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Wind Energy Systems Information User Study

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WIND ENERGY SYSTEMS INFORMATION USER STUDY

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JANUARY 1981

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FOREWORD

This document reports the results of a series of studies of users of wind energy systems information. It identifies specific wind information user group needs, the priority of those needs, and methods of disseminating information to each group. This is one of a series of ten reports covering many different solar technologies. These results will play an integral part in the planning of new information products and data bases for the Solar Energy Information Data Bank (SEIDB).

This study was performed under Contract No. EG-77C-01-4042, FY 1980 Task Number 8420.11.

Paul Notari, Chief
Information Outreach
and Dissemination Branch

Approved for

SOLAR ENERGY RESEARCH INSTITUTE

Herbert B. Landau, Manager
Information Systems Division

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WIND ENERGY INFORMATION USER STUDY MANAGEMENT SUMMARY

This report describes the results of a series of telephone studies of potential users of information on wind energy conversion systems. These studies, part of a larger study covering many different solar technologies, identified:

- the types of information each group of information users needed, and
- the ways to get information to that group.

This wind energy report is one of ten discussing the results of these studies.

BACKGROUND

The purpose of the overall study was to obtain baseline data about the information needs of the solar community. Very little previous work has been done in this area; the studies that have been done were generally restricted to solar heating and cooling of buildings. The present study is the only one known to investigate all of the following technological areas:

- Photovoltaics
- Passive Solar Heating and Cooling
- Active Solar Heating and Cooling
- Biomass Energy
- Solar Thermal Electric Power
- Industrial and Agricultural Process Heat
- Wind Energy
- Ocean Energy
- Solar Energy Storage

There have been a few previous studies which asked homeowners what solar information they needed, but this is the only known study to provide data on the solar information that such groups as researchers, manufacturers, architects, engineers, installers, lawyers, bankers, insurers, public interest groups, state energy offices, and agricultural extension agents themselves say they want.

The data from this study will be used along with other data to determine what new information products and services the Solar Energy Research Institute (SERI), the Solar Energy Information Data Bank (SEIDB) Network, and the entire solar information outreach community should be preparing for and disseminating to the solar community.

STUDY CHARACTERISTICS

Between 3 September 1979 and 13 October 1979 Market Opinion Research, Inc. of Detroit, Michigan—under subcontract to SERI—conducted telephone interviews with 86

distinct groups of solar information users taken from across the nine different technological areas. Approximately nine respondents were interviewed from each group. Interviews were based upon professionally reviewed and tested questionnaires that utilized a mixture of open-ended and closed-ended questions. The interviews took an average of 18 minutes to complete.

The respondents proved to be very cooperative. Considering the length and nature of the telephone interviews, it was surprising that only about 3% of the respondents terminated an interview or refused to be interviewed. This finding supported the interviewers' statements that the respondents were very interested in telling what they were doing in solar energy, in obtaining solar information, and in specifying what solar information would prove the most valuable.

SAMPLE SIZE

Studies of 86 groups, each interested either in one of nine specific solar technologies or in solar energy in general, provided an extremely broad view of the information needs of the solar community. Although the sample size of only nine respondents per group was small, the data still proved to be adequate for planning purposes. It was possible to determine the information most important to the respondents and the best channel for dissemination. A variety of valid statistical tests were performed, both to compare the priorities a group gave to different information items and to compare the priorities different groups gave to the same item (see Section 2.3 and Appendix E).

WIND ENERGY GROUPS STUDIED

The results of an earlier study identified the groups of information users constituting the wind energy community [1] and determined the priority (to accelerate commercialization of solar energy) of getting information to each user group. In the current study only high-priority groups were included. Considerable effort (e.g.; library searches, phone calls, subcontractors) went into obtaining the names of people professionally involved with wind energy. When the phone interviews were conducted, an elaborate screening process was used to guarantee that the potential respondent was truly involved in wind energy. Respondents in the following ten groups were queried about their need for information on wind energy conversion systems:

- DOE-Funded Wind Energy Conversion System Researchers,
- Non-DOE-Funded Wind Energy Conversion System Researchers,
- Representatives of wind systems and component Manufacturers,
- Distributors of wind systems and components,
- Electric Power Engineers who were interested in wind energy on the job,
- Wind Engineers who were members of the International Solar Energy Society (ISES),
- Representatives of Utilities conducting wind energy experiments or demonstrations,
- Educators teaching college level courses in wind energy conversion,

- Cooperative Extension Service (CES) County Agents who will be needing information on wind energy conversion, and
- Small Wind Energy System Users.

Several of the groups discussed in another report from this study [2] also indicated an interest in information on wind energy (see Section 2.2.4).

RESULTS

In most cases the results from both groups of researchers were similar. Thus, in the following tables the data for Wind Researchers have been combined.

Usefulness of General Types of Information

The most important result obtained from this study was the identification of the wind energy information categories ranked the most useful by each group of respondents (see Table S-1). Wind respondents in almost every group gave high ratings to information on:

- Climatological data;
- Cost/performance;
- Installation/operation costs;
- Research in progress;
- Tax credits, grants, incentives; and
- Expected major developments.

Most notable, however, was the wide range of rankings the groups gave to the information items. For example, for some of these generally high-ranked items, there were several groups who ranked the item 10th or worse. Similarly, for the generally low-ranked items, there were often several groups ranking the item 7th or better. This underlines the need to design most information products on a group by group basis.

Usefulness of Specific Information Products

The same questions also provided information on how valuable a set of specifically proposed information products would be to the respondents (see Table S-2). The first seven of these products could be targeted for large segments of the wind energy community rather than for specific groups. Probably the most interesting results were:

- The high level of interest in technical descriptions, lists of wind energy information sources, and systems design information;
- The greater usefulness of manual analytical tools than of computer models for wind system design; and
- The relative lack of interest in bibliographies.

Table S-1: COMPARATIVE USEFULNESS OF GENERAL TYPES OF WIND ENERGY INFORMATION

General Information Types	Total Wind Researchers	Wind Manufacturer Reps	Wind Distributors	Wind Engineers	Wind Electric Power Engineers	Wind Utility Representatives	Wind Educators	Wind CES County Agents	Small Wind System Owners
	Ranking[a]	Ranking	Ranking	Ranking	Ranking	Ranking	Ranking	Ranking	Ranking
State of the Art in Wind Research	1	12	8	2	2	4	10	13	10
Wind Research in Progress	2	8	6	4	12	6	2	9	8
Wind Systems Installation/ Operation Costs	8	12	11	2	1	1	14	5	1
Wind Systems Cost/ Performance	4	8	6	4	4	1	4	1	2
Local Building Codes, Regulations	14	5	4	8	7	3	14	7	10
Climatological Data	2	1	8	1	2	12	2	11	2
Marketing Statistics and Sales Projections for Wind Systems	16	8	3	18	17	19	17	19	19
Wind Systems Marketing ("How To Market")	NA[b]	12	4	18	19	20	10	NA	NA
Educational Institutions Offering Wind-Related Courses	18	7	20	15	17	17	10	17	17
Standards, Specifications, or Certification for Wind Systems	12	2	1	16	7	8	4	9	15
Institutional, Social, Environmental, or Legal Aspects of Wind Applications	8	12	15	11	12	12	4	17	18
Expected Developments in Wind ("Next 10 Years")	5	4	17	10	7	4	4	11	15
International Wind Energy Markets, Research, Programs, Industry	16	5	12	20	19	NA	19	NA	NA
Tax Credits, Grants, Incentives	15	2	1	11	7	6	1	7	5
Coming Events in Wind	5	12	17	17	15	16	8	13	14
Wind Information Sources	7	20	12	11	4	8	8	2	4
Technical Experts on Wind Systems	13	12	17	11	4	15	17	13	13
Local Wind Infrastructure[c]	18	8	8	8	16	15	19	5	6
Technical Descriptions of Wind Systems	10	12	15	4	11	8	14	2	6
Nontechnical Descriptions of Wind Systems	20	21	20	NA	NA	14	19	2	12
Wind Systems Design[d]	11	19	12	7	14	11	13	16	9
Sample Size	18	9	9	9	9	9	9	9	9

[a]The Ranking was based upon asking respondents how useful each item would be to them (see text of main report). If items were tied, they were all given the highest possible rank.

[b]"NA" means the question was not asked of this particular set of respondents.

[c]Local lenders, insurers, builders, engineers, installers, distributors, or manufacturers of wind systems.

[d]This item was derived by combining the results from four distinct questions related to systems design (see Question 8a; items 4, 8, 10, and 11 in Appendix D).

Table S-2: VALUE ASSESSMENT OF SPECIFIC WIND ENERGY INFORMATION PRODUCTS

Specific Information Products	Total Wind Researchers	Wind Manufacturer Reps	Wind Distributors	Wind Engineers	Wind Electric Power Engineers	Wind Utility Representatives	Wind Educators	Wind CES County Agents	Small Wind System Owners	All Wind Respondents[b]
	Percent[a]	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent[b]
Bibliography of General Readings on Wind Systems	39	22	33	22	33	22	67	33	67	38
Calendar of Wind Conferences and Programs	67	56	33	22	44	33	67	11	44	44
Wind System Diagrams or Schematics	33	56	44	67	33	56	78	44	56	50
Wind System Design/ Installation Handbooks, Reference Tables	61	44	67	67	33	44	56	56	100	59
Manual Analytical Tools for Wind System Design	50	67	33	78	67	56	67	33	67	57
Computer Analytical Tools (Models) for Wind System Design	61	33	33	56	33	89	56	11	11	44
Lists of Local Wind Experts[c]	17	67	78	56	33	33	56	56	78	49
Lists of Wind Technical Experts	39	56	33	44	78	33	44	22	44	X[d]
Technical Descriptions of Wind Systems	50	56	44	78	67	67	67	67	67	X[d]
Nontechnical Descriptions of Wind Systems	11	33	33	NA[e]	NA	67	44	78	44	X[d]
List of Wind Information Sources	59	44	56	44	67	78	78	67	78	X[d]
Sample Size	18	9	9	9	9	9	9	9	9	90

[a]Percent is the percentage of respondents rating the item as "essential" or "very useful" (as opposed to "somewhat useful" or "not at all useful").

[b]Although a percentage is given for All Wind Respondents, it may not be indicative of the percentage of the whole wind community interested in that item (since the proportion of each type of respondent in this study may not correspond to the proportion that group constitutes of the entire population).

[c]Local lenders, insurers, builders, engineers, installers, manufacturers, or distributors for wind systems.

[d]"X" indicates no overall percentage was calculated. For these items it may be necessary to develop different products/services for each group if their information needs are to be fully met.

[e]"NA" means the question was not asked of this particular set of respondents.

Sources Used to Obtain Information

Table S-3 lists the proportion of each group that had used different sources to obtain any type of solar information in the past few years. It will be noted that a column is given for all wind respondents; these summary figures are indicators (not estimates) of the familiarity of the entire wind energy community with these information sources. In planning how specific information is to be transmitted, however, it will be essential to fully specify both the information products or services and the groups to be reached before making the decision of which information channels are to be used. One can not assume, for example, that the two or three top-rated sources should be used for all—or even most—of the information transmissions to the wind energy community.

The information sources most familiar to the wind energy groups studied were:

- Periodicals, newspapers, or magazines;
- A solar installer, builder, designer, or manufacturer;
- Workshops, conferences, or training sessions;
- The Government Printing Office (GPO);
- An organizational or local library; and
- Directly from the Department of Energy (DOE).

Technical Areas of Interest

Table S-4 lists the proportion of each group interested in information on different types of wind energy applications. The major results were:

- Fairly high levels of interest in all applications, and
- Highest levels of interest in "electrical equipment" and "small-scale systems."

Advanced Information Acquisition Methods Used

Table S-5 lists the proportion of each group that had used selected advanced acquisition methods to obtain information in the past year. The following results were observed:

- Wind respondents in general were not very accustomed to using these techniques;
- Computer terminals were used less widely than microforms; and
- Wind Researchers were the most likely of wind respondents to use microforms; Wind Engineers and Electric Power Engineers were the most likely to use computer terminals.

Additional Findings

- DOE-Funded Wind Researchers felt significantly more involved with and better informed about wind energy conversion systems than did the Non-DOE-Funded Wind Researchers. DOE-Funded Wind Researchers appeared to be working on feasibility, assessment, or impact types of studies, while Non-DOE-Funded Researchers were generally working on specific wind energy conversion systems.

Table S-3: SOURCES USED TO OBTAIN SOLAR INFORMATION (Percent[a])

Information Sources	Total Wind Researchers	Wind Manufacturer Reps	Wind Distributors	Wind Engineers	Wind Electric Power Engineers	Wind Utility Representatives	Wind Educators	Wind CES County Agents	Small Wind System Owners	All Wind Respondents[b]
Public Media										
Radio or TV	NA[c]	NA	56	NA	NA	NA	67	11	33	(42)[d]
Periodicals, newspapers, or magazines	100	100	100	NA	NA	100	100	89	100	(99)
Private Solar-Involved Orgs										
Private solar energy or environmental orgs.	56	67	78	67	33	33	89	11	33	52
Internat'l. Solar Energy Society (including publications)	44	33	67	78	33	11	56	0	56	42
Solar Energy Industries Ass'n. (including publications)	22	22	22	44	22	11	56	0	33	26
Contacts With Professionals										
Solar installer, builder, designer, or manufacturer	72	78	100	89	100	67	100	22	100	80
Workshops, conferences, or training sessions	94	89	78	67	67	100	89	56	56	79
Information Services										
Respondent's organizational library or local library	94	56	67	89	78	67	100	33	33	71
Commercial data base	33	22	33	44	11	22	22	22	22	27
Smithsonian Science Information Exchange (SSIE)	22	NA	NA	11	11	22	33	0	0	(15)
Federal library or information center	44	44	44	67	33	56	56	22	33	44
Gov't. Printing Office (GPO)	83	67	89	89	78	78	78	33	44	72
National Technical Information Service (NTIS)	78	33	56	78	56	44	78	0	44	54
Technical Information Center (TIC)	22	33	11	33	33	22	44	0	22	24
Government Solar-Involved Orgs										
Directly from the U.S. Department of Energy (DOE)	83	67	78	89	89	78	78	11	33	69
National Solar Heating & Cooling Information Center	28	22	44	NA	NA	22	44	0	33	(28)
Regional Solar Energy Centers	33	33	33	56	33	33	56	33	56	40
State energy or solar offices	56	44	56	56	44	67	56	44	56	53
Other										
Some other state or local gov't. office or publication	17	67	56	44	44	22	67	44	33	41
Public utility company	67	33	56	56	56	56	56	22	33	50
American Wind Energy Ass'n.	78	89	89	33	22	56	67	0	44	56
Sample Size	18	9	9	9	9	9	9	9	9	90

[a]Percent is the percentage of respondents who used the source to obtain any solar information in the past few years.

[b]Although a percentage is given for All Wind Respondents, it may not be indicative of the percentage of the whole wind community interested in that item (since the proportion of each type of respondent in this study may not correspond to the proportion that group constitutes of the entire population).

[c]"NA" means the question was not asked of the particular set of respondents.

[d]"( )" means the question was not asked of all of the groups in the particular set of respondents. For example, "(44)" means that 44% of those who were asked had used that source. In no case were fewer than nine respondents asked.

Table S-4: INTEREST IN INFORMATION ON WIND ENERGY TOPICS

Topics	Total Wind Researchers	Wind Manufacturer Reps	Wind Distributors	Wind Engineers	Wind Electric Power Engineers	Wind Utility Representatives	Wind Educators	Wind CES County Agents	All Wind Respondents[b]
	Percent[a]	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent[b]
Small-Scale Wind Systems	83	100	78	89	56	73	100	89	84
Med/Large-Scale Wind Systems	83	56	56	67	67	73	44	67	67
Rotary Equipment	61	67	67	56	100	67	56	67	67
Towers	56	89	78	56	56	67	100	67	69
Control Equipment	72	56	78	78	100	100	100	33	77
Electrical Equipment	78	67	89	78	100	100	100	89	86
Sample Size	18	9	9	9	9	9	9	9	81

[a]Percent is the percentage of respondents interested in the application.

[b]Although a percentage is given for All Wind Respondents, it may not be indicative of the percentage of the whole wind community interested in that item (since the proportion of each type of respondent in this study may not correspond to the proportion that group constitutes of the entire population). The data for Small Wind System Owners is not included in All Wind Respondents, as they were not asked this question.

Table S-5: ADVANCED INFORMATION ACQUISITION METHODS USED

Acquisition Methods	Total Wind Researchers	Wind Manufacturer Reps	Wind Distributors	Wind Engineers	Wind Electric Power Engineers	Wind Utility Representatives	Wind Educators	Wind CES County Agents	All Wind Respondents[b]
	Percent[a]	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent[b]
Computer Terminal Access to Data Banks	22	22	22	33	33	11	22	0	21
Microform (microfiche, microfilm sheets or rolls, COM, etc.)	56	11	33	44	33	44	22	11	35
Sample Size	18	9	9	9	9	9	9	9	81

[a]Percent is the percentage of respondents who used the method in the past year.

[b]Although a percentage is given for All Wind Respondents, it may not be indicative of the percentage of the whole wind community interested in that item (since the proportion of each type of respondent in this study may not correspond to the proportion that group constitutes of the entire population). The data for Small Wind System Owners is not included in All Wind Respondents, as they were not asked this question.

The DOE-Funded Researchers were more interested in programmatic types of information while the Non-DOE-Funded Researchers were much more interested in cost and design information.

- Wind Distributors were similar to distributors of active solar heating and cooling systems in giving high ratings to "tax credits, grants, or other economic incentives" and to "costs and performance of systems." The Wind Distributors were much more interested, however, in research-related information, in marketing information, in site-specific information, and in "standards, specifications, or certification programs for systems or installations."
- Wind Electric Power Engineers and Wind Engineers were very similar in both information needs and information sources. Wind Engineers, however, appeared to be more interested in small wind energy conversion systems, but not by a large margin. Both gave very high ratings to "manual methods for sizing."
- There were almost no differences between the information needs of Wind Utility Representatives and those of Wind Electric Power Engineers. Their information sources were similar, but the Engineers were more likely to receive information through their professional associations.
- Wind Educators were much more involved with wind systems beyond just teaching (designing, manufacturing, installing, servicing, and using) than was the typical solar Educator in his technology of choice. They were aware of many sources of available information and rated almost every type of information as useful.
- County Extension Agents obtained almost none of their information through the American Wind Energy Association or through solar-related or DOE-sponsored sources. The most efficient way to get them information would probably be through cooperative agreements between the United States Department of Agriculture and DOE or by getting information directly to the state specialists who would then forward it to the county-level agents.
- Since seven of the nine Owners of small wind energy conversion systems had owned their system for over three years, they must be classified as "early innovators" [3]. As such, care must be taken in extrapolating these results to potential purchasers of active solar heating and cooling systems.
- Owners of small wind energy conversion systems had used substantially fewer information sources than Passive Homeowners and Active Solar Heating and Cooling Homeowners, both of whom were also considered to be "early innovators."
- Owners of small wind energy conversion systems gave very high ratings to "wind systems design handbooks, installation handbooks, or reference tables."

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SECTION 1.0

INTRODUCTION

This report describes the results of a series of telephone interviews with potential users of information on wind energy conversion. These interviews, part of a larger study covering nine different solar technologies, attempted to identify:

- the type of information each distinctive group of information users needed, and
- the best way of getting information to that group.

This section explains the background of the study, places this report in the context of the overall program, and describes the structure of this report.

1.1 BACKGROUND

The rapid, widespread commercialization of solar energy will be necessary if the United States is to meet the energy crises of the next 50 years, but the use of solar energy will never reach meaningful levels without both the recognition that information transfer is essential to commercialization and the deliberate development of systems for the transfer of information. For example: scientists need the latest solar research results to enhance their own efforts; engineers and installers need performance data to design solar systems; public interest groups need environmental impact data to support solar technologies against conventional energy alternatives; potential owners of solar energy systems need cost information to make purchase decisions; the general public needs basic information to weigh which public policies to support.

In 1974 the Congress, noting the importance of information transfer and recognizing the value to the solar community of an integrated, comprehensive data collection and information dissemination system, called for the implementation of a Solar Energy Information Data Bank (SEIDB). In The Solar Energy Research and Development Act (P.L. 93-473) Congress stated that the SEIDB should be established "for the purpose of collecting, reviewing, processing, and disseminating information and data . . . in all of the solar energy technologies."

The U.S. Department of Energy (DOE) has assigned the Solar Energy Research Institute (SERI) the task of serving as the lead center to fulfill this Congressional mandate to collect all types of solar-related information, to convert it into a user-oriented format, and to disseminate this information to the widest possible range of persons and groups with an interest in solar energy. These groups range from decision makers at all levels of government to manufacturers of solar products; from solar architects, installers, and service persons to home or farm owners; and from banks and financial institutions to scientists and researchers. In accord, SERI's Information Systems Division (ISD) is now in the process of collecting solar information, building data bases, and preparing and disseminating information through a variety of products and services.

The long-range objective of the SEIDB is a centrally coordinated network to ensure that all individuals concerned with solar energy have prompt and efficient access to whatever information is necessary to support sound decisions. Ultimately this information will be accessible through a variety of means (publications, computer data systems, audiovisual

products, the Solar Energy Information Center, inquiry and referral services, etc.) to serve the diverse requirements of the solar community.

1.2 SOLAR ENERGY INFORMATION DATA BANK (SEIDB) PROGRAM PLANNING

In the past decade, information scientists have studied many organizations responsible for data collection and information product development. A consistent finding of this research is that a key to the successful, efficient operation of such an organization is to design the entire system with the potential information user in mind. It is essential that development of information products and data bases be targeted for specific users rather than merely developed spontaneously. The information users, their information needs, and the priority of those needs must all be identified before effective information products and services can be developed efficiently. To ensure that the SEIDB is responsive to the high-priority information needs of the solar community, the Information Market Research Section of ISD is performing the following tasks:

1. Defining the community of solar information users;
2. Setting priorities as to which groups of information users have the most important near-term information needs;
3. Determining the near-term information needs of the high-priority users;
4. Determining the information channels which can be effectively used to reach the high-priority users;
5. Determining what high-priority information needs are being met fully by existing products and services; and
6. Recommending additional, targeted, cost-effective information products and services to meet high-priority needs.

The results of the first two tasks are described in a previous document [1]: First, for each solar technology, those members or potential members of the solar community who will need solar information were identified; second, the relative importance of meeting the near-term information needs of each group of information users was described. This document provides guidelines to SEIDB planners as to who might be using the SEIDB and whose near-term needs are the most important.

The results of the third and fourth tasks are described in the current set of ten reports (see Section 1.3). These reports document the high-priority information needs and the most familiar information channels for each of 86 groups which were interviewed by telephone.

There have been a few previous studies that asked homeowners what solar information they needed, but this is the only known study to provide data on the solar information that such groups as researchers, manufacturers, architects, engineers, installers, lawyers, bankers, insurers, public interest groups, state energy offices, and agricultural extension agents themselves say they want.

The data from this study will be used along with other data to determine what new information products and services SERI, the SEIDB Network, and the entire solar information outreach community should be preparing for and disseminating to the solar community. These data will include (but not be limited to): contacts with SERI specialists;

review of the Annual Operating Plans, Institutional Plans, and Program Plans of DOE and SERI; reviews of other solar literature; development of an "information user profile" data base from mailing list response cards; information user panels; direct contacts with members of the solar community at conferences, training sessions, etc.; visits to headquarters of national associations of users; and feedback provided by users of existing information products. Since information needs and priorities will continuously change these tasks will necessarily be ongoing.

1.3 REPORT CONTENTS

This wind energy report is one of ten issued on the results of these studies of solar energy information users. The full set of reports covers:

- Photovoltaics
- Passive Solar Heating and Cooling
- Active Solar Heating and Cooling
- Biomass Energy
- Solar Thermal Electric Power
- Industrial and Agricultural Process Heat
- Wind Energy
- Ocean Energy
- Solar Energy Storage
- General Solar Energy

Section 2.0 of this report describes the type of study conducted and the resulting constraints. The method used to select these groups is also described in Section 2.0. Several groups discussed in other reports from this study also indicated an interest in information on wind energy. These groups are listed in Section 2.2.4. Sections 3.0 through 9.0 describe the results of studies of:

- DOE-Funded Wind Energy Conversion System Researchers and Non-DOE-Funded Wind Energy Conversion System Researchers,
- Representatives of Manufacturers of wind energy systems and equipment,
- Distributors of wind energy systems and equipment,
- Wind Engineers and Electric Power Engineers working with utilities,
- Representatives from Utilities conducting wind energy experiments or demonstrations,
- Educators teaching college level courses in wind energy technologies,
- Cooperative Extension Service County Agents who will be needing information on wind energy, and
- Small Wind Energy System Owners.

