MASTER

LARGE WIND ENERGY

FOCUS GROUP RESULTS

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Prepared by:

Market Facts - Washington
1750 K Street, N.W.
Washington, D.C. 20006

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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 large wind energy systems 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 wind energy, to determine the barriers to development of this resource, 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 large wind energy systems development. The report addresses the following questions:

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

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 representa-atives 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 THE GROUP

The research reported herein concerns the commercialization of large wind energy systems. The focus group meeting took place in Boston, Massachusetts from 12:00 to 3:00 pm on July 27, 1978. Dr. Francis T. Campos, Associate Study Director of Market Facts, Inc., served as moderator for the group.

There were 11 respondents present at the focus group. They represented the following types of organizations and interests:

- Federal wind energy grant holder
- Energy planning institution
- Rural utility executive
- Investor-owned Utility
- University Wind Energy Expert
- Financial Executive
- State energy office representative
- Equipment manufacturing executive
- Engineering representative
- Utility executive: Marketing and Consumer Relations
- Utility executive involved in wind energy.

SECTION II

SUMMARY AND MAJOR CONCLUSIONS

To summarize, the respondents feel that large wind machines are technologically ready for commercialization but need a few refinements before commercial production can begin. The previous barriers are seen to be:

- High current costs relative to other energy sources.
- Lack of guaranteed market.
- Lack of capital to prepare mass production facilities.

They believe that the Federal Government should act in the following ways to promote commercialization.

- Provide a guaranteed government market (BuRec) for large wind machines to promote the development of 2 or 3 compaines.
- Remove economic barriers that prevent the utilities from adopting wind energy. For example, provide capacity credit and remove subsidies to present fuels.
- Promote industry R&D by allowing the company to retain patent rights.
- Promote arrays of smaller machines rather than one or two large machines

A. COMMERCIALIZATION FEASIBILITY

The consensus of the respondents is that large wind energy systems are technologically ready for commercialization. The primary barrier is the lack of a guaranteed market for large scale industrial production. Once such a market is created, the technical refinements and the improvements in cost necessary for commercial production will follow rapidly.

The respondents believe that the perspective on relative energy costs could be clarified if the government would take action to price energy at its true costs rather than the costs as subsidized. The development of a market among the electrical utilities is believed to require changes in rate structure and allocations of capacity credit to provide incentives for the widespread use of large wind energy.

B. NATURE AND EXTENT OF MARKET

The respondents feel that market-related issues are the key to the success of the commercialization of large wind energy systems. They are confident that a guaranteed market would soon result in high levels of production of cost-efficient wind machines from two or three private companies. The majority of the respondents feel that the Federal Government should provide a market that would support the development of this industrial capacity.

The effects of such a market are perceived to be the following:

- Remove industry reluctance to invest effort in the final stages of technical refinement
- Provide an incentive for industry to invest in the mass production facilities necessary to bring the costs of wind machines to economical levels.
- Provide a demonstration and final check on the feasibility of arrays of wind machines to provide relatively large amounts of power to a grid.
- Remove any barriers of conservatism and reluctance on the part of utilities as an incentive to adopting wind energy systems.
- Broaden the market for large wind energy systems beyond the Federal Government to investor-owned and municipal utilities and to other industries that use large quantities of electrical power.

The respondents feel strongly that without such a guaranteed market, industrial development will not occur. The majority of the respondents feel that the Federal Government is the appropriate locus for that market.

C. BARRIERS TO COMMERCIALIZATION

High life-cycle cost is believed to be the strongest barrier to commercialization for large wind energy systems. Furthermore, this is seen as the only real barrier to adoption by the utilities. Once the costs "fall into line", the other problems such as grid stability could be resolved with relative ease, in the opinion of many of the respondents.

A number of factors are believed to contribute to high costs. The respondents feel that the current mode of production must be substantially altered so that mass production techniques could reduce the price of large wind machines. Although fuel displacement is a major aspect of the economy of wind energy, the respondents feel that granting capacity credit for wind machines would substantially improve the life-cycle costs. Furthermore, the current rate structures are perceived as discouraging the utilities from the use of wind energy.

Once the barrier of high cost is reduced, the respondents believe that the barrier of utility conservatism and familiarity will be substantially less important. The consensus is that utilities would consider wind energy as a source of electrical power as soon as the scale of costs was proven.

The barrier of an uncertain market is seen to be as important as the barrier of high cost. The consensus is that private industry can develop the capability to produce economical large wind machines in substantial quantities. The

respondents feel that the lack of a more certain market prevents a stronger commitment by private industry to the development of large wind energy machines.

