked in order of criticality, with 5 being most important, and 1 being least important.

**Ranked on a scale of 1-5, with 1 having no effect, and 5 virtually eliminating the barrier. F=federal S=state

+A field evaluation program of new, oil-burner retrofit devices (i.e., vent dampers) will address technical and institutional barriers.

‡Loan guarantees are being investigated at the state and federal levels.

DISCUSSION GUIDE

I. Introduction

A. Topic and Purpose of discussion

B. Discussion format

C. Background of participants

1. Organization identity
2. Role of organization in technology
3. Individual's role

II. Current State of the Energy Technology

A. What is the current state of the art?

B. To what extent has the technology advanced over the years?

C. What have been the characteristics of this advancement?

D. What will be the net effect on energy output in short-term? Long-term?

III. Commercialization

A. Is the technology understood and far enough along in its development that it can be commercially implemented?

B. Is industry physically and psychologically ready to accept and implement the technology?

C. What are the likely markets for the technology: Consumer? Governmental? Industrial?

D. Are these markets physically and psychologically ready to accept and utilize the technology?

E. Are any of the following barriers to commercialization What are they? How are they barriers? How important are they?

1. Technological barriers
2. Economic barriers
3. Social barriers
4. Political barriers
5. Environmental barriers

F. Do any of the following present themselves as opportunities or facilitators of commercialization? What are they? How are they opportunities? How important are they?

1. Technological factors
2. Economic factors
3. Social factors
4. Political factors
5. Environmental factors

G. What, if any, information should be provided to insustry and the public to enhance the acceptability of the technology? In what form should it be conveyed? Who should provide the information?

H. Financial considerations

1. What are the estimated costs associated with the commercialization of the technology?
2. What are the sources for these funds? Why these sources?

IV. Impacts

A. What if any, impact will there be on the following as a result of commercialization?

1. Physical environment
2. Social structures
3. Political structures
4. Economic structures
5. Labor market

B. How important are these impacts?

V. Role of the Federal Government in commercialization of the Technology?

A. Should the government exercise a role?

B. What role is desired or necessary?

1. Provide findings?
2. Favorable legislation?
3. Provide knowledge?
4. Provide equipment, materials and facilities?
5. Other?

C. What departments and agencies should be involved?

VI. Presentation of and Reaction to DOE Thinking

A. (Present concept statements to participants)

B. General reactions

C. Are these plans realistic/feasible given the:

1. Current state of technology
2. Realities of the market place
3. Realities of social, economic, political structures?

D. (Focus on specific aspects of the concept statement. Included here:)

1. Has DOE realized all of the opportunities and barriers? Are there others? How important is each?
2. Has DOE presented all of the possible solutions to the barriers? Are there others? What is the relative likelihood of success of each solution?
3. Is DOE's time schedule realistic/feasible?

VII. Summary

(The discussion will be reviewed with the participants in order to develop "bottom line" statements about each critical issue).