These respondents were asked specifically about their needs for information on wind energy conversion. In each of these sections describing study results, a standard presentation format has been used.

The appendices contain a list of all 86 groups interviewed (including the technologies other than wind energy). They also contain a description of how the study was developed, a copy of the letter of introduction, a sample questionnaire, a description of the statistical tests used, and the data from the studies of the wind energy groups.

SECTION 2.0

STUDY DESCRIPTION

This section gives a brief description of the study. Appendix B gives additional information on how the study was designed and conducted. This section also explains how groups from the wind energy community were selected as those to be sampled and gives a few comments on interpretation of study results. The study findings are reported in Sections 3.0 through 9.0.

2.1 STUDY CHARACTERISTICS

Between 3 September 1979 and 13 October 1979 Market Opinion Research, Inc. (MOR) of Detroit, Michigan—under subcontract to the Solar Energy Research Institute (SERI)—conducted telephone interviews with 86 distinct groups of solar information users. Approximately nine respondents were interviewed from each group. Interviews were based upon professionally reviewed and tested questionnaires (see Appendix D); they took an average of 18 minutes to complete. The 86 groups, selected to cover 9 solar technologies/applications, are listed in Appendix A. The results discussed in this report are from the 10 of those 86 studies which dealt specifically with wind energy.

Studies of 86 groups, each interested either in one of the nine specific solar technologies or in solar technologies in general, provided an extremely broad view of the information needs of the solar community. Although the sample size of nine respondents per group was small, the data still proved to be quite adequate for planning purposes. It was possible to determine which information was the most important to the respondents and what was the best channel for disseminating that information. A variety of valid statistical tests were performed, both to compare the priorities a group gave to different information items and to compare the priorities different groups gave to the same item.

The respondents proved to be very cooperative. Considering the length and nature of the telephone interviews, it was surprising that only about 3% of the respondents terminated an interview or refused to be interviewed. This finding supported the interviewers' statements that the respondents were very interested in telling what they were doing in the field of solar energy, in obtaining solar energy information, and in specifying what solar information would prove the most valuable. It was also observed that the number of respondents answering "don't know" or not answering a question was quite low. Including those cases where the potential respondent could not be reached within three attempts (or before the required number of interviews was completed), where the respondent refused to be interviewed, where the respondent terminated the interview prematurely, etc., the completion rate for the entire study was about 75%. The completion rate for each individual group is given in the section in which that group is discussed.

2.2 GROUPS STUDIED

One of the most important tasks was the selection of the groups of potential users of solar information to be studied. Before this could be done, however, it was necessary to list the important groups constituting the wind energy community and to develop a conceptual framework within which selections could be made.

2.2.1 Target Audiences, Classes, and Groups

An important information science concept in developing information products and services is that of the "target audience" or "target group." These are generally defined as a collection of individuals or organizations who have similar information needs and information-acquiring habits. People in the same group tend to need information on the same subjects, at a similar technical level, and within a similar timeframe. In developing an information product program, it is important to begin with a typology that assigns information users who have similar needs to common groupings. This allows development of efficient, targeted information products to meet identified needs of specific users, without inundating other members of the solar community with unneeded information.

In Solar Information User Priority Study [1] such a typology was developed. Under this system, members of the solar community were placed in distinct "user groups." A set of user groups formed a "user class" and a collection of user classes formed a "target audience." For more precise definitions:

- A User Group is the most basic category of information users who can be combined together under a single definitive title (e.g., Civil Engineers). A single information user group should be addressable by many specific information products. The purpose of defining distinct information User Groups is to identify a single set of users who can be served by the same information product (e.g., a civil engineers' handbook).
- A User Class is a set of information user groups which exhibit many common distinguishing characteristics (e.g., Facility or System Designers). A single information user class should be addressable by many general information products. The purpose of defining separate information User Classes is to identify sets of two or more groups of users who can be served by similiar information products (e.g., solar heating and cooling system design models).
- A Target Audience is a set of information user classes which exhibit some common distinguishing characteristics (e.g., Researchers). A single target audience should be addressable by one or more distinct types of information products. The purpose of defining separate information user Target Audiences is to identify broad sets of users who can be served by the same generic types of information products (e.g., research-in-progress newsletters).

Following this system, all solar information users fall within one or more of five Target Audiences. These Target Audiences are:

Researchers - those who are actively involved in researching, developing, and testing of new state-of-the-art technical developments in solar energy.

Applications Technologists - those involved in translating research results into marketable equipment and services. This classification includes manufacture, distribution, sales, design, installation, and maintenance of solar systems or components.

Facilitators - those whose decisions or actions directly aid (in either a positive or negative manner) the commercialization of solar energy. Thus, congressmen would be Facilitators in that they have the ability to pass legislation giving incentives; lobbyists in that they can affect legislation; state energy offices in that they can initiate demonstration projects; and the Environmental Protection Agency (EPA) in that it can forbid construction of a manufacturing plant at a specific site.

Users or Prospective Users - those individuals or organizations who have already applied this type of solar energy technology in their operations or have a reasonable chance of doing so in the near future.

General Public - Individuals who are not likely to utilize solar energy in the near future. An important aspect of this audience is its ability to influence the course of solar energy technologies through political influence, pro or con.

Based upon this scheme, the wind energy information user community has been defined. Table 2-1 enumerates the user groups comprising the wind energy information community and shows into which target audience each falls [1].

2.2.2 Criteria for Selection of Groups to Study

From Table 2-1, it is rapidly evident that there are many user groups who will eventually be needing information on wind energy. The problem was, thus, to select those groups to be surveyed as a part of this study. To determine which groups would be studied, each group was evaluated with respect to the following selection criteria:

- appropriateness of using a structured telephone interview to collect information from the group on information needs and habits,
- relative priority of the group's short- or medium-range information needs, and
- availability of a sample frame for the group.

First, for many groups a structured telephone interview was not an appropriate method for defining information needs: It was not practical to interview the U.S. Department of Energy (DOE), or an organization like the Electric Power Research Institute, or a group like Congressional committee staff which would be too busy to respond. Rather than defining the information needs of these groups by telephone interview, they will be contacted directly in FY 1981.

Second, only those groups with a high immediate or potential need for wind energy information were selected. Further, since fulfilling short-range information needs is critical, it was decided that in most cases those people who were already involved with wind energy would be sampled. It was felt that these were the people who would be primary users of the Solar Energy Information Data Base (SEIDB) over the next few years. These groups had been identified earlier in the Solar Information User Priority Study [1].

Finally, for many of the groups, lists of persons to be interviewed could not be developed or acquired. In the absence of sample frames, studies of such groups were not possible. (For more detail on sample frame development, see Appendix B.)

2.2.3 Groups Included in the Wind Energy Study

After all decision criteria and constraints had been applied, it was determined that studies of the following ten groups would be conducted to ask respondents about their need for information on wind energy:

- DOE-Funded Wind Researchers,
- Non-DOE-Funded Wind Researchers,

Table 2-1. WIND ENERGY SYSTEMS INFORMATION USERS

Target Audiences
User Classes
User Groups

1.0 Researchers

1.1 DOE-Funded Researchers or Developers
- Contractors
- National Laboratories

1.2 Non-DOE, Federally Funded Researchers or Developers
- National Aeronautics and Space Administration (NASA)
- Department of Commerce (DOC)-National Oceanic and Atmospheric Administration (NOAA)
- Department of Interior (DOI)-Bureau of Reclamation (BOR)
- U.S. Department of Agriculture (USDA)

1.3 Nonfederally Funded Researchers or Developers
- Universities
- Wind Manufacturers
- Trade Research Associations
  - Electric Power Research Institute (EPRI)
- Independent Research Organizations
- Industrial Solar Users
- Utilities

2.0 Applications Technologists

2.1 Wind or Wind-Related Manufacturers
- Wind System Manufacturers
- Wind System Components Manufacturers

2.2 Wind Facility or System Designers
- System Designers/Engineers
- Architectural/Engineering Design Firms
- Power Engineers (Industrial)
- Electrical Engineers
- Mechanical Engineers

2.3 Builders, Developers, or Contractors
- General Contractors
- Architectural/Engineering Construction Firms
- Mechanical Engineering Contractors
- Construction Engineers

Table 2-1. WIND ENERGY SYSTEMS INFORMATION USERS (Continued)

2.4 Wind System Installers or Maintainers
- Installers
- Electricians
- Wind Maintenance Workers

2.5 Wind Equipment Distributors

2.6 Technical Specialists for Utility, Government, Commercial, or Industrial Organization Using a Wind System
- Operation Managers
- Power Engineers
- Planners

3.0 Facilitators

3.1 Legislators or Staff
- Congressmen
- Congressional Committee Staff
- State Legislators
- National Conference of State Legislatures

3.2 Local Government Organizations
- County Government Officials
- Local Government Officials
- Municipal Planners
- Tax Assessors and Officials

3.3 Government Solar-Active Organizations
- DOE—Conservation and Solar Energy (C&SE)
- DOE—Energy Information Administration (EIA)
- DOE—Energy Research (ER)
- DOE—Regional Solar Energy Centers (RSECs)
- DOE—Regional Energy Offices
- DOE—Energy Extension Service
- DOE—Federal Energy Regulation Commission (FERC)
- USDA—Cooperative Extension Service
- USDA—Other
- National Center for Appropriate Technology (NCAT)
- DOI-Bureau of Land Management
- U.S. Department of Commerce (DOC)
- International Energy Agency
- State Governors' Office
- State Energy Offices
- State Solar Energy Offices
- State Agricultural Offices
- Municipal Energy Offices

Table 2-1. WIND ENERGY SYSTEMS INFORMATION USERS (Continued)

3.4 Government Solar-Concerned Organizations
- Federal Communications Commission (FCC)
- Small Business Administration (SBA)
- USDA-Rural Electrification Administration (REA)
- Council for Environmental Quality (CEQ)

3.5 Nongovernment Solar-Active Organizations
- Solar Trade Associations
- Solar Professional Societies
  - American Wind Energy Association
- Solar Public Interest Groups
  - The Alternate Energy Institute
- Solar Lobbyists

3.6 Nongovernment Solar-Concerned Organizations
- Home Improvement Associations
- Public Interest Organizations
- Environmental Organizations
- Nonsolar Professional Societies
- Nonsolar Trade Associations
  - Farmer Co-ops
  - Farmer's Education and Cooperative Union of America

3.7 Regulatory, Codes, or Standards Community
- Environmental Protection Agency (EPA)
- Occupational Safety and Health Administration (OSHA)
- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- Better Business Bureaus
- American Society for Testing Materials (ASTM)

3.8 Utility Community
- Electric Power Companies
- National Association of Regulatory Utility Commissioners
- State Utility Commissions
- Utility Trade Associations
  - American Public Power Association
  - National Rural Electrification Association
- Federal Power Marketing Agencies
  - DOE--Bonneville Power Administration
  - Tennessee Valley Authority (TVA)
- Municipally Owned Gas and Electric Utilities

3.9 Financial Community
- Bankers
- Venture Capital Brokers

Table 2-1. WIND ENERGY SYSTEMS INFORMATION USERS (Continued)

Government Loan Agencies
Stock Brokers

3.10 Legal Community

3.11 Real Estate Community

3.12 Insurance Community
Management
Agents
Actuaries

3.13 Educational Community
High School Science Teachers
University Faculty
Vocational Instructors
Career Counselors
Seminar Organizers and Instructors

3.14 Information Intermediaries
Federal Technical Libraries
Industrial Technical Libraries
Academic or Nonprofit Technical Libraries
Public Libraries
Federal Information Centers
On-Line Information Services
Bookstores
Film Distributors

3.15 Media
Newspapers or Magazines
Technical and Trade Journals
Television
Radio
Book Publishers
Newspaper Farm Editors of America

3.16 Labor Organizations
Electrical Unions
Carpentry Unions
Construction Unions
Aerospace Unions

4.0 Users or Prospective Users

4.1 Government, Commercial, or Industrial Users
Electric Utilities
Owners of Large Buildings or Complexes
Owners of Small Buildings

Table 2-1. WIND ENERGY SYSTEMS INFORMATION USERS (Concluded)

		Other Commercial, Industrial Users
		Foreign Users
		Owners of Remote Facilities
	4.2	Residential or Farming Users
		Homeowners
		Farmers, Ranchers
		Remote Facility Owners
5.0	General Public	
		Secondary School Students
		College Students
		Adults

- Representatives of Manufacturers of wind systems and components,
- Distributors of wind systems and components,
- Electric Power Engineers who were interested in wind energy on the job,
- Wind Engineers who were members of the International Solar Energy Society (ISES),
- Representatives of Utilities conducting wind energy experiments or demonstrations,
- Educators teaching college level courses in wind energy conversion,
- Cooperative Extension Service (CES) County Agents who will be needing information on wind energy conversion, and
- Owners of small wind energy systems.

The results from these studies are reported in Sections 3.0 through 10.0. Groups considered for the study, but for whom adequate sample frames could not be obtained, included wind system designers and potential purchasers of small wind energy conversion systems.

2.2.4 Wind Energy-Concerned Groups Included in the General Solar Study

Additionally, as a part of the overall study a number of groups were queried about their need for information on solar energy in general, rather than on a specific technology like wind energy conversion. While it was determined that all respondents in these groups had some involvement with solar energy, for many of them it was likely that this involvement was not, nor would it become, a primary factor in their professional work. Rather, for most—if not all—of them, solar energy was a new but minor issue which they were beginning to address within the scope of their existing jobs. Because each of these groups had peripheral interests in more than one solar technology, yet had not yet become fully involved with any, they were asked for general solar information needs rather than technology-specific solar information needs.

The results of the General Solar study are reported in another document [2]. For wind energy the following seven groups were especially relevant because for each group at least four of the nine respondents indicated wind energy was one of the areas in which they were "particularly interested in obtaining information":

- Utilities not known to have conducted solar experiments or demonstrations,
- Real Estate Appraisers,
- Tax Assessors,
- Lawyers,
- Public Interest Groups,
- Information Specialists at State CES Offices, and
- Agricultural engineering Specialists at State CES Offices.

The General Solar Energy report [2] also discusses the results of studies in which state solar/energy office representatives were asked about their general, rather than technology-specific, solar information needs. More than 80% of these respondents expressed an interest in wind energy information.

2.3 DATA INTERPRETATION

This subsection describes several points the reader should keep in mind in interpreting the data and results presented in the following sections.

2.3.1 Impact of the Sample Frames: Who was Sampled?

There were several ways in which the method of constructing the sample frames impacted the data. First, in some of the sample frames one geographic region was relatively over-represented, while another was relatively under-represented. For a study of sample size nine, however, such biases were generally not bothersome since the results were principally qualitative rather than quantitative.

Second, the sample frames were only as good as the sources. For example, the Smithsonian Science Information Exchange (SSIE) data base and DOE's Research in Progress (RIP) data base were principal sources in developing lists of researchers. The SSIE was not always current, often did not include the name of the correct principal investigator, and did not contain much of the nonfederally funded research. RIP had similar problems, varying greatly in quality according to which technology was involved. Each of these problems could cause biases as to which researchers were included and which were excluded from the samples.

Third, many arbitrary decisions were necessary in developing the sample frames. For example, it was important not to interview a respondent more than once, even if he or she was working in more than one technical area. Thus, if Researcher X at Company Y was listed as principal investigator both for one project in photovoltaics and for another in passive solar heating and cooling, then X was arbitrarily assigned to one of the two technologies, usually to the one with the smaller set of names.

The most important advice for the reader is to study carefully the description of how the sample frame was developed for each individual group. Often a generic title was assigned to a group; the reader must review sample frame development carefully to understand just who was being studied.

2.3.2 Statistical Tests

The statistical tests used are described in Appendix E. In the following sections test results are reported only if the statistical tests were significant at the $P < 0.05$ level. Thus, if a test result indicated that a difference between two means was statistically significant ($P < 0.05$), it meant that there was a maximum of a 1-in-20 chance that the two means were not different.

2.3.3 Hypotheses Versus Conclusions

Because of the limitations of sample size, it was not always possible to draw definitive conclusions. In certain cases, when definitive conclusions could not be drawn, the authors have instead formed hypotheses based upon the results.

2.3.4 Significance of Rankings

One of the most valuable results of this study was the development of a ranked list of information topics or products which would be useful to the members of each group (for example, see Fig. 3-1). Typically, statistical significance tests (see Appendix E) indicated that the four-to-six top-ranked items were rated significantly higher than the bottom four-to-six items. Thus, typically there was no statistically significant difference between the top-rated item and the second-rated item—or even between the top-rated and the fourteenth-rated item. If the sample size had been greater, the number of combinations in which one item was rated significantly higher than the other would also have been greater. Even if every sample size had been raised by a factor of 10, however, it is highly unlikely that all pairs of items would have had significantly different ratings.

How, then, should the reader treat two items which were not significantly different in rating? Was there any meaning to the ranking system?

Yes, the fact that there were statistically significant differences between the top-rated and the bottom-rated items established the validity of the ranking scale as a whole. Despite the fact that two ratings are not significantly different, they still have the statistical property of being the Best Linear Unbiased Estimators. For example, even if Item 1 (with a rating of 3.4) was not significantly greater than Item 2 (with a rating of 3.1), Item 1 should still be considered the more important need unless there is additional, outside information to the contrary. (In determining which information products to develop, of course, one must also consider additional factors such as the cost of the product, the proportion of the group which will be reached, and the degree to which the information need will be met.)

2.3.5 Alternative Measures of Usefulness

The ranking of selected information items (in usefulness to the respondent) was based upon the rating developed by assigning a "4" for each response of "essential," a "3" for "very useful," a "2" for "somewhat useful," and a "1" for "not at all useful"; summing the responses for the entire group; then dividing by the number of responses in the group. Using the rating was the preferable way to establish rankings within a group because it fully used the information on the differences between "essential" and "very useful" and between "somewhat useful" and "not at all useful."

There were several alternative ways of comparing the usefulness of items, one of which was to calculate the percentage of respondents who classified the item as either "essential" or "very useful." Using this percentage was quite handy in considering how useful a product designed for more than one group would be. For example, both "a calendar (of solar events)" and "lists of local lenders, etc." were examples of information products that would be designed for many groups to use. In comparing the two potential products as to usefulness, this method (calculating for each item the percentage of respondents who considered the item either "essential" or "very useful") provided a much more meaningful comparison than, for example, summing the ranks for all groups.

2.3.6 Combining Results From Different Groups

It should be pointed out that combining results from all wind energy groups interviewed will not provide unbiased estimates of the total wind energy community. First, the proportions of respondents from one group interviewed in this study may not correspond to the proportion of such persons in the entire community. Second, the peculiarities of each individual sample frame were responsible for varying degrees of bias for each group. Third, some of the important groups in the wind energy community were not studied (see Section 2.2).

Great care should be exercised in interpreting results from a combination of groups. It is too easy to get the impression that one product can fully meet the needs of all groups when, in fact, it may only partially meet the information needs of some of the groups involved.

2.3.7 Specific Information Products

Several specific information products were included among the items for which usefulness was assessed. It is important that responses to these items not be interpreted as totally generic responses. People who gave "a bibliography of general readings on wind energy" a low rating may have done so either because of the level and content of the subject matter (i.e., general readings on wind energy) or because of the format (i.e., bibliography). These people may or may not want bibliographies on other topics.

2.3.8 Information Sources

Another important question investigated how many respondents had used specific information sources. In using these results to plan how specific information is to be transmitted, it will be essential to specify fully both the information products or services and the groups to be reached before making the final decision of which information channels are to be used. One cannot assume, for example, that the two or three top-rated sources should be used for all, or even most, of the information transmissions to the group.

There were two other issues related to this question. The first was the decision not to ask respondents whether they had used SERI as an information source. The reasons are discussed in Appendix D.

The second issue concerned possible bias in responses to the question "have you obtained any solar information directly from the U.S. Department of Energy?" The intent of the question was to find out if respondents had contacted DOE directly for information, rather than if they had obtained DOE-produced information from other sources (such as SERI, National Technical Information Service (NTIS), Government Printing Office (GPO), National Solar Heating and Cooling Information Center (NSHCIC), Regional Solar Energy Centers (RSECs), libraries, etc.). There was, however, no assurance that respondents interpreted the question in this light. In cases where the response "directly from DOE" was high, there was the possibility that respondents were referring to information authored or funded by DOE but obtained from other sources.

SECTION 3.0

WIND ENERGY CONVERSION SYSTEM RESEARCHERS

3.1 DESCRIPTION OF RESPONDENTS

3.1.1 Description of Sample

This section describes the results of two telephone studies to determine the needs of researchers for information on wind energy conversion systems (WECS). In one study 10 DOE-Funded Wind Researchers were interviewed; in the other, 8 Non-DOE-Funded Wind Researchers were interviewed.

The sample frame for DOE-Funded Wind Researchers was constructed by reviewing the January 1978 U.S. Department of Energy (DOE) Federal Wind Energy Program, Program Summary [4], and by searching the Research in Progress (RIP) [5], the Current Research Information System (CRIS) [6], and the Smithsonian Science Information Exchange (SSIE) [7] data bases. Only those projects in progress during some part of FY 1978 or FY 1979 were included. From the data base searches, only those projects involving wind energy, wind power, windmills, or WECS and receiving at least some funding from DOE were selected. Entries without a contact name (i.e., principal investigator) were eliminated. Duplicates between this list and any other lists of wind contacts were eliminated on the other lists. In addition, this sample frame was compared to other Researcher sample frames (for active solar heating and cooling, passive solar heating and cooling, photovoltaics, solar thermal, ocean systems, solar industrial process heat, solar agricultural process heat, and energy storage) and duplicate principal investigator names were deleted from all but the smallest sample frame. No organization was sampled more than once within this group. After all adjustments were made, 10 interview candidates were randomly selected from a sample frame of 75 names.

The sample frame for Non-DOE-Funded Wind Researchers was constructed by reviewing searches of CRIS [6], SSIE [7], and RIP [5] data bases, then selecting those wind projects that had not received any funding from DOE. Only those projects in progress during some part of FY 1978 or FY 1979 were included. Duplicates were handled the same as for the DOE-Funded Wind Researchers, except that any principal investigators who had received any DOE funding during FY 1978 or FY 1979 were eliminated from the Non-DOE-Funded Wind Researchers. No organization was sampled more than once within this group. After all adjustments were made, the 8 interview candidates were randomly selected from a sample frame of approximately 100 names.

Respondents. In making the telephone calls to contact the randomly selected interview candidates, it sometimes occurred that the person could not be reached. In this event another randomly selected name was substituted for the original name. When individuals were contacted, it was verified that they had been involved in wind energy research (and had or had not received funding from DOE, as appropriate for the specific group) and that they would be needing information on wind energy within the next year. If they were not both involved and needing information, they were asked if they could refer the interviewer to someone else in their organization who would be an appropriate respondent. If such a referral was made, a call was then made to this new candidate; if no intraorganizational referral was made, a new candidate was randomly selected from the sample frame. The results of this process may be seen in Table 3-1.

Table 3-1. COMPLETION OF INTERVIEWS: WIND RESEARCHERS

Event	Number of Candidates	
	DOE-Funded	Non-DOE-Funded
Interview completed with sample frame candidate	9	7
Interview completed with referral candidate	1	1
Refusal or candidate termination	0	0
Contact attempted: could not reach candidate within three attempts or before interviews were completed	1	5
Subtotal	11	13
Contact attempted: invalid candidate (e.g.; inappropriate field of interest, no telephone)	1	6
TOTAL	12	19
Sample frame error rate[a] (Percent)	8	32
Completion rate[b] (Percent)	91	62

[a]Invalid candidates divided by TOTAL
[b]Completed interviews divided by Subtotal

Comparisons. For additional insight into the information needs and information habits of these two groups of Wind Researchers, results from these groups are compared to the results from all of the researchers interviewed in this study (All Researchers). The list of all the groups contained in All Researchers can be found in Table F-2 of Appendix F. In performing any statistical comparisons, totals for the Wind Researchers (one or both groups) have been subtracted from the totals for All Researchers. The data for Wind Researchers and for All Researchers can be found in Appendix F.

3.1.2 Current Status of Respondents

Role. Two of the DOE-Funded Wind Researchers were working for large manufacturing and research firms, 2 for universities, 1 for a National laboratory, 1 for a federal power administration, and 4 for private research or consulting companies. Four of the Non-DOE-Funded Wind Researchers were employed by universities, 2 by research laboratories, 1 by a utility company, and 1 by a federal agency.