A barrier not included on the DOE commercialization profile is believed to present an obstacle to development by private industry. The lack of patent rights provided to the company that develops a technical improvement is seen as a strong disincentive to rapid development of the technical basis of large wind energy systems. An industry representative feels that this is a severe barrier to the progress of research and development.

The remaining barriers are not perceived as presenting obstacles to commercialization that require significant levels of effort to overcome. Furthermore, they believe that the barriers of high cost and an uncertain market are mutually interdependent and can be overcome with a single, coherent plan of action.

D. GOVERNMENT ACTIONS

The respondents feel that the barrier of high cost can be overcome by two actions. The first is to help provide the financing for two or three companies to develop the production capabilities to mass produce large wind machines. The respondents feel that production on a scale of perhaps 240 machines per year would allow a company to bring its costs to a level that would be attractive to much of the market. The intended effect of this action is to lower the cost of electricity produced by wind energy.

The second action recommended by the respondents is to adjust the price of electricity from other technologies to reflect its true cost to the utility and the consumer. The respondents feel that the subsidies for oil-fired and nuclear generating plants disguise the actual cost of the energy produced. They feel that the apparent cost differences between wind energy and other energy sources would be substantially reduced if such an adjustment were to take place. They recommend the following specific actions to accomplish this price adjustment:

- Change the fuel clause so that the price of fuel is not passed on to the consumer but must be partially absorbed by the utilities.
- Readjust the price of oil so that it reflects the true cost to the consumer.
- Allow capacity credit for wind energy. This would reduce the costs to the utility of building generating plants in addition to the wind machines, thus reducing their capital costs.

. Loan guarantees or some other form of "comfort" to financial institutions are also believed to facilitate wind energy use, by utilities.

The respondents also recommended research in two areas to facilitate the justification of capacity credit for wind energy. They believe that a widely dispersed wind array would provide a stronger basis for providing statistically defined credit. They also feel that the development of energy storage systems would justify more capacity credit.

The barrier of an uncertain market is believed to be best overcome by guaranteeing a federal market for wind energy. The respondents feel that such a reduction in the uncertainty of the market for large wind machines would be a sufficient inducement for two or three companies to develop mass production capabilities. Furthermore, they feel that such a program would provide a basis from which the utilities could evaluate the costs of wind energy. If the costs are as favorable as expected, the consensus is that a large market among the utilities would develop quickly.

A number of actions were proposed to overcome the problem of the lack of patent rights granted to companies conducting research and development with federal support. The respondents believe that some arrangements could be made to pay back to the government whatever "front end" money was used to develop a patentable concept. The potential for substantial royalties from such development efforts is believed to be a valuable incentive for promoting research and development in private industry.

The respondents feel that some other actions would be valuable in promoting the commercialization of wind energy, particularly in the area of siting decisions. They feel that further research on windstream behavior would be useful. Such information is believed to be helpful in optimizing energy use at a particular site. Efforts to identify both specific and regional areas where wind energy is most economical is also believed to be useful in furthering commercialization efforts.

The respondents recommended other actions by the Federal Government that were not part of the commercialization profile. The consensus is that a national energy policy is necessary. The respondents feel that the establishment of specific goals would further the commercialization of wind energy as well as other energy technologies that would relieve the continuing energy crises.

Greater internal coordination within DOE is also believed to be an important action. The respondents feel that improvements in policy consistency would result in more effective responses to energy development programs, such as the coordination of renewable resources programs.

III MAJOR FINDINGS

A. TECHNICAL ISSUES

The general consensus of the respondents is that the major technological basis for large wind energy machines(50 KW) is prepared. They feel that the development that remains consists largely of refinements to improve the reliability and efficiency of these machines. There is some feeling that certain technical aspects deserve more caution. However, the thrust of the discussion was that large wind machines are substantially ready for a commercialization effort.

Although the respondents feel that the "state-of-the-art" is very close to a commercial machine, there are a few areas of technical uncertainty that were discussed. Some respondents feel that contemporary machines are surprisingly unreliable compared to the farm machines of the 1930's. One respondent noted that those were crude, small and inefficient units and that today's machines are seeking new levels of efficiency.

One possible problem that was mentioned was the possibility of a machine throwing blades. Some respondents dismissed this problem as one possibly of inferior engineering that could be overcome with further testing. Others were more concerned with the possible problems of 300 foot rotors. One respondent said, "Don't underplay the technology of large machines." Others feel that machines of that size are not necessarily appropriate and that arrays of smaller machines

were more suited to electrical generation.