Current activities of the DOE-Funded Wind Researchers included: development of wind energy conversion systems, including new and innovative wind machines and small wind turbines; assessment of off-shore wind systems and other applications; a feasibility study of wind energy for rural and farm applications; examination of environmental aspects of wind systems, including impacts on electromagnetic environment; using wind energy for direct conversion to a water-pumping system; use of wind energy to heat water; and preparation of a handbook on wind power generation and a guide for siting which takes into account small-scale terrain features.

Non-DOE-Funded Wind Researchers were currently involved in: testing a 15-kW plant, design of a wind turbine for grain drying and ventilation, modification of large-scale wind machine design, safety and health problems, wind characteristics, regional and site specific wind monitoring, current awareness, and planning.

Involvement. Nine of the 10 (90%) DOE-Funded Wind Researchers said that they were "very involved" with wind energy, which was significantly ($P < 0.05$) higher than the 1 of the 8 (13%) Non-DOE-Funded Wind Researchers who were "very involved." This compares to 107 of the 181 (59%) of All Researchers who were "very involved" with their respective solar technologies.

Informedness. Eight of the 10 (80%) DOE-Funded Wind Researchers considered themselves "very informed," which was significantly ($P < 0.05$) more than the 2 of the 8 (25%) Non-DOE-Funded Wind Researchers. Of All Reseachers, 117 of the 181 (65%) considered themselves "very informed." Only 3 of the other 18 groups of Researchers gave themselves higher marks for informedness than the DOE-Funded Wind Researchers.

Need for Information. All 18 Wind Researchers indicated they would need information on wind energy either on the job and/or outside the job during the next year. While all of the DOE-Funded group needed wind information on the job, 4 of the 10 (40%) also needed such information outside of the job. Seven of the 8 (88%) Non-DOE-Funded Wind Researchers needed wind information on the job; of these, 2 also needed information outside their jobs; 1 needed wind information only outside the job. Only 1 other Researcher (active solar heating and cooling) of the 181 in this study did not need solar information on the job in the next year. The proportion of Non-DOE-Funded Wind Researchers needing off the job information (3 of the 8 or 38%) was about the same as for the DOE-Funded group (40%). Of All Researchers who were asked this question, 48 of the 117 (41%) expected to need information on their specific technology outside the job.

3.1.3 Background of Respondents

Five of the 10 (50%) DOE-Funded Wind Researchers and 5 of the 8 (63%) Non-DOE-Funded Wind Researchers held a PhD, as did 51% (92 of the 180) of All Researchers. Only 1 of the 10 (10%) in the DOE-Funded group held bachelor's degrees, as did 2 of the 8 (25%) of the Non-DOE-Funded group and 31 of the 180 (17%) All Researchers. The remainder in both Wind Researcher groups held master's degrees.

Two of the DOE-Funded Wind Researchers had received their most recent degree within the last 10 years, 3 from 10-20 years ago, and 5 over 20 years ago. Similarly, 2 of the Non-DOE-Funded Wind Researchers had degrees granted within the past 10 years, 3 from 10-20 years ago, and 3 over 20 years ago.

Six of the DOE-Funded group had their most recent degrees in engineering (agricultural, mechanical, electrical). One held a physics degree, 1 a degree in electro-optics, 1 a degree in ecology, and 1 a degree in business. Two respondents in this group appeared to have changed professions since receiving their degrees (their length of time in their current profession was shorter than the length of time since degree conferral). While 6 had been in their current profession for over 10 years, 3 had only 6-10 years experience, and 1 had 3-5 years experience in his/her present profession. Current professions included: scientist, professor, aerodynamist, research ecologist, technologist, research project manager, and engineer (agricultural, systems, electronics, atmospheric).

Most (5) of the Non-DOE-Funded Wind Researchers also held advanced degrees in engineering (aeronautical, agricultural, electrical). The remainder (3) held degrees in atmospheric science, aerophysics, and physics. Five of the 8 had been in their present profession for over 10 years, the remainder for 6-10 years. Current professions included: engineer (research, structural), researcher, professor, manager, and administrator.

3.2 INFORMATION NEEDS OF RESPONDENTS

3.2.1 Technical Areas

Wind Researchers were asked to choose those areas in which they were "particularly interested in obtaining information" from a list of selected technical areas in wind energy (see Table 3-2). In each group of Wind Researchers, five or more respondents were interested in all six areas listed. DOE-Funded Wind Researchers were most interested (9 of the 10) in "small-scale wind systems" and almost as interested (8 of the 10) in "medium-to-large-scale systems." They were least interested (5 of the 9) in "towers." Non-DOE-Funded Wind Researchers were most interested (7 of the 8) in "medium-to-large-scale systems," "control equipment," and "electrical equipment." They were least interested (5 of the 8) in "rotary equipment" and "towers."

Table 3-2. AREAS OF INTEREST: WIND RESEARCHERS

Technical Area of Interest	Interested Respondents					
	DOE Funded		Non-DOE Funded		Total Wind Researchers	
	No.	Percent	No.	Percent	No.	Percent
Small-Scale Wind Systems	9	90	6	75	15	83
Medium/Large-Scale Systems	8	80	7	88	15	83
Electrical Equipment	7	70	7	88	14	78
Control Equipment	6	60	7	88	13	72
Rotary Equipment	6	60	5	63	11	61
Towers	5	50	5	63	10	56

3.2.2 Types of Information

Wind Researchers were asked to name the information about wind energy that was important for them to obtain. Seventeen of the 18 respondents from both groups volunteered one or more items of information which they considered important. Four DOE-Funded Wind Researchers considered costs (including operating expenses and life-cycle costs) and economics important. Other topics mentioned were: siting information (2), innovative systems (2), system stability, deployment of large-scale systems, safety hazard analysis, public acceptance, consumer attitudes, utility interface, weather conditions

(effects of changes in temperature and humidity as well as wind speed), materials, reports on demonstrations, availability of wind turbines, markets for small wind systems, verification of appropriate sites, performance under various environmental conditions, windmill interference with electromagnetic systems, environmental effects, advanced system developments, state-of-the-art, reliability, durability, and the contract award system as it relates to short- and long-range planning.

Information that the DOE-Funded Wind Researchers volunteered that they needed but were unable to get included: marketing potential, operating parameters, maintenance information, ways of financing wind systems, and more detailed climatological information.

Non-DOE-Funded Wind Researchers needed but were unable to get information on: cost, system reliability, power curves, and "technical aerodynamics of airfoil and high range cycles."

Choice Between Specific Needs. A list of 11 types of wind energy information products and 13 types of wind information categories was read to each respondent. Each respondent described the usefulness of each particular item by assigning it a value of "essential," "very useful," "somewhat useful," or "not at all useful." The results are given in Fig. 3-1 (DOE-Funded Wind Researchers) and Fig. 3-2 (Non-DOE-Funded Wind Researchers). For the purpose of comparison, Fig. 3-3 displays the results for All Researchers; it is not limited to wind information items, but cuts across solar technologies.

DOE-Funded Wind Researchers gave the research information category high ratings as a class. Their five top-rated information categories/products were:

- Climatological data,
- The state of the art,
- Research in progress,
- Expected major developments during the next 10 years, and
- Calendars of conferences and programs.

Non-DOE-Funded Wind Researchers similarly gave high ratings to research information but also wanted cost information. Their six top-rated information categories/products were:

- Costs and performance of systems,
- The state of the art,
- Costs of installing and operating a wind system compared to a conventional system,
- Research in progress,
- Lists of sources for information, and
- Manual methods for sizing and predicting performance or costs.

DOE-Funded Wind Researchers assigned the lowest relative ratings to:

- A nontechnical description of how a particular system works;
- Educational institutions and other organizations offering courses;

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	2		2	7	1	0
Research in progress	3		2	6	2	0
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	16		1	4	2	3
Costs and performance of systems	8		1	4	5	0
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	8		2	4	2	2
Climatological data such as wind, weather, or amount of sunshine	1		4	4	2	0
Marketing Information Categories:						
Marketing statistics and sales projections	20		1	2	5	2
Information on how to market and sell systems including guidelines on obtaining financial support	NA		NA	NA	NA	NA
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	23		0	2	6	2
Standards, specifications, or certification programs for equipment	11		2	3	3	2
Institutional, social, environmental, and legal aspects of system applications	6		2	4	4	0
Expected major developments during the next 10 years	3		3	5	1	1
Solar system programs, research, industries, and markets outside the United States	11		1	3	6	0
Tax credits, grants, or other economic incentives	16		3	0	4	3
Information Products:						
Reference Information Products:						
A bibliography of general readings	14		1	2	7	0
A calendar of conferences and programs	3		2	6	2	0
A list of sources for information	10		1	3	5	0
A list of technical experts	16		0	4	5	1
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	22		1	1	6	2
Descriptive Information Products:						
A non-technical description of how a particular system works	24		0	1	2	7
A technical description of how a particular system works	14		1	2	7	0
System diagrams or schematics	20		0	2	8	0
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	11		0	7	1	2
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	16		1	3	4	2
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	7		3	3	2	2

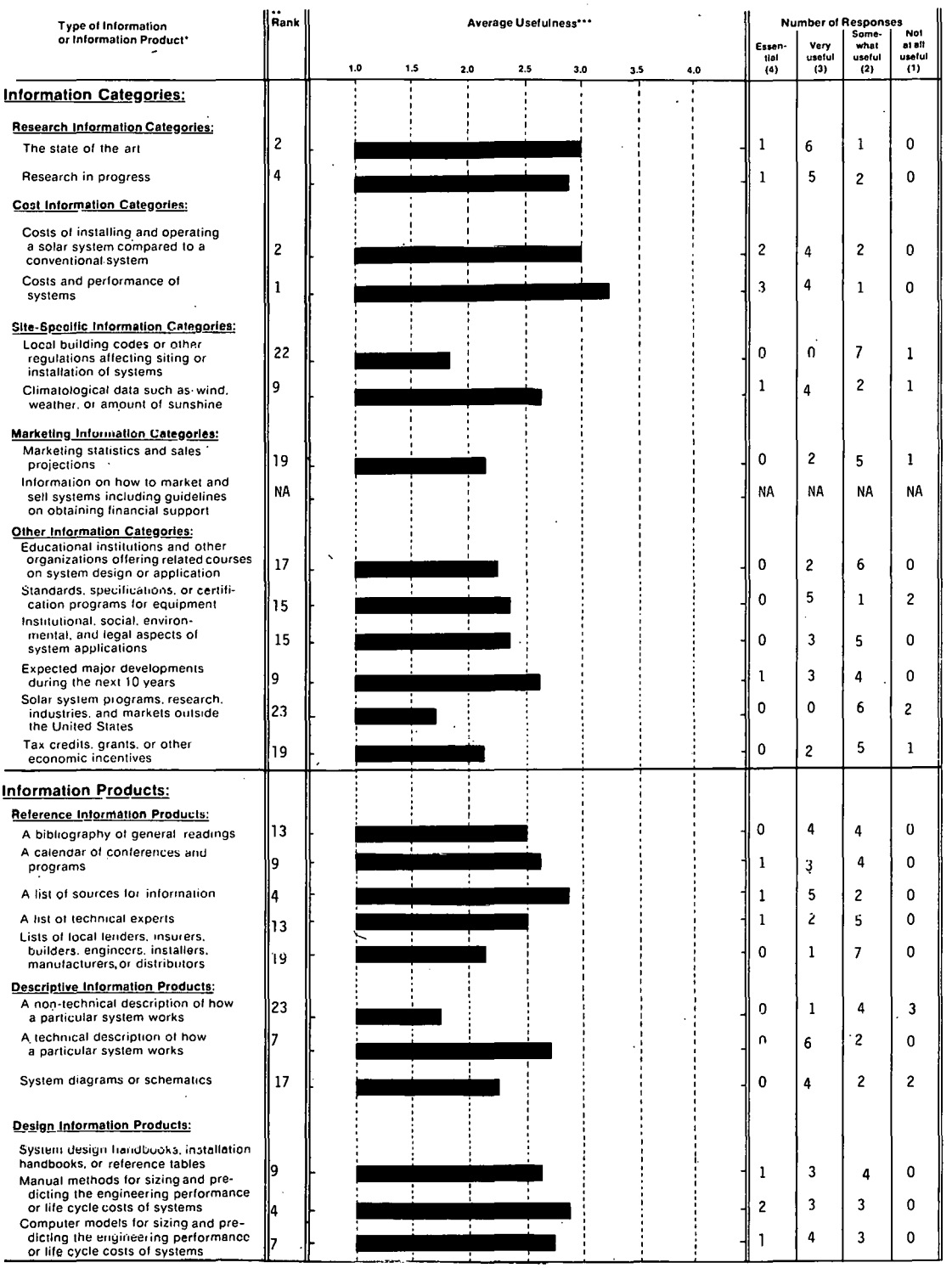
* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 3-1. Usefulness of Selected Information Items: DOE-Funded Wind Researchers

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?



Type of Information or Information Product*	Rank**	Average Usefulness***	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	2		1	6	1	0
Research in progress	4		1	5	2	0
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	2		2	4	2	0
Costs and performance of systems	1		3	4	1	0
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	22		0	0	7	1
Climatological data such as wind, weather, or amount of sunshine	9		1	4	2	1
Marketing Information Categories:						
Marketing statistics and sales projections	19		0	2	5	1
Information on how to market and sell systems including guidelines on obtaining financial support	NA		NA	NA	NA	NA
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	17		0	2	6	0
Standards, specifications, or certification programs for equipment	15		0	5	1	2
Institutional, social, environmental, and legal aspects of system applications	15		0	3	5	0
Expected major developments during the next 10 years	9		1	3	4	0
Solar system programs, research, industries, and markets outside the United States	23		0	0	6	2
Tax credits, grants, or other economic incentives	19		0	2	5	1
Information Products:						
Reference Information Products:						
A bibliography of general readings	13		0	4	4	0
A calendar of conferences and programs	9		1	3	4	0
A list of sources for information	4		1	5	2	0
A list of technical experts	13		1	2	5	0
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	19		0	1	7	0
Descriptive Information Products:						
A non-technical description of how a particular system works	23		0	1	4	3
A technical description of how a particular system works	7		0	6	2	0
System diagrams or schematics	17		0	4	2	2
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	9		1	3	4	0
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	4		2	3	3	0
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	7		1	4	3	0

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4."

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 3-2. Usefulness of Selected Information Items: Non-DOE-Funded Wind Researchers

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	2		34	93	44	9
Research in progress	1		33	102	39	7
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	4		32	70	45	16
Costs and performance of systems	3		39	78	49	14
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	20		19	38	58	48
Climatological data such as wind, weather, or amount of sunshine	7		34	55	46	28
Marketing Information Categories:						
Marketing statistics and sales projections	19		14	38	56	38
Information on how to market and sell systems including guidelines on obtaining financial support	23		3	0	7	8
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	24		1	26	99	54
Standards, specifications, or certification programs for equipment	17		18	55	53	37
Institutional, social, environmental, and legal aspects of system applications	18		13	51	73	26
Expected major developments during the next 10 years	5		24	88	51	17
Solar system programs, research, industries, and markets outside the United States	22		13	51	68	48
Tax credits, grants, or other economic incentives	15		27	44	52	40
Information Products:						
Reference Information Products:						
A bibliography of general readings	16		15	55	89	22
A calendar of conferences and programs	10		19	69	71	22
A list of sources for information	6		23	79	67	11
A list of technical experts	11		16	66	72	27
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	20		12	39	66	39
Descriptive Information Products:						
A non-technical description of how a particular system works	25		3	18	62	70
A technical description of how a particular system works	8		18	84	63	16
System diagrams or schematics	13		14	62	78	25
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	12		17	67	65	31
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	9		30	65	53	33
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	13		28	51	62	40

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 3-3. Usefulness of Selected Information Items: All Researchers

- Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors;
- Marketing statistics and sales projections; and
- System diagrams or schematics.

Non-DOE-Funded Wind Researchers were in agreement in assigning their lowest relative ratings to three of the same items, all of which also received low ratings from All Researchers:

- A nontechnical description of how a particular system works;
- Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors; and
- Marketing statistics and sales projections.

Also among their bottom-rated were:

- Solar energy programs, research, industries, and markets outside the United States;
- Local building codes or other regulations; and
- Tax credits, grants, or other economic incentives.

Statistical tests indicated that for each of the groups of Wind Researchers differences between the highest-rated and lowest-rated items listed above were statistically significant ($P < 0.05$).

It should be noted that these lower-rated items were not necessarily of no worth to the Wind Researchers. For example, 3 of the 10 (30%) DOE-Funded Wind Researchers and 2 of the 8 (25%) Non-DOE-Funded Wind Researchers thought "marketing statistics" was either "essential" or "very useful." Thus, these information categories/products could be useful to some Wind Researchers but were of a lower relative priority to the entire group.

Statistical tests were also used to determine whether the DOE-Funded Wind Researchers rated any of these information items significantly higher (or lower) than they were rated by the Non-DOE-Funded Wind Researchers or by All Researchers. Some groups, however, tended to give higher scores in general than did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The procedure for calculating the relative rating is described in Appendix E. The average overall rating DOE-Funded Wind Researchers gave to all items was 2.50; for Non-DOE-Funded it was 2.49; and for All Researchers, 2.41.

In comparing the results of these two groups of Wind Researchers to All Researchers, the high ratings for items in the research category were similar.

The DOE-Funded group rated "solar energy programs . . . outside the United States" and "local building codes" significantly ($P < 0.05$) higher than did the Non-DOE-Funded group, while rating "costs and performance" significantly ($P < 0.05$) lower. There was also evidence that DOE-Funded Researchers gave a higher rating to "climatological data,"

"expected major developments," "institutional . . .aspects," and a "calendar of conferences." On the other hand, Non-DOE-Funded Researchers appeared to give higher ratings to "costs of installing," "lists of sources for information," "a technical description," and "manual methods."

While there were no significant differences between the ratings of Non-DOE-Funded Wind Researchers and All Researchers, the DOE-Funded Wind Researchers rated "calendars" and "climatalogical data" significantly ($P < 0.05$) higher than did All Researchers, and "a nontechnical description" and "costs of installing" significantly ($P < 0.05$) lower.

3.3 ACQUISITION OF INFORMATION BY RESPONDENTS

3.3.1 Use of Selected Information Sources

Wind Researchers were asked which of 20 different potential sources of solar information they had used in the past few years. For this question the respondents were not asked if they had obtained information on wind energy, but instead were asked if they had obtained any solar information from each specific source. Thus, the question sought to determine which information sources were the most familiar to respondents. The results for the DOE-Funded and Non-DOE-Funded groups are shown in Figs. 3-4 and 3-5. For comparison Fig. 3-6 shows the results for All Researchers.

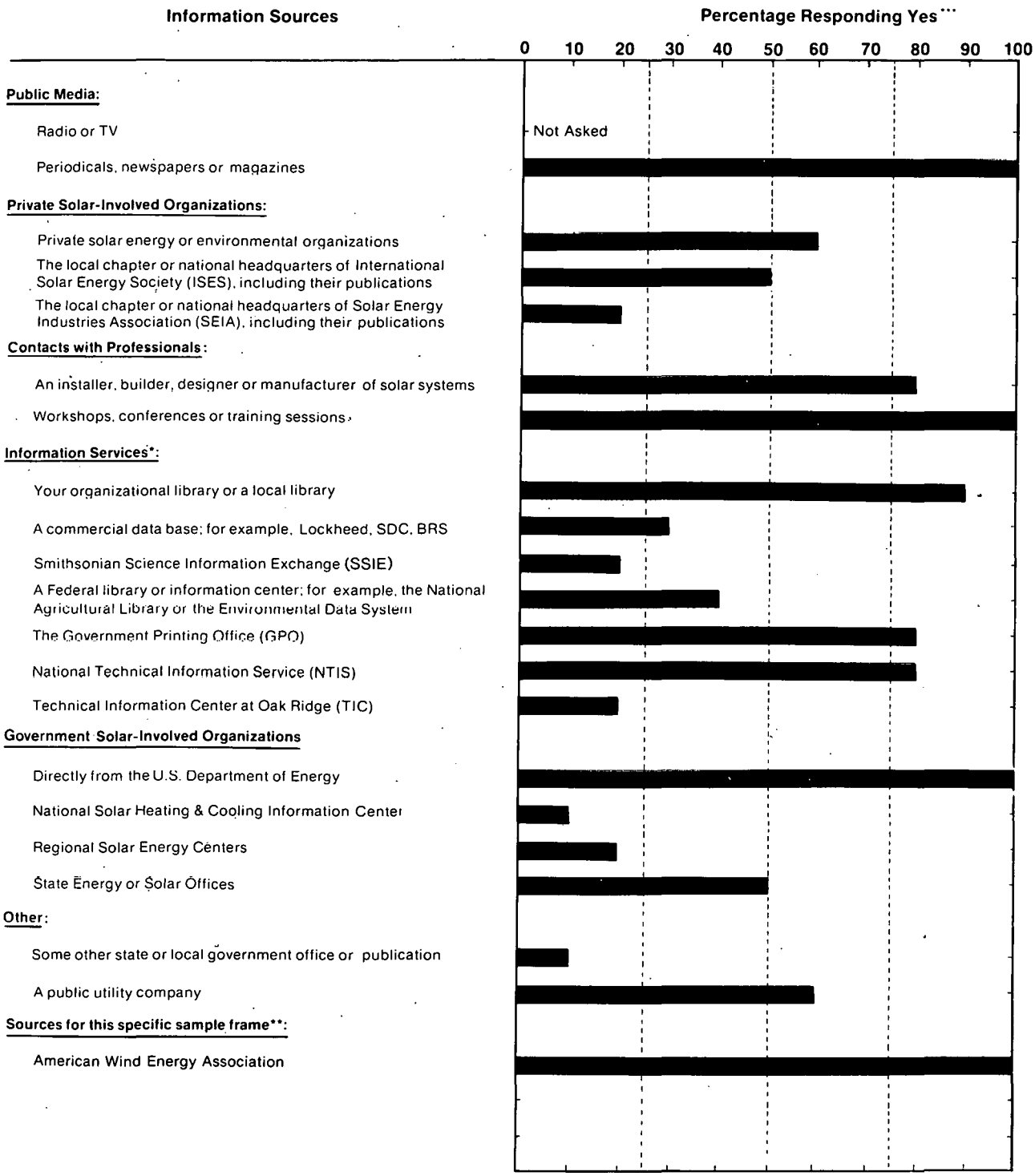
"Periodicals, newspapers, or magazines" had been used by all respondents in both groups. The information sources mentioned most often by DOE-Funded Wind Researchers (8 or more of the 10 had used them) were:

- Newspapers, periodicals, or magazines;
- Workshops, conferences, or training sessions;
- Directly from DOE;
- American Wind Energy Association (AWEA);
- An organizational library or a local library;
- An installer, builder, designer, or manufacturer of wind systems;
- The Government Printing Office (GPO); and
- National Technical Information Service (NTIS).

Others mentioned most often by Non-DOE-Funded Wind Researchers (6 or more of the 8 had used them) were:

- An organizational library or a local library;
- Workshops, conferences, or training sessions;
- GPO;
- NTIS; and
- A public utility company.