Problems of connecting an array of machines to the grid were also discussed. The respondents feel that such problems could be overcome easily if the penetration of wind machines was not too great. When wind energy accounts for a substantial proportion of the generating capacity sometime in the future, they believe that enough experience will have been gained to overcome such problems. One respondent reported that a researcher had had recent success with such a problem, feeling that it could be solved fairly easily.

B. SOCIAL AND ENVIRONMENTAL ISSUES

Some respondents were uneasy about possible environmental concerns. It was reported that an environmental group was concerned about the impact of large wind machines on night migrating birds. The feeling of other respondents was that this was a negligible impact compared to the competing technologies, such as Nuclear Energy.

The possibility of various noise components presenting social or environmental problems was discussed. Respondents with direct experience with wind machines feel that noise levels are acceptably low. One respondent reported that residents living near a future wind machine site were concerned with possible noise levels. Another respondent reported that one machine was very loud, "a real screamer," but that most machines of any large size are now very quiet.

The possibility of damaging noise from unusual parts of the frequency spectrum was raised, particularly with

respect to infrasound (very low frequency noise). This possibility was met with laughter. One respondent said, "It bothers the earthworms."

The aesthetic consequences of siting large wind machines was considered. One respondent feels that the public expects a stereotype of the Dutch wood sail windmills. His other experience shows that the public thinks that wind machines resemble oil drilling derricks. Some respondents feel that more pleasing tower designs can be used if aesthetic concerns become important. It was also noted that the majority of these sites would be in remote locations chosen for their wind velocity characteristics.

Some respondents discussed the high cost of land in heavily populated regions as a barrier to wind energy development. Although such siting decisions can present problems (discussed below), they tend to prevent aesthetic conflicts in densely populated areas.

C. SITING ISSUES

Problems of site selection were discussed with regard to the extent of the wind resource and the availability of land. The respondents feel that further research into the wind resource is warranted. Both regional and local wind characteristics are believed to require further investigation so that optimal sites can be chosen. Since the group assumed that arrays of wind machines are the most likely configuration, they concluded that urban and suburban sites are undesirable. Although coastal and offshore sites were

discussed, issues of cost are felt to be barriers to these locations.

Wind surveys are felt to be a valuable tool to determine the energy value of a particular location. Because wind is a somewhat variable resource, one respondent feels that as much as 2 or 3 years of data collection would be useful in establishing the energy value of a site. Variations of no more than plus or minus 15 percent were expected over the span of a year.

D. MARKET ISSUES

The discussion of issues related to the size, extent, and certainty of the large wind energy market began with the observation that a manufacturer not present at this meeting felt that the market potential lay overseas. Another respondent said,

> "I think there will be a market in this country but we can't begin to define it yet. The big user - the utilities - don't know how to use it and we can't describe it to them in enough detail so they could make an assessment."

In the discussion that followed one respondent said that, "The government should get out of all this as soon as possible." Other respondents noted that the government subsidizes other energy sources and consequently wind energy will need government involvement to stay competitive.

The consensus was reached that a market would not be possible until the costs of wind energy matched those of the

competing technologies. Most respondents feel that government involvement is necessary to reduce the costs of wind energy. Once those costs were reduced, the respondents feel that a broadly based market among the various kinds of utilities would evolve.

The respondents feel that the development of a sufficient market for wind energy systems depends on three issues: finding the true cost of energy, developing wind energy manufacturing capacity, and establishing a guaranteed market. They feel that the government must play a large role in each of these areas.

E. ENERGY COSTS

The respondents believe that the true costs of energy are hidden by various kinds of government subsidy. Furthermore, they believe that the costs paid by the consumer are also imbalanced so that incentives to develop more efficient energy sources are lost.

One respondent feels strongly that we must stop importing foreign oil if we are to solve many of the problems we experience today. Others agree, noting the circular nature of the low incentives to develop alternative energy sources and the dependence on foreign oil.

Others feel that a similar economic disincentive operates on the utilities to discourage alternative energy sources. The fuel clause which allows the utilities to pass on the costs of more expensive energy, is seen as a strong

disincentive to the development of wind energy. The respondents feel that a restructuring of the utility rates is necessary to promote energy development. They agree that as long as the utilities perceive wind energy as uneconomical, they will not consider it as an energy source.

A further disincentive to the utilities is believed to be present in the capacity credit system. As long as wind energy only serves to displace other fuel sources, it will not be as economical as other types of generating plants. They feel that some means of granting capacity credit to wind energy should be considered. Two possible mechanisms that were discussed are energy storage in the form of hydrogen or other advanced techniques and statistical credit for dispersed wind arrays.