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



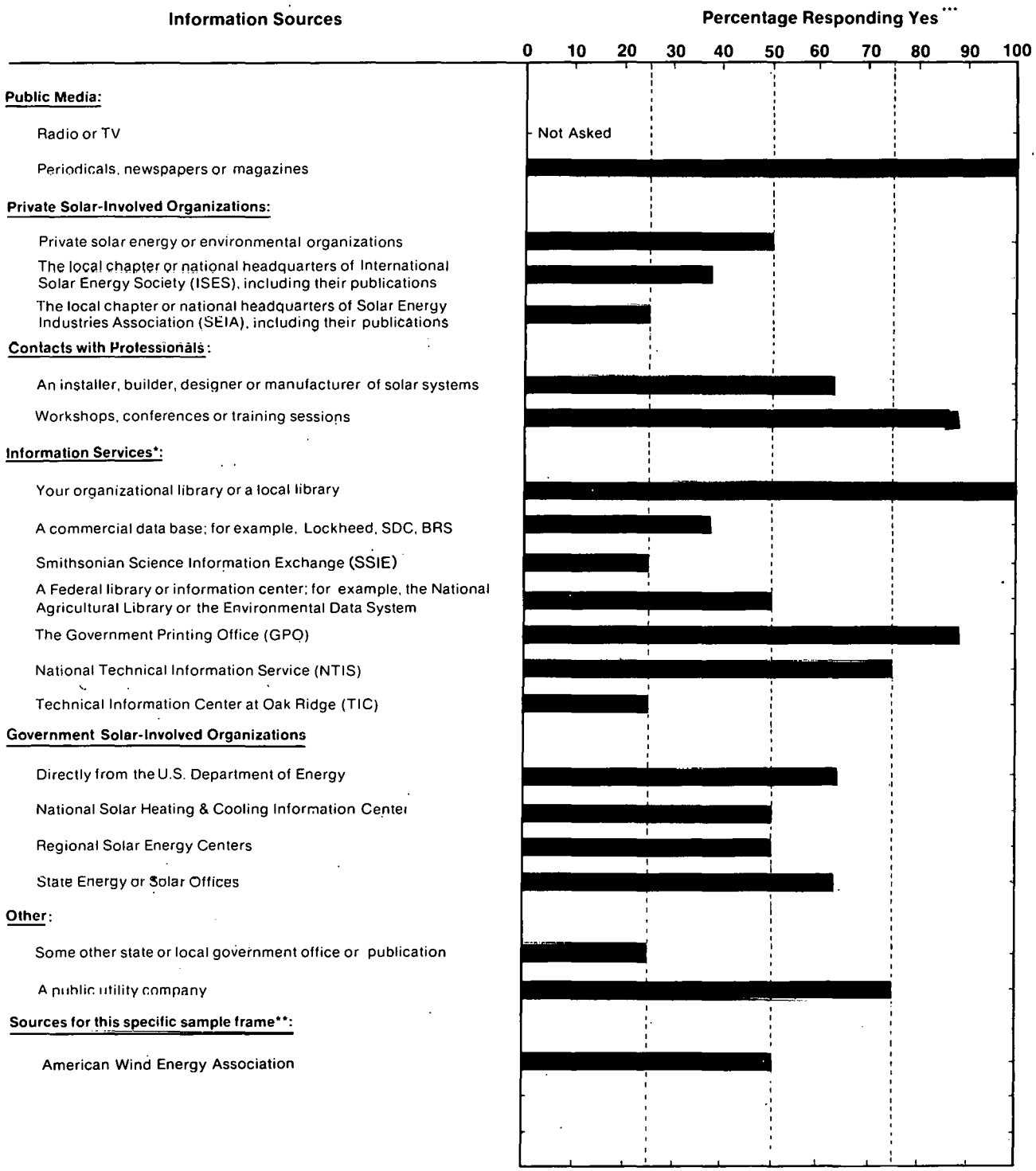
* Services and centers whose primary purpose is to disseminate information

** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."

*** These data are based upon a total of 10 respondents.

Figure 3-4. Use of Selected Information Sources: DOE-Funded Wind Researchers

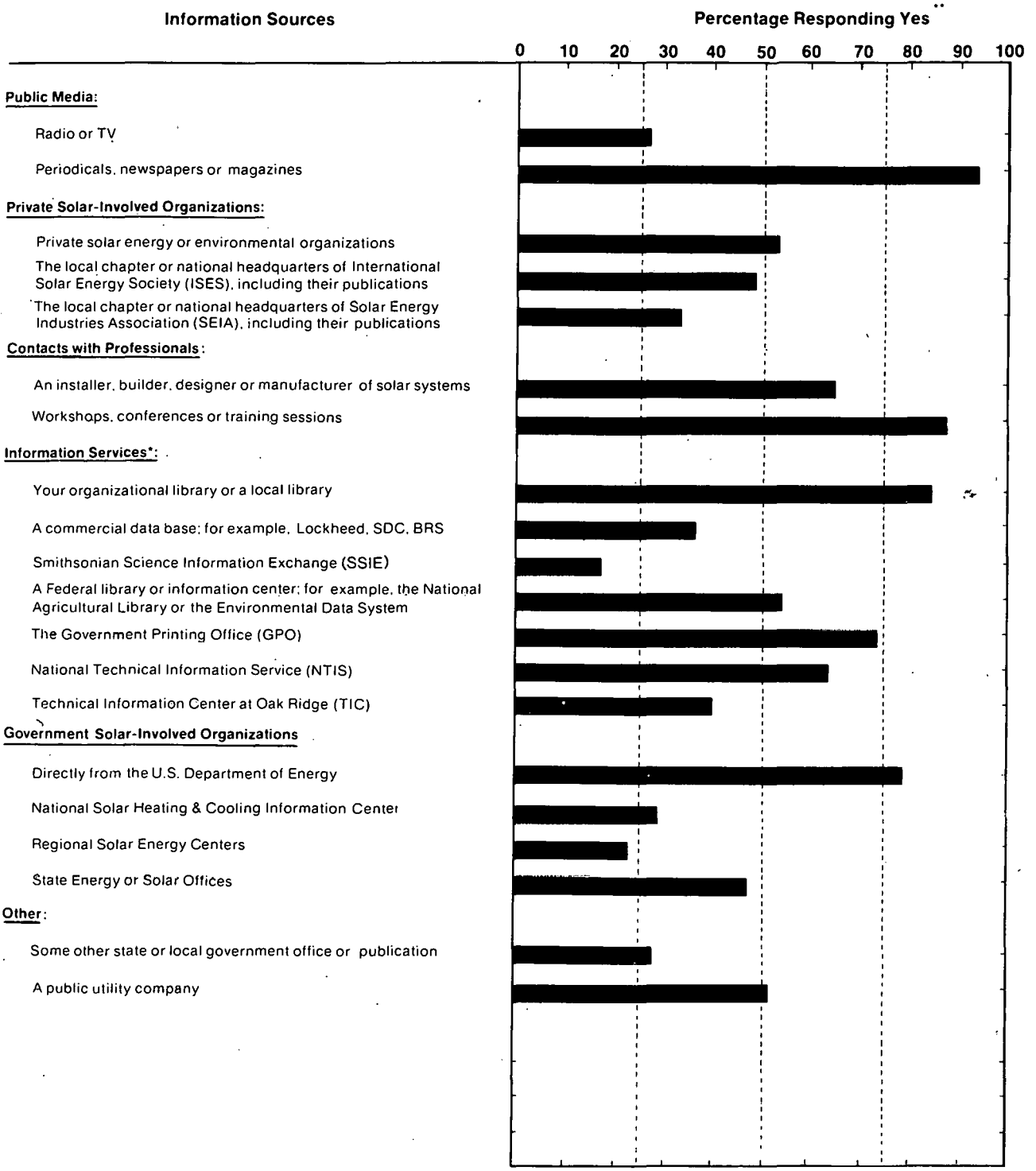
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 8 respondents.

Figure 3-5. Use of Selected Information Sources: Non-DOE-Funded Wind Researchers

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** These data are based upon a total of 181 respondents.

Figure 3-6. Use of Selected Information Sources: All Researchers

The information sources used least often by both groups of Wind Researchers were:

- Solar Energy Industries Association (SEIA),
- SSIE,
- Technical Information Center (TIC), and
- Some other state or local government office or publications.

The other information sources mentioned least often by DOE-Funded Wind Researchers were:

- National Solar Heating and Cooling Information Center (NSHCIC), and
- Regional Solar Energy Centers (RSECs).

The other information source mentioned least often by Non-DOE-Funded Wind Researchers was the International Solar Energy Society (ISES).

The low frequency of use of SSIE and TIC by both groups was a bit surprising, considering that one of the categories of information of most use to these groups was "research in progress." It appeared that both groups might have inadequate access to sources for research-in-progress information. However, none had mentioned (see Section 3.2.2) research-in-progress information as information they were unable to get. The low use of RSECs was typical of Researchers generally and probably reflected the orientation of the RSECs toward commercialization. The low use of SEIA (also commercially oriented) appeared to be compensated for by relatively high use of AWEA.

3.3.2 Membership in Solar-Interested Organizations

Eight of the 10 DOE-Funded Wind Researchers interviewed were members of a professional, technical, or other organization with an interest in solar energy. These organizations (and the number of times mentioned) included:

- American Astronautical Society,
- American Helicopter Society,
- American Institute of Aeronautics and Astronautics (AIAA)(2),
- American Meteorological Society (AMS),
- American Physical Society,
- American Society of Mechanical Engineers (2),
- AWEA (4),
- Institute of Electrical and Electronics Engineers (IEEE), and
- ISES

Seven of the 8 Non-DOE-Funded Wind Researchers belonged to such an organization. The organizations were:

- AIAA (2),
- AMS (2),

- American Society for Testing and Materials (1),
- American Society of Agricultural Engineers (2),
- IEEE, and
- Society for the Advancement of Education.

Note that although none of this group mentioned belonging to AWEA, half of them did obtain wind information from this source. Professional societies only were included in those organizations mentioned by the Non-DOE-Funded group, whereas both professional societies and solar organizations were mentioned by the DOE-Funded group. The AWEA and AMS were the most popular with Wind Researchers.

3.3.3 Exposure to Publications on Solar Energy

During the past 6 months, all 10 DOE-Funded Wind Researchers had read publications which included information on wind energy. The publications they could specify (and the number of times mentioned) included:

- Aerodynamics Industry publications,
- AWEA publications (2),
- DOE publications (3),
- Mechanical Engineering News,
- Popular Science (2),
- Proceedings of the Wind Innovative Conference (Colorado Springs),
- Solar Energy Research Institute (SERI) publications,
- U.S. Distributions (TIC),
- Wind Energy Report,
- Wind Engineering,
- Windletter (AWEA Newsletter) (3), and
- Wind Power Digest (2).

Seven of the 8 Non-DOE-Funded Researchers had read such publications, including:

- Battelle Labs reports,
- Journal of Applied Meteorology,
- Journal of Energy,
- National Aeronautics and Space Administration (NASA) reports,
- Sandia Labs reports,
- Solar Engineering, and
- Trade press.

3.3.4 Use of Special Acquisition Methods

The respondents were asked whether they had obtained any information (not just wind or solar energy) in the past year by computer terminal, by Computer Output Microform (COM), or by other microform (e.g., microfiche, microfilm sheets or rolls). Two in each group of Wind Researchers had used computer terminals. None of the DOE-Funded Wind Researchers and only 2 of the Non-DOE-Funded Wind Researchers had used COM. However, in each of the two groups, 5 respondents had used microforms (50% of DOE-Funded Wind Researchers and 63% of Non-DOE-Funded Wind Researchers). While their use of computer terminals was lower than that of All Researchers (4 of the 18, 22% of Total Wind Researchers; 62 of the 181, 34% of All Researchers), their use of microforms other than COM was higher (10 of the 18, 56%) than that of All Researchers (72 of the 181, 40%).

3.4 SUMMARY AND COMMENTS

Two types of wind researchers were studied: DOE-funded researchers and non-DOE-funded researchers. Both groups of Wind Researchers were employed by similar institutions: universities, research laboratories, and federal agencies. In addition, some DOE-Funded Wind Researchers were also working for private research and consulting firms. Educational levels were comparable to those of All Researchers interviewed in this study. The DOE-Funded group were somewhat more likely to be involved in impact studies and guides, and the Non-DOE-Funded Wind Researchers in design and testing. Both groups were interested in both large-and small-scale wind systems.

Both groups gave high ratings to the utility of information on:

- The state of the art in wind energy conversion systems, and
- Wind energy research in progress,

as did All Researchers.

The DOE-Funded group also found most useful:

- Climatolological data,
- Expected major developments in wind energy during the next 10 years, and
- Calendars of wind energy systems conferences and programs.

Non-DOE-Funded Wind Researchers were more interested in information on:

- Costs and performance of wind energy systems,
- Costs of installing and operating a wind energy system compared to a conventional system,
- Lists of sources for information on wind energy systems, and
- Manual methods for sizing and predicting performance or costs of wind energy conversion systems.

Thus, the Non-DOE-Funded group, more involved with specific systems, was also more concerned with cost and design. The DOE-Funded group, more involved with feasibility,

impact, or assessment types of studies, stressed wind resource information and expected developments. Both groups felt that there was considerable usefulness in knowing about additional sources of information and in the exchange of ideas.

Least useful to both groups were "a nontechnical description," "lists of local lenders, insurers," and "marketing statistics." In addition, the DOE-Funded Wind Researchers found relatively little usefulness in knowing about "educational institutions" or "system diagrams." The Non-DOE-Funded group was not interested in "solar energy programs . . . outside the United States," "local building codes," or "tax credits."

The most popular sources of information for Wind Researchers were the same as those identified by All Researchers: "periodicals," "workshops, conferences, or training sessions," and "an organizational or a local library." DOE-Funded Wind Researchers were also likely to use AWEA and DOE, while the Non-DOE-Funded Wind Researchers were likely to use GPO, NTIS, and utility companies.

Professional/technical organizations were prominent among those providing solar information to both groups. Only DOE-Funded Wind Researchers also mentioned solar organizations. This group also mentioned acquiring wind information from wind-specific publications, while both groups used professional association publications and reports conducted by national laboratories.

SECTION 4.0

WIND ENERGY CONVERSION SYSTEM MANUFACTURER REPRESENTATIVES

4.1 DESCRIPTION OF RESPONDENTS

4.1.1 Description of Sample

This section describes the results of a telephone study to determine the needs of representatives of manufacturers of wind systems and components for information on wind energy. Nine representatives of Wind Manufacturers were interviewed.

The sample frame for Wind Manufacturer Representatives was constructed from six sources. Manufacturers were obtained from the Solar Energy Information Data Bank (SEIDB) Manufacturers Data Base [8] which included manufacturers of wind energy conversion equipment (electrical systems, mechanical systems, and systems components). The Wind Power Digest "1979 Access Catalog" [9] was another source of manufacturers, listing manufacturers of wind systems and towers. Names for manufacturers were also obtained from the "Access Catalog Update" [9] and "A Guide to Commercially Available Wind Machines" [10]. The Massachusetts Institute of Technology Research Establishment (MITRE) "Solar Energy Technical Information Dissemination Program. Reference Directory: Wind Energy Conversion" [11] listed manufacturers/distributors. The "WTG Manufacturer Visits" list [12] was reviewed; however, none of these manufacturers had contact people listed. The book, Harnessing the Wind for Home Energy [13], listed manufacturers under the title Manufacturers and Restorers. The manufacturers from these six sources were pooled. International manufacturers, duplications with manufacturers from other technologies, duplications with wind distributors, and entries with no contact name listed were eliminated. After all adjustments were made, 9 interview candidates were randomly selected from a sample frame of 45 Wind Manufacturer Representatives.

Respondents. In making the telephone calls to contact the randomly selected interview candidates, it sometimes occurred that the person could not be reached. In this event another randomly selected name was substituted for the original name. When individuals were contacted, it was verified that the company they worked for really was a wind system or component manufacturer and that they would be needing information on wind energy within the next year. If they were not both involved and needing information, they were asked if they could refer the interviewer to someone else in their organization who would be an appropriate respondent. If such a referral was made, a call was then made to this new candidate; if no intraorganizational referral was made, a new candidate was randomly selected from the sample frame. The results of this process may be seen in Table 4-1.

Comparisons. For additional insight into the information needs and the information habits of these representatives of Wind Manufacturers, results from this group are compared to the results from representatives of All Manufacturers interviewed in this study. In performing any statistical comparisons, the totals for Wind Manufacturers have been subtracted from the totals for All Manufacturers. The data for Wind Manufacturers and for All Manufacturers can be found in Appendix F.

Table 4-1. COMPLETION OF INTERVIEWS: WIND MANUFACTURER REPRESENTATIVES

Event	Number of Candidates
Interview completed with sample frame candidate	6
Interview completed with referral candidate	3
Refusal or candidate termination	1
Contact attempted: could not reach candidate within three attempts or before interviews were completed	4
Subtotal	14
Contact attempted: invalid candidate (e.g., inappropriate field of interest, no telephone)	3
TOTAL	17
Sample frame error rate[a] (Percent)	18
Completion rate[b] (Percent)	64

[a]Invalid candidates divided by TOTAL
[b]Completed interviews divided by Subtotal

4.1.2 Current Status of Respondents

Role. Six of the 9 Wind Manufacturer Representatives were manufacturing complete wind systems, and 3 were manufacturing components only. Five of the 6 wind system manufacturers produced small wind turbine generator systems (2 specifically manufactured tri-blade machines) and 1 manufactured a large tri-blade wind turbine generator system. One of the wind system manufacturers also manufactured utility interface/inverters, and 1 provided a wind analyst/consulting service. Of the 3 manufacturers of wind components, 1 produced wind turbine blades; the second produced towers; and the third produced hygrometers, thermal radiation detectors, data acquisition systems, instrumentation and measurement equipment, and anemometers.

Involvement. Six of the 9 (67%) representatives of Wind Manufacturers felt that they were "very involved" in wind energy. Two felt that they were "moderately involved" and 1 "slightly involved." A statistical comparison between Wind Manufacturers and All Manufacturers (77 of the 96 or 80% "very involved") showed no significant differences in degree involved.

Informedness. Six of the 9 (67%) representatives of Wind Manufacturers felt they were "very informed" on wind energy and 3 were "moderately informed." A statistical comparison with All Manufacturers (72 of the 96 or 75% "very informed") showed no significant differences in degree informed.

Need for Information. All respondents indicated they would need information on wind energy on the job during the next year. Four of the 9 (44%) representatives of Wind Manufacturers also expected to need information on wind outside the job. This did not differ significantly from All Manufacturer Representatives, in which 47 of the 96 (49%) were interested in information outside the job.

4.1.3 Background of Respondents

Three of the 9 representatives of Wind Manufacturers held bachelor's degrees, 1 held a master's degree, 1 a doctoral degree, 1 an associate degree, and 3 attended college but received no degree. These educational levels were similar to that of All Manufacturer Representatives. Various kinds of degrees were held by Wind Manufacturers; including 1 each in mathematics, European history, photography, business administration, and engineering. (The respondent with an associate degree was not queried on degree field.) Four of the 5 respondents received their most recent degree within the past 12 years; the other degree was received 38 years ago.

The length of experience in their current profession varied among the representatives of Wind Manufacturers, with 3 in their current profession for 2 or fewer years, 3 for 6-10 years, and 3 for over 10 years. Two of the respondents stated their current profession as managers, 2 were in design, and 2 in research. One respondent was an aerospace engineer, 1 an expert in wind generators and support structures, and 1 was the company president and owner.

4.2 INFORMATION NEEDS OF RESPONDENTS

4.2.1 Technical Areas

Representatives of Wind Manufacturers were asked to choose those areas in which they were "particularly interested in obtaining information" from a list of selected technical areas of wind energy. All 9 were interested in "small scale wind systems," 8 of the 9 (89%) were interested in "towers," and 6 of the 9 (67%) in both "rotary equipment" and "electrical equipment." Areas generating the least interest included "medium/large-scale wind systems" and "control equipment" (5 of the 9 or 56%).

One representative of a Wind Manufacturer volunteered that he/she was also interested in information on direct drive alternators.

4.2.2 Types of Information

Representatives of Wind Manufacturers were asked to name the information about wind energy that was important for them to obtain. Seven of the 9 Wind Manufacturers volunteered one or more items of information which they considered important. Information items receiving 2 mentions each as important included national wind data and performance data (including at high speeds). Other items that received one mention each included information on: types of instrumentation, blade materials, wind energy system designs from other countries, complete wind energy systems, blade design, load data on various structures, bibliographies on wind systems, data on demonstration units, the capacity of direct drive alternators, a list of experts on wind systems, water depth by area all over the world, cost information on slow wind design turbines (designs for wind speeds of 7-9 miles per hour), wind energy grants, information on water purifying, loading information on wind energy systems, the harmonic modes and natural frequency modes of various structures, and "anything that deals with wind energy."

Five representatives of Wind Manufacturers volunteered that there was information they needed but were unable to get. This included data on wind (2), the locations of slow wind

design turbines nationally, lists of companies "willing to devote their efforts to wind energy production techniques," and research data to learn from "past mistakes."

Choice Between Specific Needs. A list of 11 types of wind information products and 14 types of wind information categories was read to each respondent. Each respondent described the usefulness of each particular item by assigning it a value of "essential," "very useful," "somewhat useful," or "not at all useful." The results are given in Fig. 4-1. For the purpose of comparison, the results for All Manufacturers (Fig. 4-2) are also included.

Representatives of Wind Manufacturers selected site-specific information categories the most important as a class. The four top-rated information categories/products were:

- Climatological data;
- Standards, specifications, or certification programs;
- Tax credits, grants, or other economic incentives; and
- Expected major developments during the next 10 years.

Representatives of Wind Manufacturers assigned the lowest relative ratings to:

- Computer models for sizing and predicting performance or costs,
- A bibliography of general readings,
- A nontechnical description of how a particular system works, and
- Lists of sources for information.

Statistical tests indicated all four of the top categories/products were rated significantly ($P < 0.05$) higher than were the four lowest-rated items.

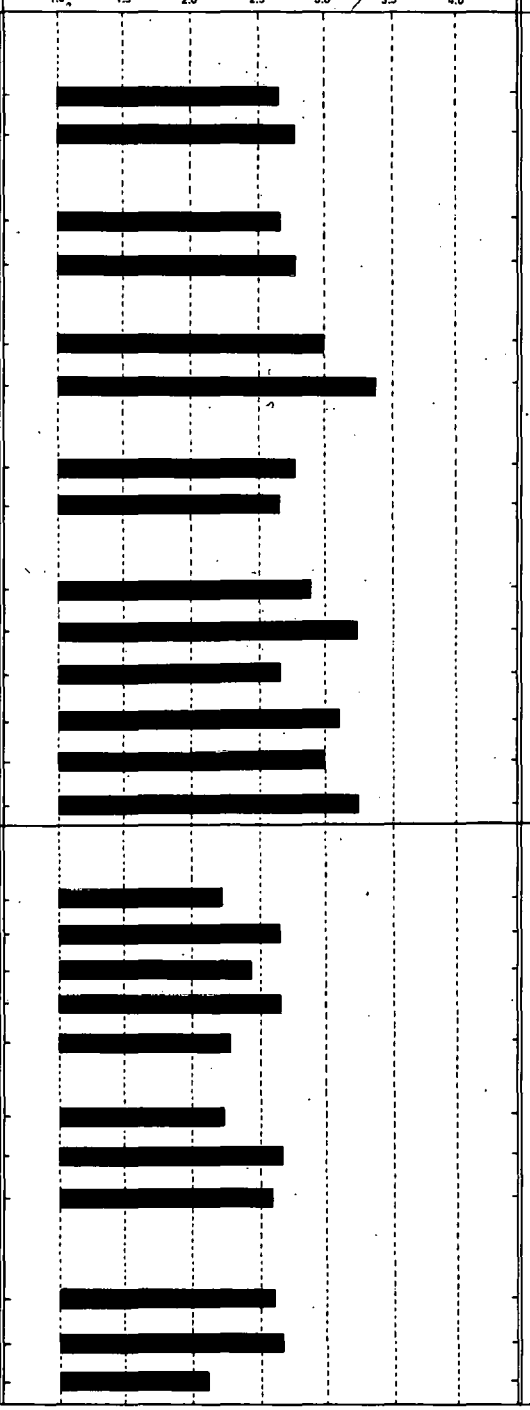
It should be noted that these lower-rated items are not necessarily of no worth to the Wind Manufacturers. For example, 4 of the 9 (44%) Wind Manufacturers thought information on "lists of sources for information" was either "essential" or "very useful." Thus, these information categories/products could be useful to some Wind Manufacturers but were of a lower relative priority to the entire group.

Statistical tests were also used to determine whether the representatives of Wind Manufacturers rated any of these information items significantly higher (or lower) than they were rated by representatives of All Manufacturers. Some groups, however, tended to give higher scores in general than did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The procedure for calculating the relative rating is described in Appendix E. The average overall rating was higher for Wind Manufacturers (2.74) than it was for All Manufacturers (2.51).

A comparison of representatives of Wind Manufacturers to representatives of All Manufacturers showed the wind group to be significantly ($P < 0.05$) more interested in "educational institutions."

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:					
Research Information Categories:					
The state of the art	12	2	3	3	1
Research in progress	8	2	4	2	1
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	12	2	3	3	1
Costs and performance of systems	8	3	2	3	1
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	5	3	4	1	1
Climatological data such as wind, weather, or amount of sunshine	1	5	3	1	0
Marketing Information Categories:					
Marketing statistics and sales projections	8	3	2	3	1
Information on how to market and sell systems including guidelines on obtaining financial support	12	3	1	4	1
Other Information Categories:					
Educational institutions and other organizations offering related courses on system design or application	7	3	2	4	0
Standards, specifications, or certification programs for equipment	2	4	3	2	0
Institutional, social, environmental, and legal aspects of system applications	12	2	3	3	1
Expected major developments during the next 10 years	4	4	2	3	0
Solar system programs, research, industries, and markets outside the United States	5	3	3	3	0
Tax credits, grants, or other economic incentives	2	4	4	0	1
Information Products:					
Reference Information Products:					
A bibliography of general readings	23	1	1	6	1
A calendar of conferences and programs	12	2	3	3	1
A list of sources for information	22	1	3	4	1
A list of technical experts	12	1	4	4	0
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	8	2	4	2	1
Descriptive Information Products:					
A non-technical description of how a particular system works	23	2	1	3	3
A technical description of how a particular system works	12	2	3	3	1
System diagrams or schematics	20	0	5	4	0
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	20	2	2	4	1
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	12	2	4	1	2
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	25	1	2	3	3



* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 4-1. Usefulness of Selected Information Items: Wind Manufacturer Representatives

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	6		23	34	26	10
Research in progress	5		22	38	26	9
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	4		19	43	23	8
Costs and performance of systems	3		19	44	26	6
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	13		21	32	27	19
Climatological data such as wind, weather, or amount of sunshine	8		28	28	20	19
Marketing Information Categories:						
Marketing statistics and sales projections	8		22	30	34	9
Information on how to market and sell systems including guidelines on obtaining financial support	17		22	17	33	23
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	23		8	15	43	30
Standards, specifications, or certification programs for equipment	2		29	28	31	8
Institutional, social, environmental, and legal aspects of system applications	22		9	24	41	21
Expected major developments during the next 10 years	7		19	36	33	8
Solar system programs, research, industries, and markets outside the United States	20		14	25	34	23
Tax credits, grants, or other economic incentives	1		30	41	15	9
Information Products:						
Reference Information Products:						
A bibliography of general readings	24		5	14	52	24
A calendar of conferences and programs	18		10	33	36	16
A list of sources for information	16		10	37	34	14
A list of technical experts	19		11	30	36	19
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	10		19	36	27	13
Descriptive Information Products:						
A non-technical description of how a particular system works	25		3	13	32	20
A technical description of how a particular system works	11		13	45	25	12
System diagrams or schematics	14		5	44	39	7
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	15		9	40	33	14
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	12		19	34	26	16
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	21		8	33	29	25

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4."

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 4-2. Usefulness of Selected Information Items: All Manufacturer Representatives

4.3 ACQUISITION OF INFORMATION BY RESPONDENTS

4.3.1 Use of Selected Information Sources

Representatives of Wind Manufacturers were asked which of 19 different potential sources of solar information they had used in the past few years. For this question the respondents were not asked if they had obtained information on wind energy, but instead were asked if they had obtained any solar information from each specific source. Thus, the question sought to determine which information sources were the most familiar to the respondents. The results are shown in Fig. 4-3. For the purpose of comparison, the results for All Manufacturers (Fig. 4-4) are also included.

The information sources mentioned most often by representatives of Wind Manufacturers were:

- Periodicals, newspapers, or magazines;
- Workshops, conferences, or training sessions;
- An installer, builder, designer, or manufacturer;
- Private solar energy or environmental organizations;
- The Government Printing Office (GPO);
- Directly from the U.S. Department of Energy (DOE); and
- Some other state or local government office or publications.

The information sources mentioned least often by representatives of Wind Manufacturers were:

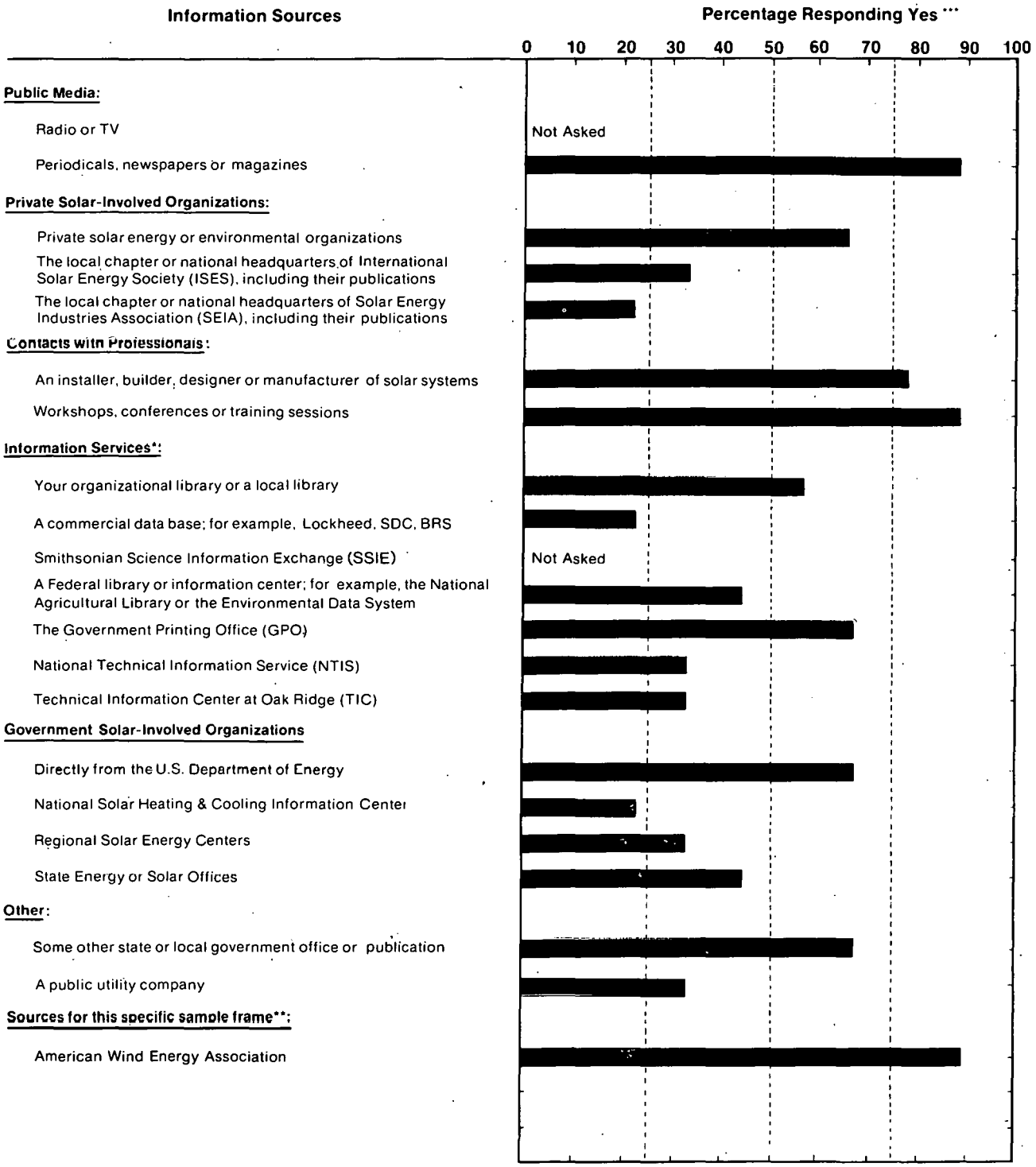
- Solar Energy Industries Association (SEIA),
- A commercial data base,
- National Solar Heating and Cooling Information Center (NSHCIC),
- International Solar Energy Society (ISES),
- National Technical Information Service (NTIS),
- Technical Information Center (TIC),
- Regional Solar Energy Centers (RSECs), and
- A public utility company.

Representatives of All Manufacturers also appeared to rely more frequently on "periodicals," professional contacts ("an installer" and "workshops"), GPO, and DOE.

4.3.2 Membership in Solar-Interested Organizations

Five of the 9 representatives of Wind Manufacturers interviewed were members of a professional, technical, or other organization with an interest in solar energy. These organizations (and the number of times mentioned) included:

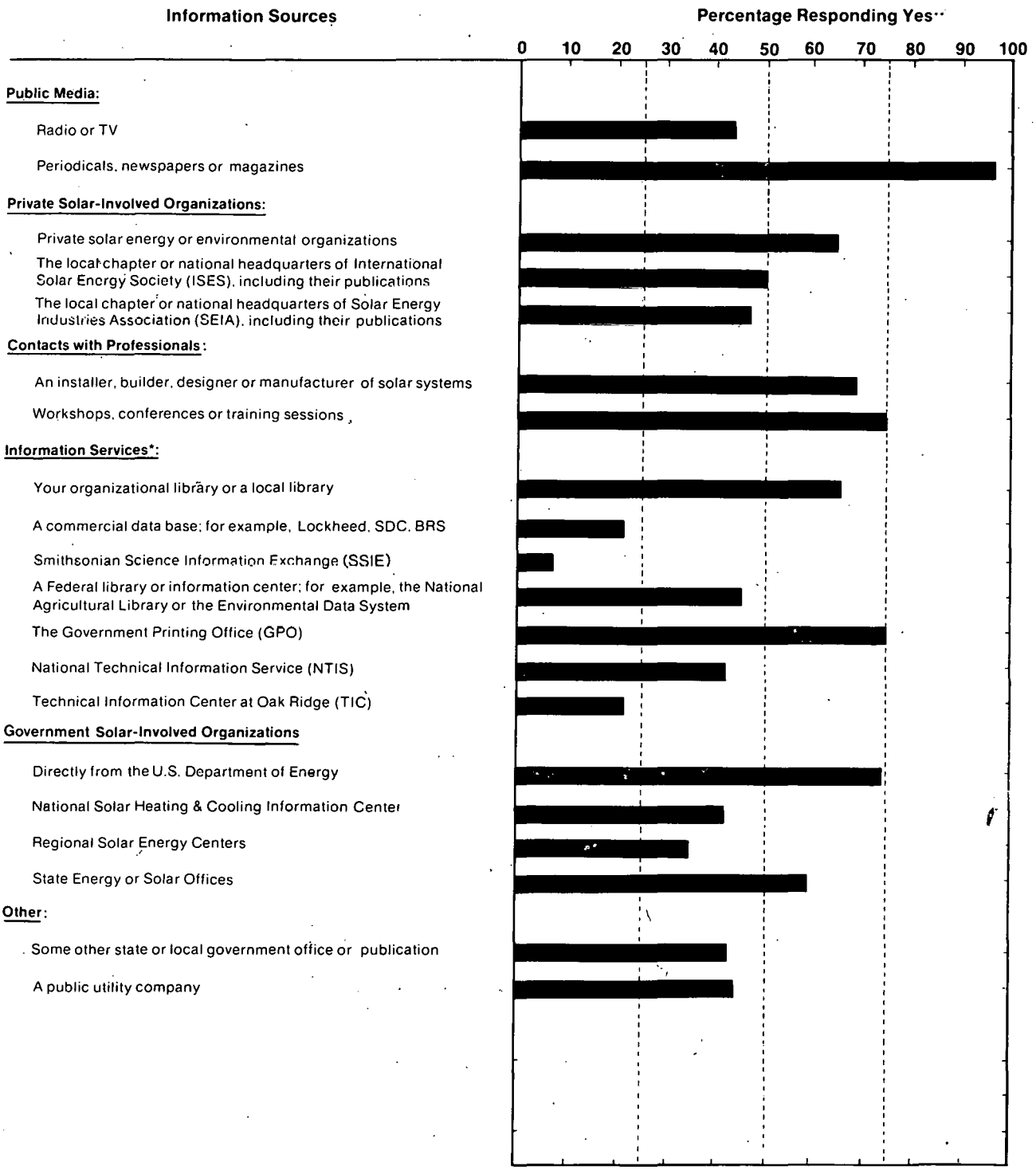
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 9 respondents.

Figure 4-3. Use of Selected Information Sources: Wind Manufacturer Representatives

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** These data are based upon a total of 96 respondents.

Figure 4-4. Use of Selected Information Sources: All Manufacturer Representatives

- American Wind Energy Assoication (AWEA) (5),
- Lehigh Valley (Pennsylvania) Solar Energy Association, and
- Michigan Solar Society.

One respondent also mentioned membership in the "Hydrogen Society," an organization that could not be verified by the authors.

4.3.3 Exposure to Publications on Solar Energy

During the past 6 months, all 9 representatives of Wind Manufacturers had read publications which included information on wind energy. The publications they could specify (and the number of times mentioned) included:

- Alternative Sources of Energy,
- Mother Earth News,
- National Aeronautics and Space Administration (NASA) reports,
- Wind Power and Other Energy Options (book by David Inglis),
- Wind Power Digest (3), and
- Wind Technology Journal (2).

Single mentions were also received for some publications that could not be verified by the authors. These included "American Energy Association publications," "Wind and Energy Digest," and "federal reports."

4.3.4 Use of Special Aquisition Methods

The respondents were asked whether they had obtained any information (not just wind energy or solar energy) in the past year by computer terminal, by Computer Output Microform (COM), or by other microform (e.g., microfiche, microfilm sheets or rolls). Few Wind Manufacturers appeared accustomed to using these special acquisition methods, a trait common to manufacturers in all technologies surveyed. In the past year, only 2 of the 9 (22%) Wind Manufacturers had used a computer terminal, none had used COM, and only 1 (11%) had used other microform.

4.4 SUMMARY AND COMMENTS

Nine representatives of Wind Manufacturers were interviewed. Six of the nine manufactured complete wind systems, and three manufactured components only. Their level of involvement, degree of informedness, and educational level was typical of manufacturers interviewed in this study. All nine Manufacturers were interested in "small-scale wind systems." Five of the nine (56%) respondents were also interested in "medium/large-scale wind systems."

Representatives of Wind Manufacturers gave the highest priority to receiving information on:

- Climatological data;
- Standards, specifications, or certification programs for wind systems;
- Tax credits, grants, or other economic incentives for wind systems; and
- Expected major developments in wind energy during the next 10 years.

They gave low ratings to "computer models," "a bibliography," "a nontechnical description" and "lists of sources."

In order of priority, Wind Manufacturers did not appear to value cost and research information as highly as All Manufacturers. Instead, this group appears to more highly value site-specific information and information necessary for applying the technology (i.e., "standards" and "tax credits"). These results are consistent with their greater preference for small wind systems.

The most popular sources of information identified by Wind Manufacturers were the same as those for All Manufacturers: "periodicals," "workshops, conferences, or training sessions," "an installer, builder," and federally funded sources. Only two were members of a solar energy association.

SECTION 5.0

WIND ENERGY CONVERSION SYSTEM DISTRIBUTORS

5.1 DESCRIPTION OF RESPONDENTS

5.1.1 Description of Sample

This section describes the results of a telephone study to determine the needs of distributors of wind energy conversion systems or components for information on wind energy. Nine Wind Distributors were interviewed.

The sample frame for Wind Distributors was constructed from wind machine dealer/distributor companies listed in the source, "A Guide to Commercially Available Wind Machines" [10]. Companies without a contact name were eliminated. Duplicates with Wind Manufacturers were also eliminated. After all adjustments were made, the 9 interview candidates were randomly selected from a sample frame of 31 names.

Respondents. In making the telephone calls to contact the randomly selected interview candidates, it sometimes occurred that the person could not be reached. In this event another randomly selected name was substituted for the original name. When individuals were contacted, it was verified that they really were distributors of wind energy conversion systems and components and that they would be needing information on wind energy within the next year. If they were not both involved and needing information, they were asked if they could refer the interviewer to someone else in their organization who would be an appropriate respondent. If such a referral was made, a call was then made to this new candidate; if no intraorganizational referral was made, a new candidate was randomly selected from the sample frame. The results of this process may be seen in Table 5-1.

Table 5-1. COMPLETION OF INTERVIEWS: WIND DISTRIBUTORS

Event	Number of Candidates
Interview completed with sample frame candidate	6
Interview completed with referral candidate	3
Refusal or candidate termination	1
Contact attempted: could not reach candidate within three attempts or before interviews were completed	10
Subtotal	20
Contact attempted: invalid candidate (e.g., innappropriate field of interest, no telephone)	5
TOTAL	25
Sample frame error rate[a] (Percent)	20
Completion rate[b] (Percent)	45

[a]Invalid candidates divided by TOTAL
[b]Completed interviews divided by Subtotal

Comparisons. For additional insight into the information needs and the information habits of these Wind Distributors, results from this group are compared to the results from SHAC Distributors (distributors of active solar heating and cooling systems and components). The data for Wind Distributors and for SHAC Distributors can be found in Appendix F.

5.1.2 Current Status of Respondents

Role. Eight of the 9 Wind Distributors were involved in the distribution of wind energy conversion systems; one was looking at the marketing and retailing of wind systems. One helped write a book for the U.S. Department of Energy (DOE) and served on the standards committee for wind energy. Other wind energy related activities specifically mentioned included: manufacturing (2), designing a prototype of a gyromill, and rebuilding systems.

Involvement. Slightly more Wind Distributors (7 of the 9 or 78%) said that they were "very involved" in wind energy than SHAC Distributors (4 of the 9 or 44%) were in their technology.

Informedness. Five of the 9 (56%) Wind Distributors considered themselves "very informed," compared to 7 of the 9 (78%) SHAC Distributors.

Need for Information. All respondents indicated they would need information on wind energy conversion systems on the job during the next year. Only 2 of the 9 (22%) Wind Distributors, however, expected to need information on wind outside the job. This was similar to the results for SHAC Distributors, where all 9 indicated they would need information on their own technology on the job and 3 of the 9 (33%) outside the job.

5.1.3 Background of Respondents

Three of the 9 Wind Distributors held a bachelor's degree, 4 held master's degrees, 1 held an associate degree, and 1 had no degree. Three had received degrees in engineering, 3 in administration, and the other 2 in mechanics and education. SHAC Distributors also had a mix of business and engineering degrees; however, none had received advanced degrees (beyond bachelor's) of any kind. Years in which Wind Distributors received their most recent degree varied, with one receiving his/her most recent degree 31 years ago, 1 from 20-25 years ago, 3 from 10-20 years ago, and 2 within the past 10 years. Years in which SHAC Distributors received their degrees also varied.

Only 1 had been in his/her current profession for 2 or fewer years, 4 for 3-5 years, and 4 for over 10 years; their levels of experience were similar to those of SHAC Distributors. Types of current professions mentioned included: manager (2), "evaluator," salesman/repairman, distributor, manufacturer, designer, engineer, and small business owner.

5.2 INFORMATION NEEDS OF RESPONDENTS

5.2.1 Technical Areas

Wind Distributors were asked to choose those areas in which they were "particularly interested in obtaining information" from a list of selected technical areas of wind energy. They seemed to be somewhat more interested in "electrical equipment" (8 of the 9), "small-scale wind systems" (7 of the 9), "towers" (7 of the 9), and "control equipment" (7 of the 9) than in "rotary equipment" (6 of the 9) and "medium/large-scale wind systems" (5 of the 9).

One of the Wind Distributors volunteered that he/she was also interested in information on fuel conversion and passive systems.

5.2.2 Types of Information

Wind Distributors were asked to name the information about wind energy that was important for them to obtain. Six of the 9 Wind Distributors volunteered one or more items of information which they considered important. All 6 respondents mentioned different types of information items. Topics mentioned included information on: complete wind energy conversion systems, vertical and horizontal axis wind turbines, wind components, economic data on wind systems, performance data, standards for testing metals for wind turbines, new product releases, marketing information, applications data, an evaluation of wind resources, current information on breakthroughs on wind energy, methods for producing hydrogen via wind energy, and data on the government-sponsored prototypes in the MOD-series.

Six of the 9 Wind Distributors volunteered that they needed but were unable to get information on wind energy. Three of the 6 respondents mentioned climatological data or wind maps. Other topics receiving one mention included: more information on the MOD-series government-sponsored large-scale prototypes, lists of equipment suppliers, and marketing information on how competitors handling similar-sized windmills or gyromills are doing.

Choice Between Specific Needs. A list of 11 types of wind information products and 14 types of wind information categories was read to each respondent. Each respondent described the usefulness of each particular item by assigning it a value of "essential," "very useful," "somewhat useful," or "not at all useful." The results are given in Fig. 5-1. For the purpose of comparison, the results for SHAC Distributors (Fig. 5-2) are also included.

Wind Distributors tended to assign the marketing information category high ratings as a class. The seven top-rated information categories/products were:

- Standards, specifications, or certification programs;
- Tax credits, grants, or other economic incentives;
- Marketing statistics and sales projections;
- How to market and sell solar systems;
- Local building codes or other regulations;

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	8		3	3	1	2
Research in progress	6		3	3	2	1
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	11		2	4	1	2
Costs and performance of systems	6		2	5	1	1
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	4		4	2	2	1
Climatological data such as wind, weather, or amount of sunshine	8		3	2	3	1
Marketing Information Categories:						
Marketing statistics and sales projections	3		4	3	1	1
Information on how to market and sell systems including guidelines on obtaining financial support	4		3	4	1	1
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	24		0	1	6	2
Standards, specifications, or certification programs for equipment	1		5	2	1	1
Institutional, social, environmental, and legal aspects of system applications	18		1	1	6	1
Expected major developments during the next 10 years	21		0	3	4	2
Solar system programs, research, industries, and markets outside the United States	13		3	0	4	2
Tax credits, grants, or other economic incentives	1		5	2	1	1
Information Products:						
Reference Information Products:						
A bibliography of general readings	20		0	3	3	2
A calendar of conferences and programs	21		1	2	3	3
A list of sources for information	13		1	4	2	2
A list of technical experts	21		0	3	4	2
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	8		1	6	1	1
Descriptive Information Products:						
A non-technical description of how a particular system works	24		0	3	2	4
A technical description of how a particular system works	18		1	3	2	3
System diagrams or schematics	17		1	3	3	2
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	11		2	4	1	2
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	15		1	2	4	1
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	15		2	1	3	2

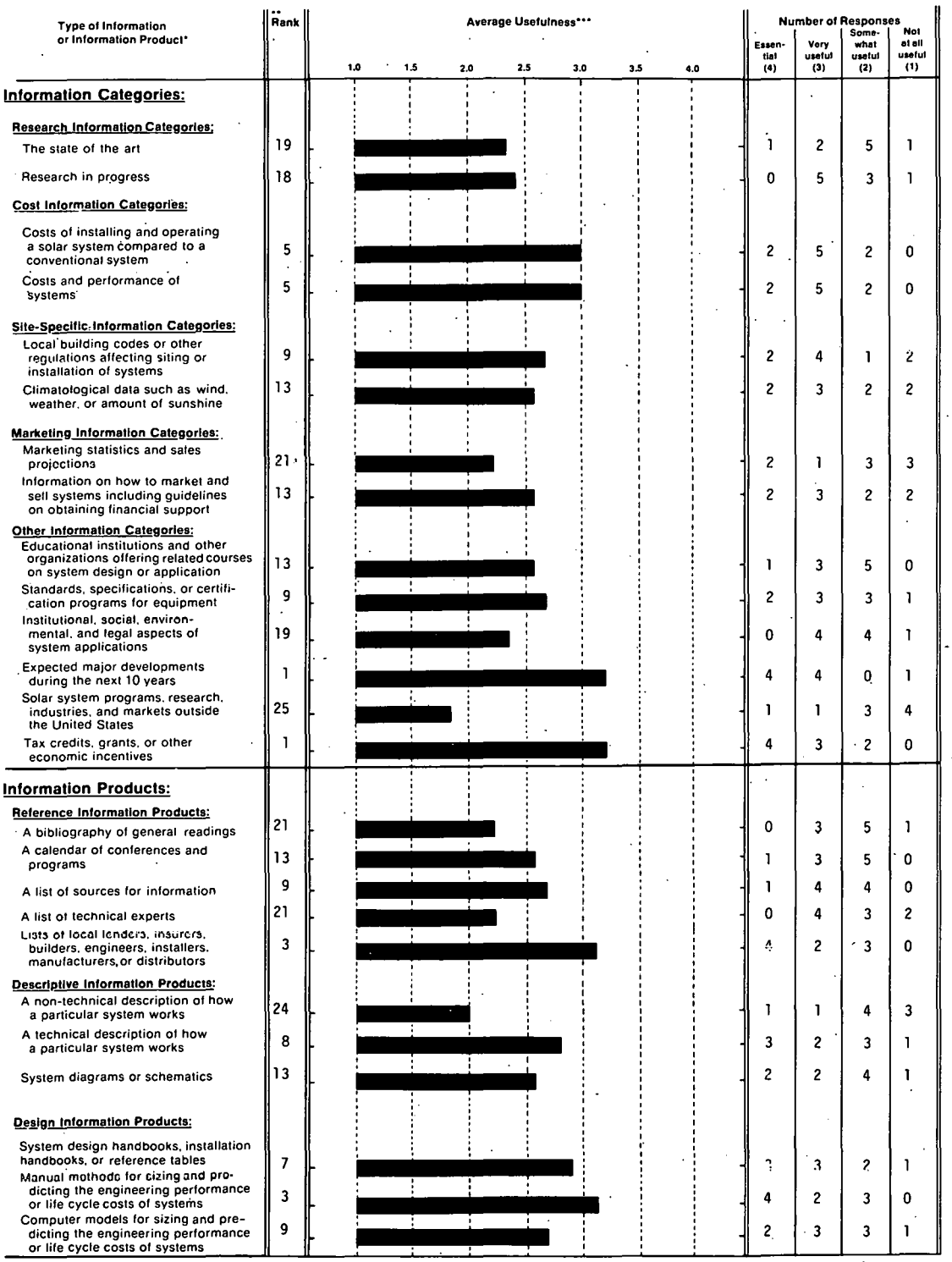
* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 5-1. Usefulness of Selected Information Items: Wind Distributors

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?