F. INDUSTRY DEVELOPMENT

The respondents agree that the costs of large wind systems must be lowered substantially before a market of any reasonable size can be contemplated. Furthermore, there is general agreement that the most significant cost savings can be made through applying mass production techniques to the manufacture of large wind machines. One respondent feels that the cost per pound should be the same as for any other type of heavy machinery.

They agree that private industry would not be willing to make a substantial investment in either the development or the physical plant without some guarantee of a market. The possibility of government loan guarantees was mentioned

by one respondent. Others feel that such guarantees would not be worthwhile unless a proven market were available.

G. GUARANTEED FEDERAL MARKET

The respondents feel that the government should exert leadership in the use of large wind energy. They feel that a program of wind energy development would support two or three manufacturers if orders of 500 or more units could be made. It is believed that such a demonstration program would widen the market to utilities once wind energy had been proved economical.

The respondents discussed a program that might be sponsored by the Bureau of Reclamation as a replacement for energy from new dams. They feel that such a program would reduce our dependence on foreign oil as an added benefit. Such a program is also felt to be effective in advancing the final development necessary for production techniques to be economical.

They expect the goals of this program for industry would be to demonstrate the economy of large wind energy. This demonstration is believed to be an effective means of widening the market to include electric utility companies who would ordinarily be reluctant to use an unproven technology. They feel that such an action would be highly effective against the most important barriers to commercialization.

APPENDIX

TABLE 3

COMMERCIALIZATION PROFILE FOR LARGE WIND SYSTEMS

BARRIER	TECHNICAL/ECONOMIC			INITIAL DEPLOYMENT			ENVIRONMENTAL				INSTITUTIONAL
Importance	4	2	3	3	3	3	2	2	2	1	2
COMMERCIALIZATION LARGE WIND SYSTEMS (All Markets) ACTION	HIGH COST	RELIABILITY/ SYSTEM LIFE-TIME	GRID STABIL-ITY & CONTROL	UTILITY CON-SERVATISM/ FAMILIARITY	MARKET UNCERTAINTY	INDUSTRIAL INFRASTRUC-TURE	TV INTER-FERENCE	AESTHETICS	SAFETY	INFRASOUND	PRODUCT LIABILITY (P)
INFORMATION											
Technology Development (F)	5	5	5	4	3	3	4	2	5	5	4
Market Information/Strategies (F)	3	2	1	2	5	3	3	4	2	2	1
Demonstrations (F)	4	3	4	5	4	5	3	4	3	3	4
Technical Information/Assistance (FS)	3	3	4	4	4	2	3	2	3	1	2
Wind Prospecting (FS)	4	1	2	4	5	3	2	4	2	1	2
Siting/Economic Tools (F)	4	2	1	4	4	3	5	4	3	2	1
FINANCIAL INCENTIVES											
Planning Grants (F)	2	1	2	4	4	4	5	4	3	2	2
Price Guarantees (F)	2	1	1	4	4	3	2	1	1	1	2
Loan Guarantees (Producer) (F)	3	1	1	2	3	3	2	1	1	1	2
Loan Guarantees (Consumer)	3	1	1	3	2	2	2	1	1	1	2
Low Interest Loans (F) (Producer)	4	1	1	2	3	3	2	1	1	1	2
Low Interest Loans (F) (Consumer)	3	1	1	4	2	2	2	1	1	1	2
Construction/Tooling Expenses (F)	4	3	1	1	4	4	3	2	2	2	2
Investment Tax Credits (FS)	3	2	1	4	2	2	2	1	1	1	2
Accelerated Depreciation (F)	3	2	1	4	2	2	1	1	1	1	2
Federal Power Demonstrations (F)	4	3	4	5	3	4	3	4	3	3	4
Guaranteed Federal Use Market	4	3	4	5	4	4	3	4	3	3	4
Federal Land Usage (F)	3	1	1	2	1	1	3	4	2	3	2
TAXES & PENALTIES											
Product Warrantees (FP)	2	3	2	4	2	3	2	1	3	2	3
Fuel Surcharge (F)	4	1	1	4	3	2	1	2	1	1	1
Fuel Import Quotas (F)	4	1	1	4	3	2	1	2	1	1	1
REGULATION											
Model Zoning/Building Codes (FSL)	2	3	1	2	3	2	3	3	3	3	3
Rate Structure Guidelines (FS)	2	2	1	4	3	2	1	1	1	1	1
Federal Insurance	2	1	1	3	3	2	1	1	4	1	5

F - FEDERAL L - LOCAL

S - STATE P - PRIVATE

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 sourees 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).