Type of Information or Information Product*	Rank**	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:					
Research Information Categories:					
The state of the art	19	1	2	5	1
Research in progress	18	0	5	3	1
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	5	2	5	2	0
Costs and performance of systems	5	2	5	2	0
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	9	2	4	1	2
Climatological data such as wind, weather, or amount of sunshine	13	2	3	2	2
Marketing Information Categories:					
Marketing statistics and sales projections	21	2	1	3	3
Information on how to market and sell systems including guidelines on obtaining financial support	13	2	3	2	2
Other Information Categories:					
Educational institutions and other organizations offering related courses on system design or application	13	1	3	5	0
Standards, specifications, or certification programs for equipment	9	2	3	3	1
Institutional, social, environmental, and legal aspects of system applications	19	0	4	4	1
Expected major developments during the next 10 years	1	4	4	0	1
Solar system programs, research, industries, and markets outside the United States	25	1	1	3	4
Tax credits, grants, or other economic incentives	1	4	3	2	0
Information Products:					
Reference Information Products:					
A bibliography of general readings	21	0	3	5	1
A calendar of conferences and programs	13	1	3	5	0
A list of sources for information	9	1	4	4	0
A list of technical experts	21	0	4	3	2
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	3	4	2	3	0
Descriptive Information Products:					
A non-technical description of how a particular system works	24	1	1	4	3
A technical description of how a particular system works	8	3	2	3	1
System diagrams or schematics	13	2	2	4	1
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	7	3	3	2	1
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	3	4	2	3	0
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	9	2	3	3	1

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful"

Figure 5-2. Usefulness of Selected Information Items: Active Solar Heating and Cooling Distributors

- Research in progress; and
- Costs and performance of systems.

Wind Distributors assigned the lowest relative ratings to:

- Educational institutions and other organizations offering courses,
- A nontechnical description of how a particular system works,
- Expected major developments during the next 10 years,
- Calendars of conferences and programs,
- Lists of technical experts, and
- A bibliography of general readings.

Statistical tests indicated all seven top categories/products were rated significantly ($P < 0.05$) higher than were the five lowest-rated items.

It should be noted that these lower-rated items were not necessarily of no worth to the Wind Distributors. For example, 3 of the 9 (33%) thought "a list of technical experts" was "very useful." Thus, these information categories/products could be useful to some Wind Distributors but were of a lower relative priority to the entire group.

Statistical tests were also used to determine whether the Wind Distributors rated any of these information items significantly higher (or lower) than they were rated by the SHAC Distributors. Some groups, however, tended to give higher scores in general than did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The procedure for calculating the relative rating is described in Appendix E. The average overall rating Wind Distributors gave to all items was slightly lower (2.55) than it was for SHAC Distributors (2.62).

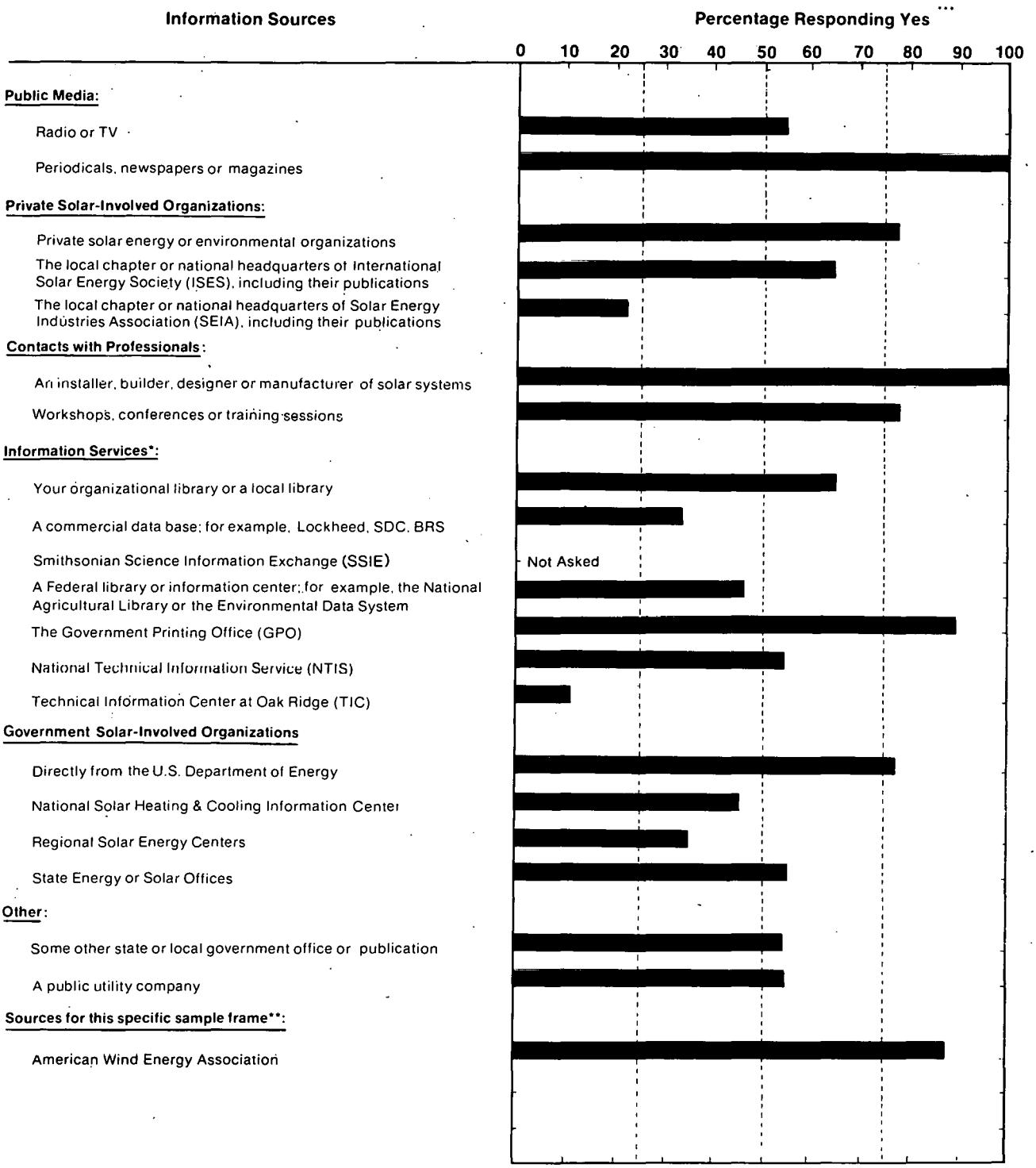
Statistical tests indicated that, compared to SHAC Distributors, Wind Distributors rated the need for information on "marketing statistics and sales projections" as significantly ($P < 0.05$) higher, and "educational institutions" and "expected major developments" as significantly lower. The data also indicated that the Wind Distributors gave higher ratings to "state of the art," "research in progress," "how to market," "standards," and international programs.

5.3 ACQUISITION OF INFORMATION BY RESPONDENTS

5.3.1 Use of Selected Information Sources

Wind Distributors were asked which of 20 different potential sources of solar information they had used in the past few years. For this question the respondents were not asked if they had obtained information on wind energy, but instead were asked if they had obtained any solar information from each specific source. Thus, the question sought to determine which information sources were the most familiar to the respondents. The results are shown in Fig. 5-3. For the purpose of comparison, the results for SHAC Distributors (Fig. 5-4) are also included.

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



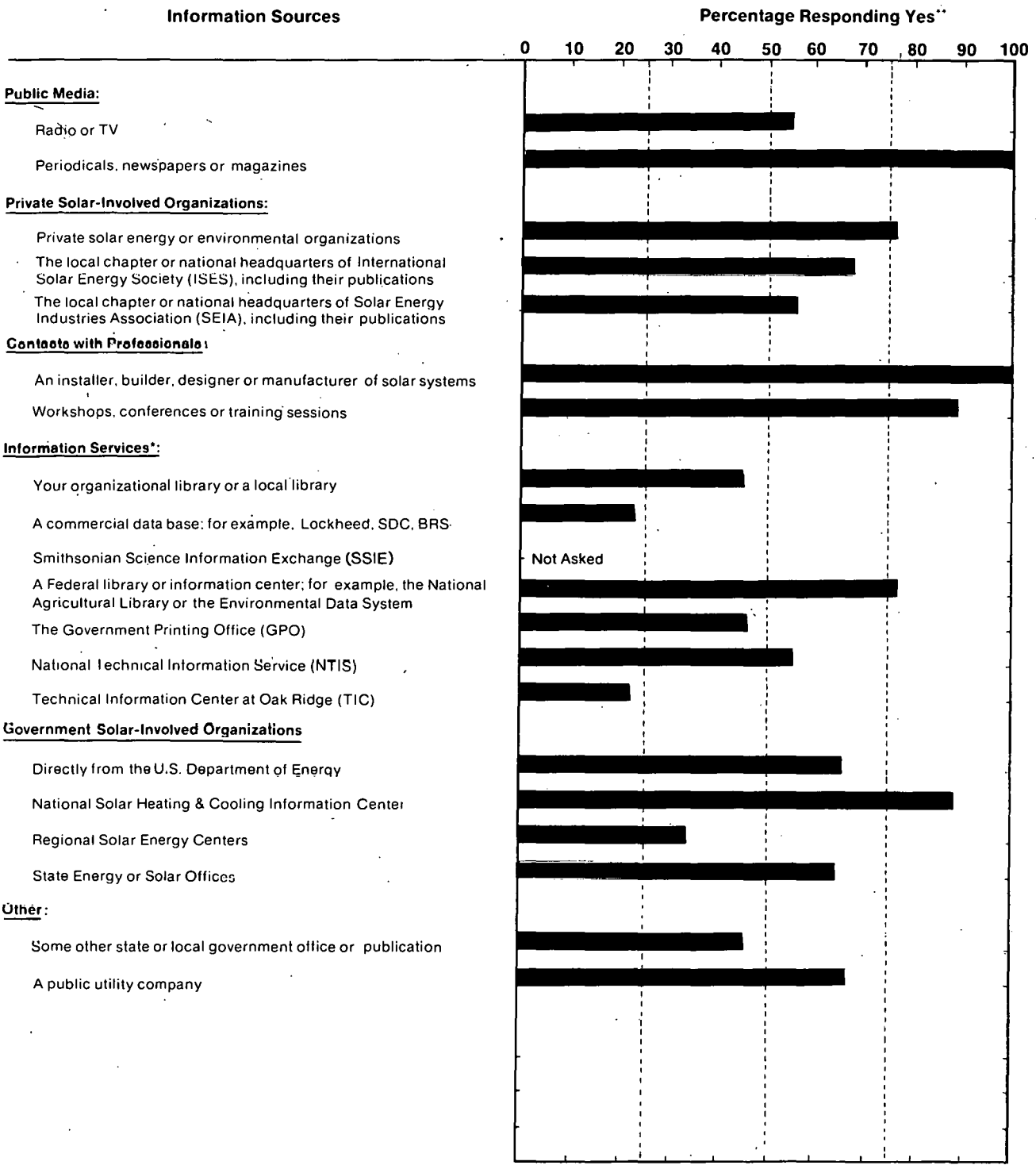
* Services and centers whose primary purpose is to disseminate information

** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."

*** These data are based upon a total of 9 respondents.

Figure 5-3. Use of Selected Information Sources: Wind Distributors

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** These data are based upon a total of 9 respondents.

Figure 5-4. Use of Selected Information Sources: Active Solar Heating and Cooling Distributors

The information sources mentioned most often by Wind Distributors were:

- Periodicals, newspapers, or magazines;
- An installer, builder, designer, or manufacturer;
- The Government Printing Office (GPO);
- American Wind Energy Association (AWEA);
- Private solar energy or environmental organizations;
- Workshops, conferences, or training sessions; and
- Directly from DOE.

The information sources mentioned least often by Wind Distributors were:

- Technical Information Center (TIC),
- Solar Energy Industries Association (SEIA),
- A commercial data base, and
- Regional Solar Energy Centers (RSECs).

In comparing the information sources used by Wind Distributors to SHAC Distributors, no statistically significant differences were found.

5.3.2 Membership in Solar-Interested Organizations

Six of the 9 Wind Distributors interviewed were members of a professional, technical, or other organization with an interest in solar energy. All 6 were members of the AWEA, and 1 was also a member of the International Solar Energy Society (ISES). Single mentions were also made for several organizations that the authors could not verify. These included "Midwest Energy Alternatives" and "Renewable Energy Association."

5.3.3 Exposure to Publications on Solar Energy

During the past 6 months, all 9 Wind Distributors had read publications which included information on wind energy. The publications they could specify (and the number of times mentioned) included:

- Alternative Sources of Energy,
- ASSE journal (American Society of Safety Engineers),
- Laboratory Digest,
- Mechanix Illustrated,
- Mother Earth News,
- Popular Science (2),
- Wind Energy Report,
- Windletter,

- Wind Power Digest (6), and
- Wind Technology Journal.

Also receiving single mentions were several publications that the authors could not verify. These included "Proceedings of Wind Energy Association" and "Wind and Energy Digest."

5.3.4 Use of Special Acquisition Methods

The respondents were asked whether they had obtained any information (not just wind or solar energy) in the past year by computer terminal, by Computer Output Microform (COM), or by other microform (e.g., microfiche, microfilm sheets or rolls). Few Wind Distributors appeared accustomed to using these special acquisition methods, a trait also common to SHAC Distributors. In the past year, only 2 of the 9 (22%) had used a computer terminal, 1 (11%) had used COM, and 3 (33%) had used other microform. A comparison of Wind Distributors with SHAC Distributors showed no statistically significant differences in the proportion using computer terminals, COM, or other microform.

5.4 SUMMARY AND COMMENTS

Nine distributors were interviewed; eight were actively involved in the distribution of wind energy conversion systems and one was looking into the marketing and retailing of products of that nature. Involvement by Wind Distributors was found to be slightly higher than that of SHAC Distributors; however, their level of informedness was slightly lower.

Slightly more Wind Distributors were interested in the technical areas of electrical equipment, small-scale wind systems, towers, and control equipment than in rotary equipment and medium/large-scale wind systems.

Wind Distributors gave the highest priority to receiving information on:

- Standards, specifications, or certification programs for wind systems;
- Tax credits, grants, or other economic incentives for wind systems;
- Marketing statistics and sales projections for wind energy conversion equipment;
- How to market and sell wind energy conversion systems;
- Local building codes or other regulations affecting wind energy conversion systems;
- Wind energy research in progess; and
- Costs and performance of wind energy systems.

They gave low ratings to "educational institutions," "a nontechnical description," "expected major developments during the next 10 years," "calendars," "lists of technical experts," and "a bibliography."

In comparing Wind Distributors to SHAC Distributors, both groups placed "tax credits" as the number one priority. Wind Distributors also appeared to highly value marketing, current research, and site-specific information. SHAC Distributors, on the other hand, appeared to be somewhat more cost conscious, more in need of technical descriptions, and significantly ($P < 0.05$) more interested in "expected major developments during the next 10 years."

Wind Distributors were familiar with a wide range of information sources. Similar to SHAC Distributors, they most often received solar information through "periodicals," professional contacts ("an installer" and "workshops"), and private solar energy organizations. Other sources frequently used by the wind group include GPO, AWEA, and DOE. Wind Power Digest also served as an important information source. TIC was one of the least used sources.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SECTION 6.0

WIND ENERGY CONVERSION SYSTEM ENGINEERS

6.1 DESCRIPTION OF RESPONDENTS

6.1.1 Description of Sample

This section describes the results of two telephone studies to determine the needs of electric power engineers at utilities and of engineers working with wind systems for information on wind energy. Nine representatives of Wind Electric Power Engineers (the engineers at utilities) and 9 Wind Engineers were interviewed.

The sample frame of Wind Electric Power Engineers was constructed by reviewing Who's Who In Engineering, (Electric Power Section) [14] and The Association of Energy Engineers (AEE) Directory of Energy Professionals, 1979-1980. [15]. From Who's Who In Engineering, all electric power engineers were selected who were associated with a utility but were not hydroelectric power engineers. From the AEE Directory, lists were drawn of engineers who mentioned any of the key words (cogeneration, electric generation, or power) in the sections on expertise or job title, who were associated with a utility (or mentioned the word utility in the expertise section), or who mentioned wind in the expertise section. The majority of the engineers, however, did not specify an area of solar expertise. The engineers were divided into three groups (for wind, photovoltaics, and solar thermal electric power) at random. Duplicates with contacts for utilities in the technologies of photovoltaics (PV), solar thermal electric power, and solar heating and cooling were eliminated. After all adjustments were made, 9 interview candidates were randomly selected from the Wind Electric Power Engineers sample frame of 29 names.

Wind Engineers were obtained from the 1979 Directory of the American Section of the International Solar Energy Society (ISES); Wind Power Division [16]. Members from this division who were listed as engineers were used. For each state, names were randomly selected to allow no more than 3 engineers per state. After these adjustments were made, 9 interview candidates were randomly selected from the Wind Engineers sample frame of 85 names.

In the Wind Engineer group, 6 of the 9 engineers were members of ISES. Although the original sample frame of Wind Engineers was composed of ISES members, 3 non-ISES members were called due to referrals.

Respondents. In making the telephone calls to contact the randomly selected interview candidates, it sometimes occurred that the person could not be reached. In this event, another randomly selected name was substituted for the original name. When individuals were contacted, it was verified that they really were Wind Electric Power Engineers (or Wind Engineers), and that they would be needing information on wind energy within the next year. If they were not both involved and needing information, they were asked if they could refer the interviewer to someone else in their organization who would be an appropriate respondent. If such a referral was made, a call was then made to this new candidate; if no intraorganizational referral was made, a new candidate was randomly selected from the sample frame. The results of this process may be seen in Table 6-1.

Table 6-1. COMPLETION OF INTERVIEWS: WIND ELECTRIC POWER ENGINEERS AND ENGINEERS

Event	Number of Candidates	
	Wind Electric Power Engineers	Wind Engineers
Interview completed with sample frame candidate	4	6
Interview completed with referral candidate	5	3
Refusal or candidate termination	0	1
Contact attempted: could not reach candidate within three attempts or before interviews were completed	9	0
Subtotal	18	10
Contact attempted: invalid candidate (e.g., inappropriate field of interest, no telephone)	6	3
TOTAL	24	13
Sample frame error rate[a] (Percent)	25	19
Completion rate[b] (Percent)	50	90

[a]Invalid candidates divided by TOTAL
[b]Completed interviews divided by Subtotal

Comparisons. For additional insight into the information needs and the information habits of these Wind Electric Power Engineers and Wind Engineers, results from these groups were compared to each other and to the results both from All Electric Power Engineers and from All Engineers interviewed in the study. All comparisons between Wind Electric Power Engineers and Wind Utility Representatives are made in Section 7.0. All Electric Power Engineers consisted of 25 engineers who were interviewed on PV (9), solar thermal electric power (7), and wind (9) information needs. The respondents interviewed on PV and solar thermal electric power were selected from the same sources as those interviewed on wind energy. All Engineers included All Electric Power Engineers, plus eight other groups of engineers (interested in various solar technologies) for a total of 96 individual engineers studied. The list of all the groups contained in All Engineers can be found in Table F-2 of Appendix F. The data can be found in Appendix F.

6.1.2 Current Status of Respondents

Role. All 9 Wind Electric Power Engineers studied were working for utility companies. Three of the 9 were trying to obtain funding from the U.S. Department of Energy (DOE); one of the 3 had DOE approval on 2 proposals for installing wind turbine generators during the summer of 1980, one had applied to DOE for demonstration of an "R-2," and 1 was reviewing the potential to apply for DOE money for more work on wind energy. Two mentioned that their utility companies consulted with the public on the types of systems available. One of the utilities stated they encourage customers to put in wind energy systems, and one stated that they inform people about the problems that might occur

with backup with other utilities. Of the remaining 4 Wind Electric Power Engineers, one was "selling wind test installations" and monitoring systems to evaluate the energy output, one had wind projects under research and development, one was evaluating the cost effectiveness and effect of wind systems on electric utilities, and one was reviewing what types of technologies on wind energy are available.

Of the 9 Wind Engineers, 4 were working at universities, 4 worked for commercial enterprises, and 1 worked for a state government correctional facility. Five were actively involved with wind systems; two of the 5 were using the systems for pumping water, one had developed a new type of system ("air foil on a long pole") to participate in international competition with other universities, one was testing the use of wind energy in rural homes and the amount of energy on a mountain, and one was building and writing proposals for funding wind turbines. The 4 Wind Engineers not actively involved with wind systems were collecting and evaluating information on the technology; one specifically mentioned a system for personal use and one for application to agriculture (e.g., crop drying and food processing).

Involvement. The level of involvement was mixed for both Wind Electric Power Engineers and Wind Engineers. Four of the 9 (44%) Wind Electric Power Engineers were "very involved," 1 was "moderately involved," and 4 were "slightly involved." Of the 9 Wind Engineers, 3 (33%) were "very involved," 3 were "moderately involved," and 3 were "slightly involved." Comparatively, the Wind Electric Power Engineers were significantly ($P < 0.05$) more involved (44% "very involved") than the electric power engineers interviewed for PV (0 "very involved") and for solar thermal power (1 of the 7 or 14% "very involved").

Informedness. Few Wind Electric Power Engineers felt they were well informed; two of the 9 (22%) in the wind electric power group felt they were "very informed," 5 were "moderately informed," and 2 were "slightly informed." This level of informedness did not significantly differ from the other electric power engineers studied for PV and solar thermal power. In the Wind Engineer group, 3 of the 9 (33%) stated they were "very informed," 3 were "moderately informed," and 3 were "slightly informed."

Need for Information. All respondents indicated they would need information on wind energy either on the job and/or outside the job during the next year. All 9 Wind Electric Power Engineers indicated they would need information on wind energy on the job; however, only 2 of the 9 (22%) needed information outside the job. In contrast, the Wind Engineers had 7 of the 9 (78%) interested on the job and 7 of 9 (78%) outside the job. The level of interest expressed by Wind Engineers was also higher than that expressed by engineers studied for any other technology.

6.1.3 Background of Respondents

Five of the 9 (56%) Wind Electric Power Engineers held a bachelor's degree, 3 held master's degrees, and 1 held an associate degree. Comparatively, the Wind Engineers appeared slightly more educated with 4 bachelor's degrees, 1 master's degree, and 3 doctoral degrees (one had no degree). The kinds of degrees earned by both groups were similar, with 7 of the 9 Wind Electric Power Engineers earning engineering degrees and 6 of the 8 degreed Wind Enginers earning engineering degrees. In the Wind Engineers group, the other 2 degrees were in economics and fluid mechanics; in the Wind Electric Power Engineers group the other 2 degrees were both MBAs. In the Wind Electric Power group, 1 received his/her most recent degree over 30 years ago, 3 from 10-25 years ago, and 5

within the past 5-10 years. Similarly, in the Wind Engineers group, 2 received their most recent degree over 30 years ago, 1 from 20-30 years ago, 1 from 10-20 years ago, and 4 within the past 10 years. The educational level and date of degree for Total Wind Engineers did not appear to differ from All Engineers.

The number of years in their current profession was also similar for both groups of wind engineers. Of the Wind Electric Power Engineers, 1 had been in his/her current profession for 2 years or less, 1 for 3-5 years, 3 for 6-10 years, and 4 for over 10 years. Of the Wind Engineers, 1 had been in his/her current profession for 2 years or less, 1 for 3-5 years, 2 for 6-10 years, and 5 for over 10 years. These combinations in levels of experience within the groups were similar to the experience levels of All Electric Power Engineers and All Engineers. The current professions of the Wind Electric Power Engineers included: engineers (6), specialist in energy management for industries, an analyst of energy management, and techniques and alternate fuel systems. One Electric Power Engineer stated he was a "knowledgeable person on alternate systems." The current professions of the Wind Engineers included: engineers (6), economist, researcher, and expert on wind energy.

6.2 INFORMATION NEEDS OF RESPONDENTS

6.2.1 Technical Areas

Both groups of Wind Engineers were asked to choose those areas in which they were "particularly interested in obtaining information" from a list of selected technical areas of wind energy (see Table 6-2). All 9 Wind Electric Power Engineers were interested in "rotary equipment," "control equipment," and "electrical equipment," with only 5 of the 9 interested in "small-scale wind systems" and "towers." In contrast, Wind Engineers were somewhat more interested in the reverse, with "small-scale wind systems" receiving the greatest interest (8 of the 9) and "rotary equipment" and "towers" receiving the least interest (5 of the 9).

Table 6-2. AREAS OF INTEREST: WIND ELECTRIC POWER ENGINEERS AND WIND ENGINEERS

Technical Areas of Interest	Wind Electric Power Engineers		Wind Engineers	
	No.	Percent	No.	Percent
Control Equipment	9	100	7	78
Electrical Equipment	9	100	7	78
Rotary Equipment	9	100	5	56
Small-Scale Wind Systems	5	56	8	89
Medium/Large-Scale Wind Systems	6	67	6	67
Towers	5	56	5	56

One Wind Electric Power Engineer also was interested in information on battery storage and another was interested in airfoil design.

6.2.2 Types of Information

Wind Electric Power Engineers were asked to name the information about wind energy that was important for them to obtain. All 9 respondents volunteered one or more items of information which they considered important: the economics of wind energy conversion systems (3), equipment availability (2), system availability (2), wind data (2), and electrical interface (2). Other topics receiving one mention each included: information on electrical interface with an existing grid, 100 kW systems for power production, reliability, technical performance, operations and maintenance, case histories regarding applications, lists of companies involved in manufacturing and their installed costs, lists of distributors, studies on systems which would require bulk orders of wind turbines, and environmental impact of wind systems.

All 9 Wind Engineers also volunteered one or more items of information which they considered important. Areas in which Wind Engineers agreed with Wind Electric Power Engineers included: information on electrical interfaces (3), wind data (2), and performance of wind systems ("how good wind turbines are for generating electricity"). Other topics mentioned included: data on construction of a small (5 kW) system, propellers, wind vanes, cost projections, design information, energy conversion, state of the art, new developments, applications for home appliances, different types of electrical hook-ups, information on airfoil design (including the different types and best applications), and data on using a wind energy system connected to a generator for recharging batteries (primarily for providing energy for cars, homes, and home appliances).

Two of the 9 (22%) Wind Electric Power Engineers and 4 of the 9 (44%) Wind Engineers studied, volunteered that there was information they needed but were unable to get. The topics included: site-specific data on wind frequency (2), wind generator performance in the past year, system design, and reliability and maintainability of wind turbines.

Choice Between Specific Needs. A list of 10 types of wind energy information products and 14 wind energy information categories was read to each respondent. Each respondent described the usefulness of each particular item by assigning it a value of "essential," "very useful," "somewhat useful," or "not at all useful." The results are given in Figs. 6-1 and 6-2. For the purpose of comparison, the results for All Electric Power Engineers (Fig. 6-3) and All Engineers (Fig. 6-4) are also included.

The information categories/products which rated the highest for both groups were:

- Costs of installing and operating a wind energy conversion system compared to a conventional system,
- Climatological data,
- The state of the art,
- Manual methods for sizing and predicting performance or costs, and
- Costs and performance of systems.

It is interesting to note that information on "state of the art" and the cost information categories were also given the highest priority by All Electric Power Engineers and All Engineers.

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	2		3	4	2	0
Research in progress	13		2	2	5	0
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	1		5	3	0	1
Costs and performance of systems	4		4	2	2	1
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	8		3	2	2	1
Climatological data such as wind, weather, or amount of sunshine	2		5	1	2	1
Marketing Information Categories:						
Marketing statistics and sales projections	21		1	1	4	3
Information on how to market and sell systems including guidelines on obtaining financial support	23		1	1	2	5
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	21		0	2	5	2
Standards, specifications, or certification programs for equipment	8		2	4	3	0
Institutional, social, environmental, and legal aspects of system applications	13		3	1	4	1
Expected major developments during the next 10 years	8		4	1	3	1
Solar system programs, research, industries, and markets outside the United States	23		0	2	3	4
Tax credits, grants, or other economic incentives	8		3	3	2	1
Information Products:						
Reference Information Products:						
A bibliography of general readings	17		0	3	6	0
A calendar of conferences and programs	15		1	3	4	1
A list of sources for information	4		3	3	3	0
A list of technical experts	4		2	5	2	0
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	17		3	0	3	3
Descriptive Information Products:						
A non-technical description of how a particular system works	NA		NA	NA	NA	NA
A technical description of how a particular system works	12		3	3	1	2
System diagrams or schematics	15		3	0	1	2
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	17		1	2	5	1
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	4		3	3	3	0
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	20		1	2	3	3

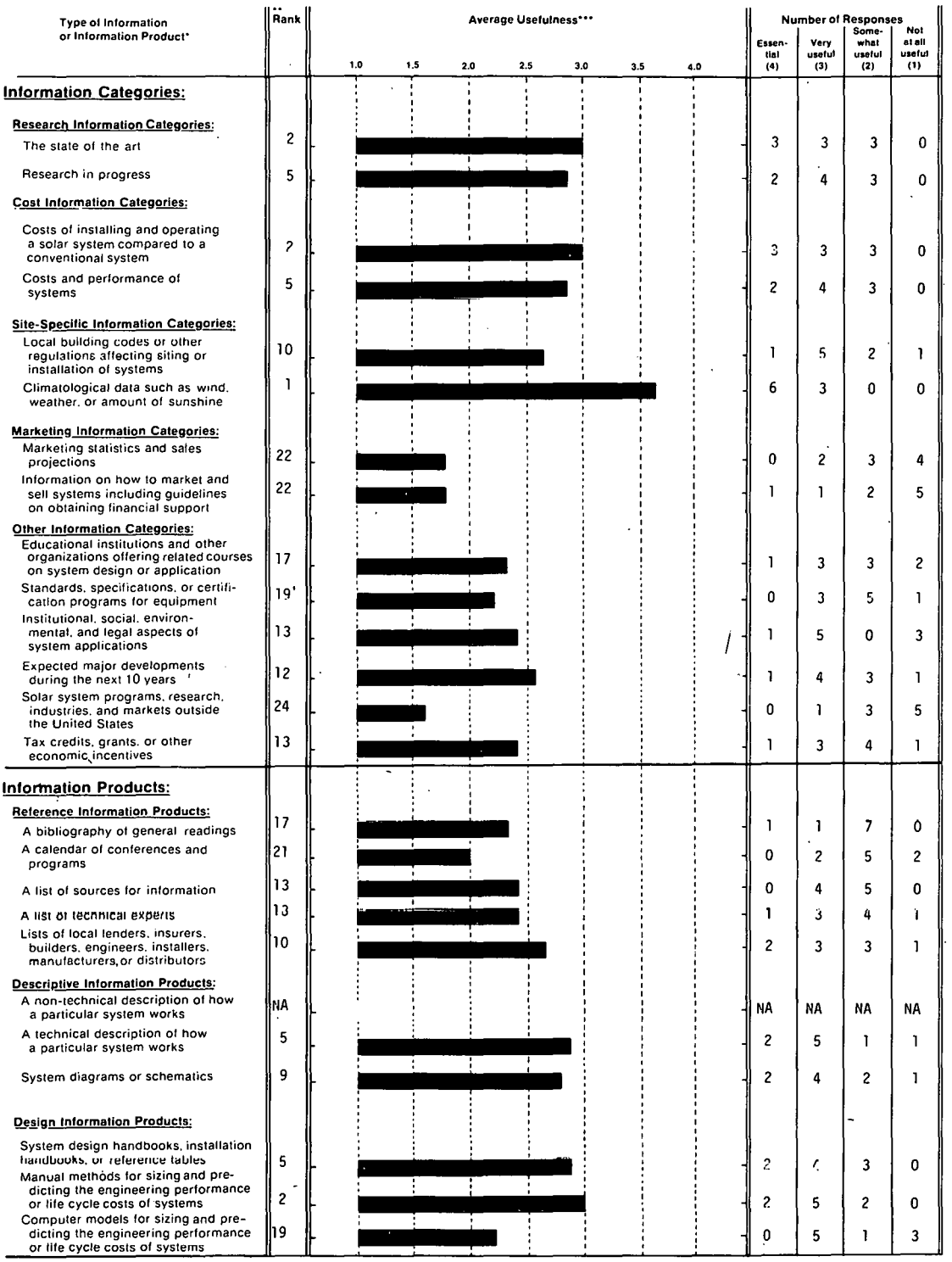
* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4."

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 6-1. Usefulness of Selected Information Items: Wind Electric Power Engineers

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?



Type of Information or Information Product*	Rank**	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:					
Research Information Categories:					
The state of the art	2	3	3	3	0
Research in progress	5	2	4	3	0
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	2	3	3	3	0
Costs and performance of systems	5	2	4	3	0
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	10	1	5	2	1
Climatological data such as wind, weather, or amount of sunshine	1	6	3	0	0
Marketing Information Categories:					
Marketing statistics and sales projections	22	0	2	3	4
Information on how to market and sell systems including guidelines on obtaining financial support	22	1	1	2	5
Other Information Categories:					
Educational institutions and other organizations offering related courses on system design or application	17	1	3	3	2
Standards, specifications, or certification programs for equipment	19	0	3	5	1
Institutional, social, environmental, and legal aspects of system applications	13	1	5	0	3
Expected major developments during the next 10 years	12	1	4	3	1
Solar system programs, research, industries, and markets outside the United States	24	0	1	3	5
Tax credits, grants, or other economic incentives	13	1	3	4	1
Information Products:					
Reference Information Products:					
A bibliography of general readings	17	1	1	7	0
A calendar of conferences and programs	21	0	2	5	2
A list of sources for information	13	0	4	5	0
A list of technical experts	13	1	3	4	1
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	10	2	3	3	1
Descriptive Information Products:					
A non-technical description of how a particular system works	NA	NA	NA	NA	NA
A technical description of how a particular system works	5	2	5	1	1
System diagrams or schematics	9	2	4	2	1
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	5	2	4	3	0
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	2	2	5	2	0
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	19	0	5	1	3

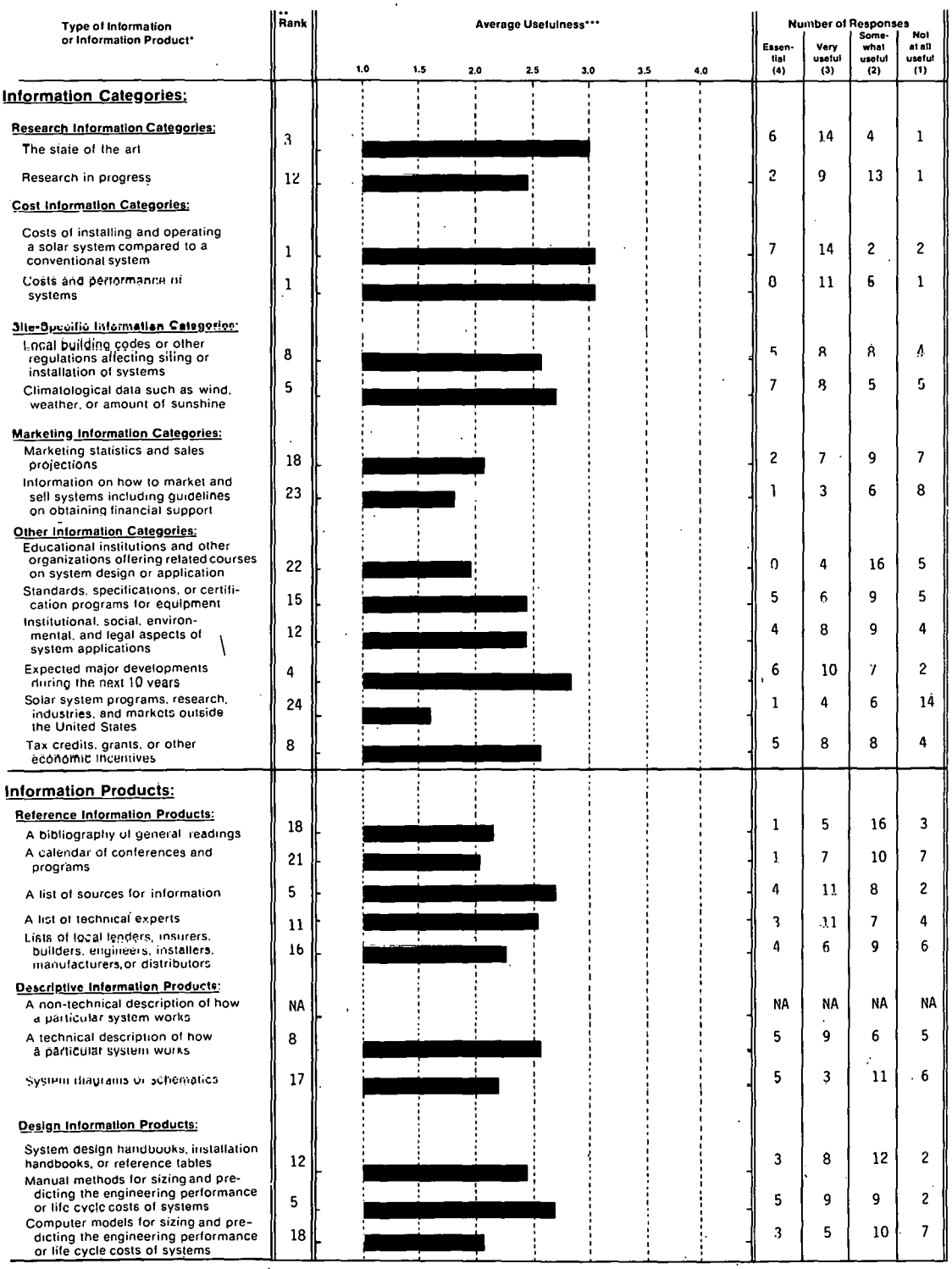
* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 6-2. Usefulness of Selected Information Items: Wind Engineers

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?



Type of Information or Information Product*	Rank**	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:					
Research Information Categories:					
The state of the art	3	6	14	4	1
Research in progress	12	2	9	13	1
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	1	7	14	2	2
Costs and performance of systems	1	8	11	6	1
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	8	5	8	8	4
Climatological data such as wind, weather, or amount of sunshine	5	7	8	5	5
Marketing Information Categories:					
Marketing statistics and sales projections	18	2	7	9	7
Information on how to market and sell systems including guidelines on obtaining financial support	23	1	3	6	8
Other Information Categories:					
Educational institutions and other organizations offering related courses on system design or application	22	0	4	16	5
Standards, specifications, or certification programs for equipment	15	5	6	9	5
Institutional, social, environmental, and legal aspects of system applications	12	4	8	9	4
Expected major developments during the next 10 years	4	6	10	7	2
Solar system programs, research, industries, and markets outside the United States	24	1	4	6	14
Tax credits, grants, or other economic incentives	8	5	8	8	4
Information Products:					
Reference Information Products:					
A bibliography of general readings	18	1	5	16	3
A calendar of conferences and programs	21	1	7	10	7
A list of sources for information	5	4	11	8	2
A list of technical experts	11	3	11	7	4
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	16	4	6	9	6
Descriptive Information Products:					
A non-technical description of how a particular system works	NA	NA	NA	NA	NA
A technical description of how a particular system works	8	5	9	6	5
System diagrams or schematics	17	5	3	11	6
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	12	3	8	12	2
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	5	5	9	9	2
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	18	3	5	10	7

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful"

Figure 6-3. Usefulness of Selected Information Items: All Electric Power Engineers

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	6		19	38	34	4
Research in progress	12		11	35	42	8
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	2		22	47	21	6
Costs and performance of systems	1		24	47	21	4
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	13		18	24	38	16
Climatological data such as wind, weather, or amount of sunshine	3		29	38	16	13
Marketing Information Categories:						
Marketing statistics and sales projections	24		3	13	34	28
Information on how to market and sell systems including guidelines on obtaining financial support	23		2	7	11	15
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	21		4	19	49	24
Standards, specifications, or certification programs for equipment	14		13	29	42	12
Institutional, social, environmental, and legal aspects of system applications	17		11	26	33	25
Expected major developments during the next 10 years	11		13	39	34	10
Solar system programs, research, industries, and markets outside the United States	25		5	13	30	48
Tax credits, grants, or other economic incentives	8		16	41	28	11
Information Products:						
Reference Information Products:						
A bibliography of general readings	17		6	25	51	14
A calendar of conferences and programs	20		5	23	45	23
A list of sources for information	9		14	41	32	9
A list of technical experts	16		9	27	44	16
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	19		11	26	33	26
Descriptive Information Products:						
A non-technical description of how a particular system works	22		3	16	22	21
A technical description of how a particular system works	6		20	44	21	11
System diagrams or schematics	10		20	30	32	13
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	5		17	45	28	6
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	4		19	45	27	5
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	15		11	35	28	22

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 6-4. Usefulness of Selected Information Items: All Engineers

Although the two groups agreed on the five information categories/products mentioned above, they differed in assigning high ratings to some other areas. The Wind Electric Power Engineers gave equally high ratings to "lists of sources for information" and "lists of technical experts." In contrast, Wind Engineers assigned high ratings to "research in progress," "a technical description of how a particular system works," and "design handbooks, installation handbooks, or reference tables."

Both groups of Wind Engineers assigned the lowest ratings to:

- Solar energy programs, research, industries, and markets outside the United States;
- How to market and sell solar systems;
- Marketing statistics and sales projections; and
- Computer models for sizing and predicting performance or costs.

Wind Electric Power Engineers also gave low ratings to "educational institutions and other organizations offering courses"; "a bibliography of general readings"; "lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors"; and "design handbooks, installation handbooks, or reference tables." Wind Engineers gave low ratings to "standards, specifications, or certification programs" and "calendars of conferences and programs."

For Wind Electric Power Engineers, statistical tests indicated all seven of the top categories/products were rated significantly ($P < 0.05$) higher than were the eight lowest-rated items. For Wind Engineers, the eight top-rated categories/products were rated significantly ($P < 0.05$) higher than the six lowest-rated categories/products.

It should be noted that these lower-rated items were not necessarily of no worth to the Wind Electric Power Engineers or Wind Engineers. For example, 5 of the 9 (56%) Wind Engineers thought "computer models" was "very useful." Thus, these information categories/products could be useful to some Wind Electric Power Engineers or Wind Engineers but were of a lower relative priority to the entire group.

Statistical tests were also used to determine whether the Wind Electric Power Engineers rated any of these information items significantly higher (or lower) than they were rated by the Wind Engineers, All Electric Power Engineers, and All Engineers. Some groups, however, tended to given higher scores in general than did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The procedure for calculating the relative rating is described in Appendix E. The average overall rating Wind Electric Power Engineers gave to all items was 2.62; for Wind Engineers it was 2.54; for All Electric Power Engineers it was 2.45; and for All Engineers, 2.45.

Statistical tests did not indicate any significant differences in information needs of the Wind Electric Power Engineers compared to either Wind Engineers or All Electric Power Engineers. Compared to All Engineers, however, the Wind Electric Power Engineers rated "lists of technical experts" significantly ($P < 0.05$) higher and "design handbooks" significantly ($P < 0.05$) lower; the Wind Engineers rated "climatological data" significantly ($P < 0.05$) lower than did All Engineers.

6.3 ACQUISITION OF INFORMATION BY RESPONDENTS

6.3.1 Use of Selected Information Sources

Wind Electric Power Engineers and Wind Engineers were asked which of 19 different potential sources of solar information they had used in the past few years. For this question the respondents were not asked if they had obtained information on wind energy but instead were asked if they had obtained any solar information from each specific source. Thus, the question sought to determine which information sources were the most familiar to the respondents. The results are shown in Figs. 6-5 and 6-6. For the purpose of comparison, the results for All Electric Power Engineers (Fig. 6-7) and All Engineers (Fig. 6-8) are also included.

Wind Engineers seemed to use the same sources as the Wind Electric Power Engineers but were slightly more likely to have used each individual source. The information sources mentioned most often by both Wind Electric Power Engineers and Wind Engineers were:

- An installer, builder, designer, or manufacturer;
- Directly from DOE;
- An organizational library or a local library;
- The Government Printing Office (GPO); and
- Workshops, conferences, or training sessions.

Other sources also mentioned most often by Wind Engineers were:

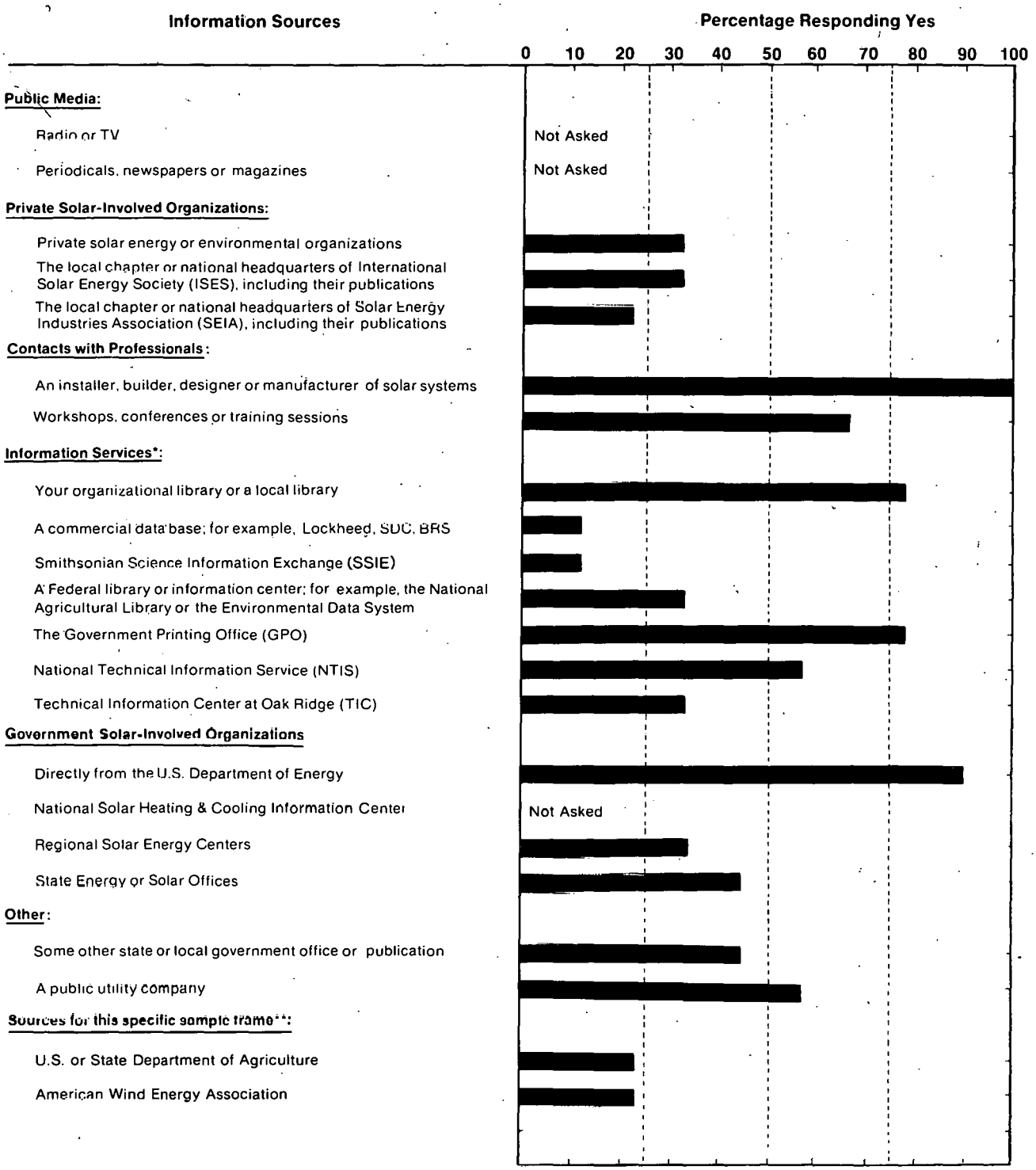
- ISES,
- National Technical Information Service (NTIS),
- Private solar energy or environmental organizations, and
- A federal library or information center.

Almost all Wind Electric Power Engineers and Wind Engineers appeared to rely on contacts with professionals to obtain information on solar energy. This was also true for All Electric Power Engineers and for All Engineers. Comparisons of Wind Electric Power Engineers and Wind Engineers to All Engineers and to All Electric Power Engineers showed no statistically significant ($P < 0.05$) differences in information sources used. More Wind Engineers, however, did appear to use the solar-involved information sources than did the Wind Electric Power Engineers.

The information source mentioned least often by both Wind Electric Power Engineers and Wind Engineers was the Smithsonian Science Information Exchange. In addition, other sources mentioned least often by Wind Electric Power Engineers were:

- A commercial data base,
- Solar Energy Industries Association (SEIA),
- United States Department of Agriculture (USDA),
- State Departments of Agriculture; and
- American Wind Energy Association (AWEA).

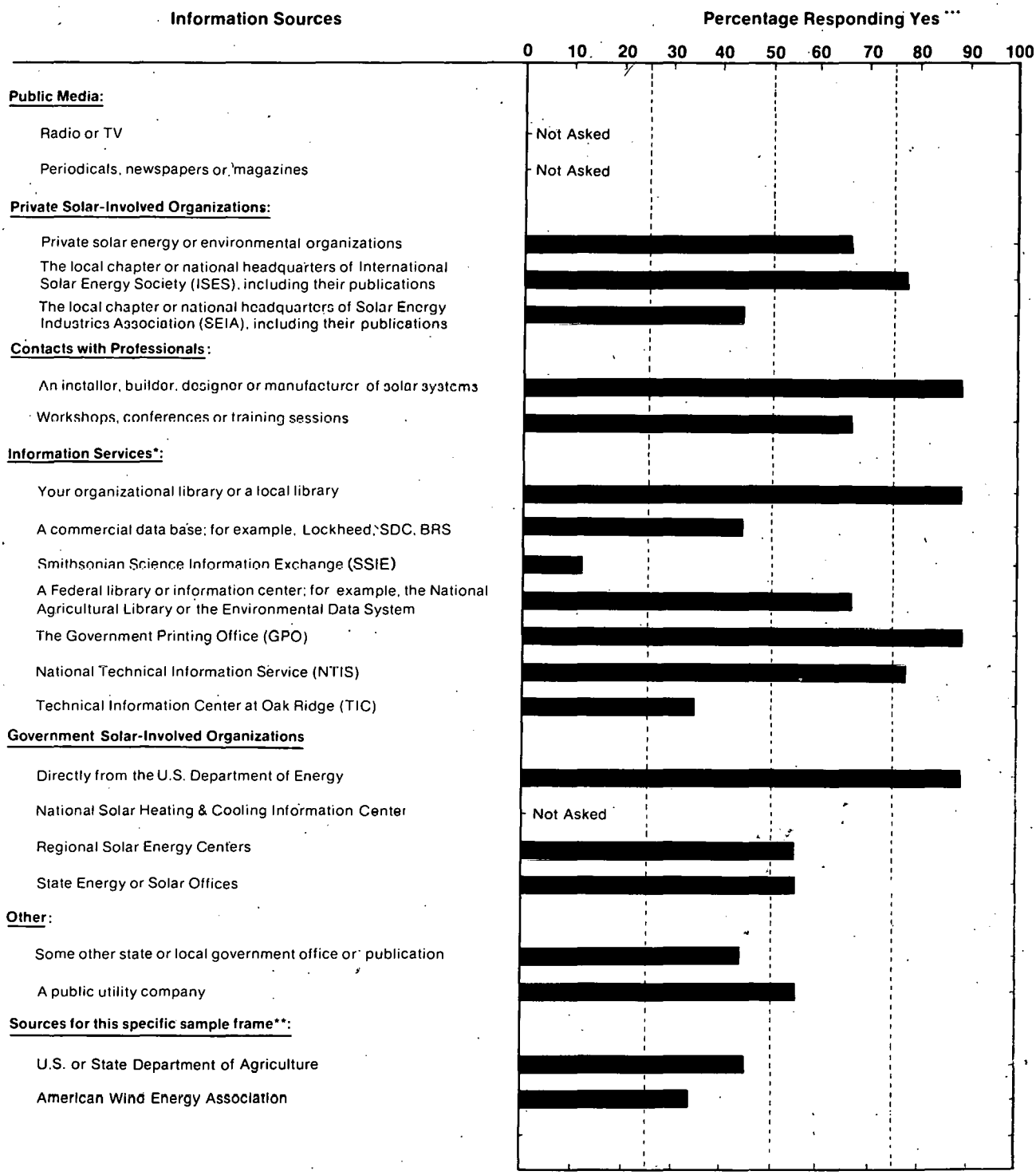
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 9 respondents.

Figure 6-5. Use of Selected Information Sources: Wind Electric Power Engineers

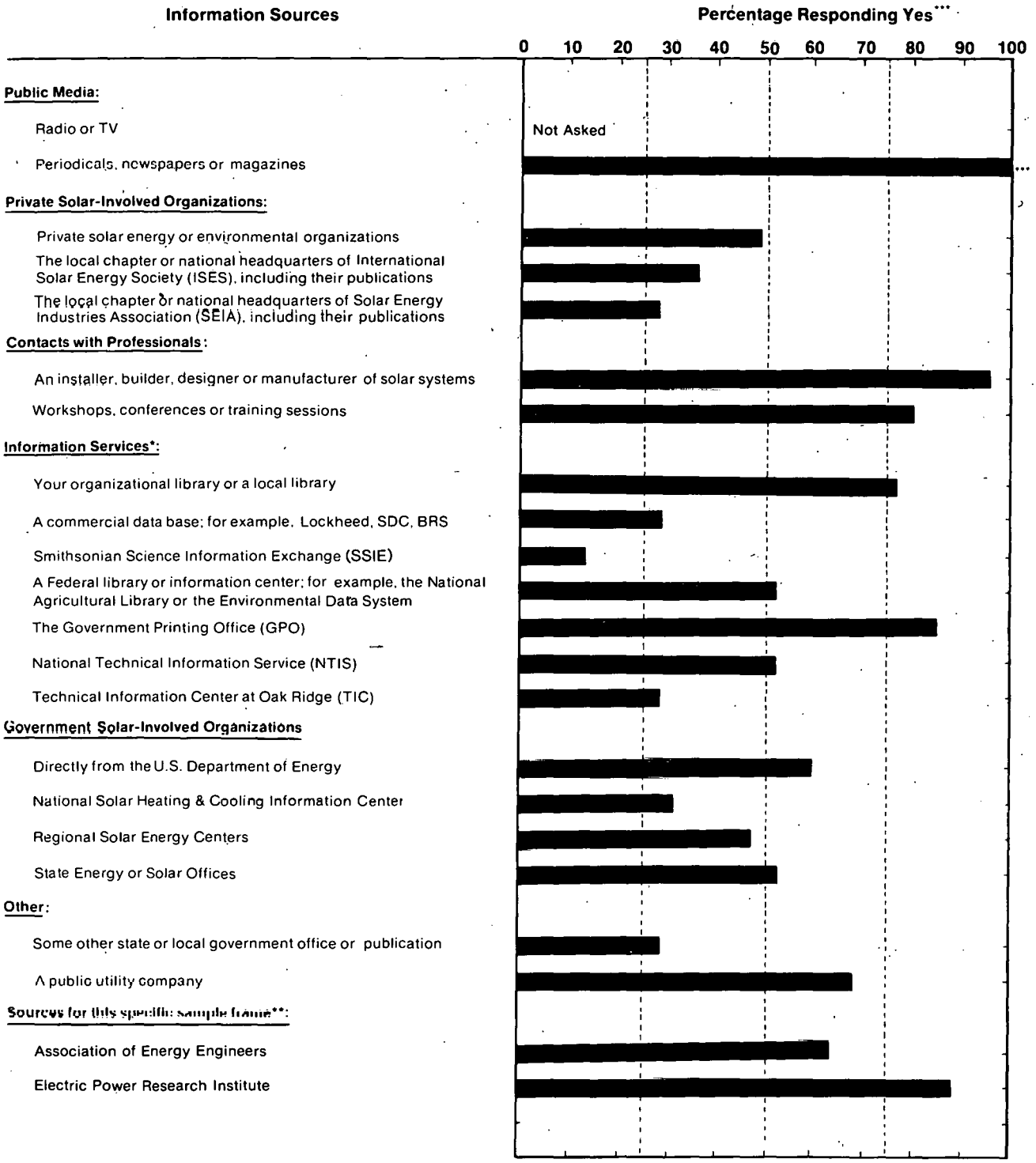
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 9 respondents.

Figure 6-6. Use of Selected Information Sources: Wind Engineers

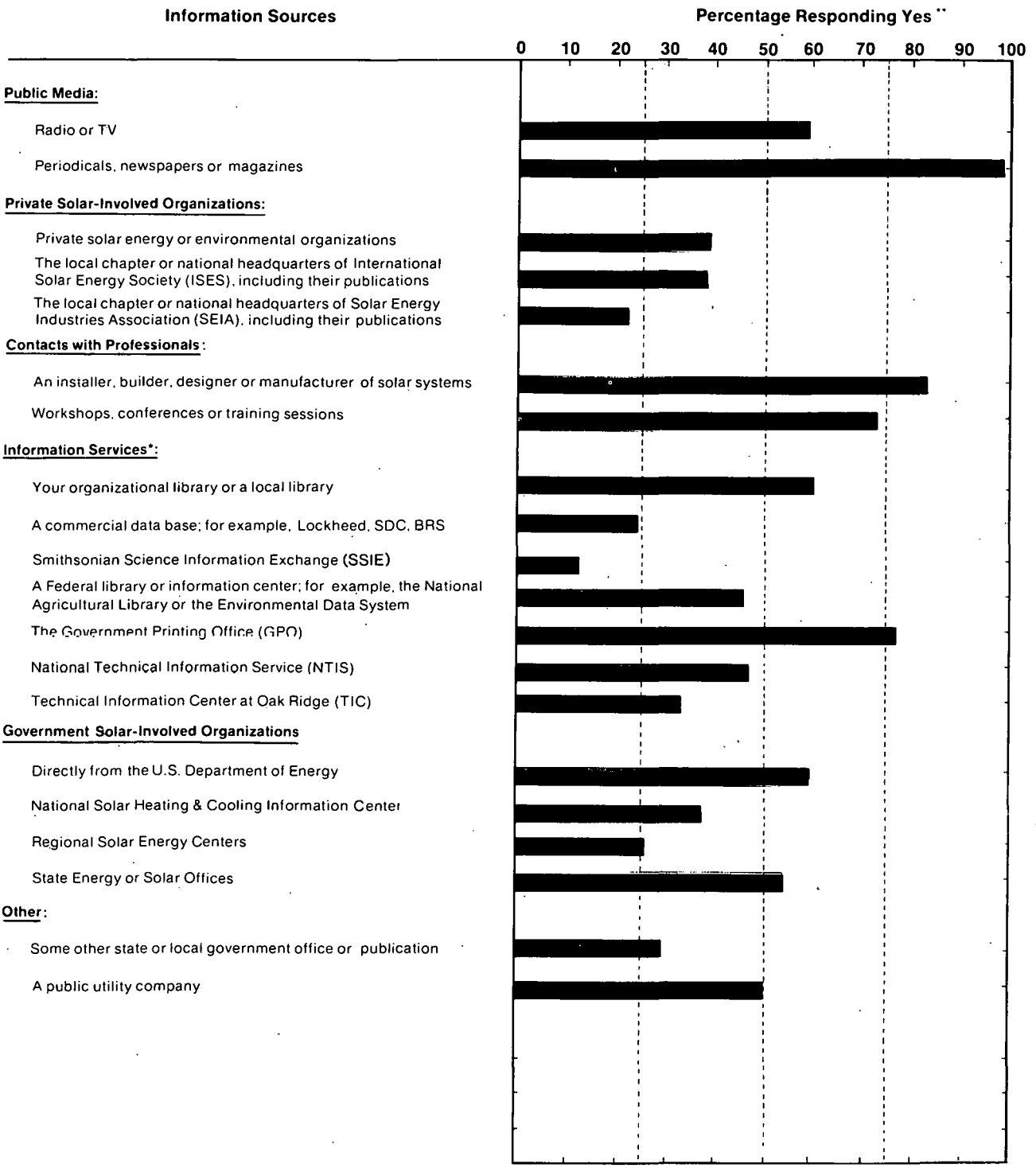
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 25 respondents.

Figure 6-7. Use of Selected Information Sources: All Electric Power Engineers

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** These data are based upon a total of 96 respondents.

Figure 6-8. Use of Selected Information Sources: All Engineers

6.3.2 Membership In Solar-Interested Organizations

All 9 of the Wind Electric Power Engineers and 7 of the 9 Wind Engineers were members of a professional, technical, or some other organization which has an interest in solar energy. For Wind Electric Power Engineers, these organizations (and the number of times mentioned) included:

- American Society of Agricultural Engineers (ASAE),
- American Society for Engineering Education (ASEE),
- American Society of Mechanical Engineers (ASME),
- American Society for Metals (ASM),
- AEE,
- Cleveland Engineering Society,
- Edison Electric Institute (2),
- Electric Power Research Institute (EPRI),
- Institute of Electrical and Electronics Engineers (Power Society) (4),
- ISES,
- National Society of Professional Engineers, and
- World Future Society.

Also mentioned were some organizations that the authors could not verify. These included "Electrical (or Electronic) Engineer," "National Wood Energy Council," and "Wisconsin Farm Electrical Council."

Organizations mentioned by Wind Engineers included:

- American Institute of Aeronautics and Astronautics (AIAA),
- ASEE,
- American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) (2),
- ASME (2),
- AWEA,
- ISES (6), and
- Sigma-Xi.

Also mentioned was "Texas Solar Institute," an organization that the authors could not verify.

6.3.3 Exposure to Publications on Solar Energy

During the past 6 months, all 9 Wind Electric Power Engineers and Wind Engineers had read publications which included information on wind energy. The publications both groups specified (and the number of times mentioned) included:

- Solar Age (5), and
- Wind Power Digest (2).

Other publications read by Wind Electric Power Engineers included:

- DOE publications;
- Electrical World (3);
- Electric Light and Power (2);
- Electric Power Research Institute (EPRI) Journal (2);
- Energy Users News;
- Heating, Air Conditioning and Refrigeration;
- Industrial Engineering;
- Institute of Electrical and Electronics Engineers (IEEE) Spectrum (2);
- National Aeronautics and Space Administration (NASA) Report (on wind energy);
- National Geographic;
- New York Times;
- Pacific Gas and Electric study on windmills (cost, components); and
- Power Engineering.

Also mentioned by Electric Power Engineers were some publications that the authors could not verify. These included "Energy and Civilization (July, August 1979)," "Industrial Energy," "Newsday," and "Wind Energy."

Other publications read by Wind Engineers included:

- American Wind Energy Association Bulletin;
- Aviation Week and Space Technology;
- Battelle publications;
- California Research Group publications (involved in wind, water, and gas production);
- Design News;
- Government reports;
- Los Angeles Times;
- New Roots;
- Popular Science (2);
- Solar Energy;
- Solar Energy Research Institute (SERI) publications;
- Solar Engineering (2);
- Solar Heating and Cooling;
- Solar magazines;

- USDA, Wind Energy Division publications (including ISES meeting use of small scale systems in agriculture); and
- Wind Energy Report.

Also mentioned by Wind Engineers were some publications that the authors could not verify. These included "Mechanical Engineering," "Mechanic Design," "Solar News and Views (International)."

6.3.4 Use of Special Acquisition Methods

The respondents were asked whether they had obtained any information (not just wind or solar energy) in the past year by computer terminal, by Computer Output Microform (COM), or by other microform (e.g., microfiche, microfilm sheets or rolls). During the past year, few Wind Electric Power Engineers and Wind Engineers appeared accustomed to using these special acquisition methods, a trait common to engineers in all technologies studied. In the past year, only 3 of the 9 respondents in each group had used a computer terminal, 3 of the 9 Wind Electric Power Engineers, and 2 of the 9 Wind Enginers had used COM. Only 2 of the 9 Wind Electric Power Engineers and 4 of the 9 Wind Engineers had used other microform. A comparison of the two groups of Wind Engineers with All Engineeers showed no statistically significant differences in the proportion using computer terminals, COM, or other microform.

6.4 SUMMARY AND COMMENTS

Nine electric power engineers working for a utility and nine other engineers working with wind systems were interviewed. Only one of the Wind Electric Power Engineers was a member of ISES; six of the nine Wind Engineers were ISES members. Two of the nine Wind Electric Power Engineers were actively involved with wind systems, three were seeking involvement in DOE-funded wind projects, two were consulting with the public on wind systems, and two were in the evaluation stage. Of the nine Wind Engineers, five were actively involved with wind systems, and the remaining four were in the evaluation stage.

The involvement of Wind Electric Power Engineers was significantly ($P < 0.05$) higher than that among electric power engineers who were asked about their needs for PV or solar thermal information; the level of informedness and educational backgrounds of both groups were about the same. Both groups of wind engineers appeared to be similar to All Engineers in level of involvement, degree of informedness, and educational background.

Wind Electric Power Engineers were somewhat more interested in information on equipment (control, electrical, and rotary), whereas small-scale wind systems generated the highest interest among Wind Engineers. Fewer Wind Electric Power Engineers were found to be interested in wind information outside of the job during the next year. Thus, Wind Electric Power Engineers indicated primarily job-related interests in medium/large wind systems and the interface of smaller wind systems to utility grids, while Wind Engineers were more small wind systems oriented and interested in personal applications.

Both groups of Wind Engineers gave the highest priority to receiving information on:

- Costs of installing and operating a wind energy conversion system compared to a conventional system,

- Climatological data,
- The state of the art in wind energy conversion systems,
- Manual methods for sizing and predicting performance or costs of wind energy conversion systems, and
- Costs and performance of wind energy systems.

It is interesting to note that all five information categories/products listed above were also given the highest priority by All Electric Power Engineers and All Engineers.

Wind Electric Power Engineers also gave equally high ratings to "lists of sources for information" and "lists of technical experts." In contrast, Wind Engineers assigned high ratings to "research in progress," "a technical description," and "design handbooks."

Both groups gave low ratings to "solar energy programs, research . . . outside the United States," "how to market and sell solar systems," "marketing statistics," and "computer models." Wind Electric Power Engineers also rated "educational institutions," "a bibliography," "lists of local lenders," and "design handbooks" low. Among those items rated lowest by Wind Engineers were "standards" and "calendars."

Most Wind Electric Power Engineers and Wind Engineers appeared to rely on contacts with professionals ("an installer, builder, (etc.)" and "workshops, (etc.)") to obtain information on solar energy; this was also true for All Electric Power Engineers and All Engineers. Other sources frequently used by the wind engineer groups included DOE, "an organizational . . . library," and GPO. The use of AWEA was surprisingly low.

SECTION 7.0

WIND ENERGY CONVERSION SYSTEM UTILITY REPRESENTATIVES

7.1 DESCRIPTION OF RESPONDENTS

7.1.1 Description of Sample

This section describes the results of a telephone study to determine the wind energy information needs of utility representatives with an active interest in wind energy conversion. Nine Wind Utility Representatives were interviewed.

The sample frame for Wind Utility Representatives was constructed from three sources. One was the Electric Utility Solar Energy Activities, 1978 Survey [17], which included 40 utilities. A second source was the Massachusetts Institute of Technology Research Establishment (MITRE) "Solar Energy Technical Information Dissemination Program. Reference Directory: Wind Energy Conversion" [11], which included contacts at 26 utilities involved in wind energy conversion either as end users (25) or as a commercializer (1). Five of these utilities were not associated with Electric Power Research Institute (EPRI) (and therefore were not included in Ref. 17). A third source was various conference lists from which 15 more wind utilities were obtained. (These lists included: Koontz's Wind Conference List, Stricker's 1977 Wind Conference List, Wind Energy Workshop, 15-17 May 1979, and Wind Energy Innovative Systems Conference, 23-25 May 1979). Duplicate contacts from utilities also interested or involved in photovoltaics (PV), solar thermal electric power, and active solar heating and cooling (SHAC) were eliminated, as were electric power engineers working for utility companies discussed in Section 6.0. After all adjustments were made, the 9 interview candidates were randomly selected from a sample frame of 40 names.

Respondents. In making the telephone calls to contact the randomly selected interview candidates, it sometimes occurred that the person could not be reached. In this event another randomly selected name was substituted for the original name. When individuals were contacted it was verified that they really were affiliated with a utility that had an interest in wind energy conversion and that they would be needing information on wind energy within the next year. If they were not both involved and needing information, they were asked if they could refer the interviewer to someone else in their organization who would be an appropriate respondent. If such a referral was made, a call was then made to this new candidate; if no intraorganizational referral was made, a new candidate was randomly selected from the sample frame. The results of this process may be seen in Table 7-1.

Comparisons. For additional insight into the information needs and the information habits of these Wind Utility Representatives, results from this group are compared to the results from Wind Electric Power Engineers, All Solar Utility Representatives (including Photovoltaics, Wind, Solar Thermal Electric Power, and SHAC) and Nonsolar Utility Representatives (utilities not known to be conducting any solar experiments or demonstrations). In performing any statistical comparisons, the totals for Wind Utility Representatives have been subtracted from the totals for All Solar Utility Representatives. The data for these groups can be found in Appendix F.

Table 7-1. COMPLETION OF INTERVIEWS: WIND UTILITY REPRESENTATIVES

Event	Number of Candidates
Interview completed with sample frame candidate	8
Interview completed with referral candidate	1
Refusal or candidate termination	1
Contact attempted: could not reach candidate within three attempts or before interviews were completed	4
Subtotal	14
Contact attempted: invalid candidate (e.g., inappropriate field of interest, no telephone)	1
TOTAL	15
Sample frame error rate[a] (Percent)	7
Completion rate[b] (Percent)	64

[a]Invalid candidates divided by TOTAL
[b]Completed interviews divided by Subtotal

7.1.2 Current Status of Respondents

Role. Five of the 9 Utility Representatives were actively participating in wind energy related activities. These included: operating a MOD-1, installing units for farm applications, monitoring the energy output of some wind systems, converting wind generated energy to storing heat and water, and "working for National Aeronautics and Space Administration (NASA) with the use of test meters." The other 4 Utility Representatives mentioned analyzing and monitoring research and developments in wind energy (2), reviewing the safety practices of wind energy conversion systems and submitting a proposal to the U.S. Department of Energy (DOE) for a large and small wind system interconnections.

Involvement. Five of the 9 (56%) Wind Utility Representatives felt that they were "very involved" in wind energy and 4 felt that they were "moderately involved" (see Table 7-2). A statistical comparison with the other utility representatives studied showed the Wind Utility Representatives to be significantly ($P < 0.05$) more involved than the PV Utility Representatives and the Nonsolar Utility Representatives. It will be recalled that the Nonsolar Utility group was specifically selected for its supposed lack of solar involvement.

Informedness. In the Wind Utility group, 4 of the 9 (44%) respondents felt they were "very informed," 4 were "moderately informed," and 1 was "slightly informed." Compared to the other Utilities and the Wind Electric Power Engineers, there were no statistically significant differences. However, similar to their levels of involvement, both the Wind Utility Representatives and the Solar Thermal Power Utility Representatives appeared to be more informed than the PV Utility Representatives. Table 7-3 illustrates the different levels of informedness among the Wind Utility group, the other Utility groups, and the Wind Electric Power Engineers studied.

Table 7-2. LEVELS OF INVOLVEMENT: UTILITY REPRESENTATIVES AND WIND ELECTRIC POWER ENGINEERS

Respondent Group	Very		Moderately		Slightly		Not At All	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Wind Utility Representatives	5	56	4	44	0	0	0	0
SHAC Utility Representatives	3	33	3	33	3	33	0	0
Solar Thermal Utility Representatives	4	50	2	25	2	25	0	0
PV Utility Representatives	0	0	6	67	3	33	0	0
Nonsolar Utility Representatives	0	0	2	25	5	63	1	13
Wind Electric Power Engineers	4	44	1	11	4	44	0	0

Table 7-3. LEVELS OF INFORMEDNESS: UTILITY REPRESENTATIVES AND WIND ELECTRIC POWER ENGINEERS

Respondent Group	Very		Moderately		Slightly		Not at All	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Wind Utility Representatives	4	44	4	44	1	11	0	0
SHAC Utility Representatives	3	33	6	67	0	0	0	0
Solar Thermal Utility Representatives	4	50	4	50	0	0	0	0
PV Utility Representatives	0	0	6	67	3	33	0	0
Nonsolar Utility Representatives	1	13	5	63	2	25	0	0
Wind Electric Power Engineers	2	22	5	56	2	22	0	0

Need for Information. All respondents indicated they would need information on wind energy conversion on the job during the next year. Three of the 9 (33%) Wind Utility Representatives also indicated they would need information on wind energy outside of the job. Wind Utility Representatives were slightly less interested than All Solar Utility Representatives (13 of the 27 or 48%) and Nonsolar Utility Representatives (5 of the 8 or 63%) but were similar to Wind Electric Power Engineers (2 of the 9 or 22%).

7.1.3 Background of Respondents

Wind Utility Representatives appeared to be the least educated of the four solar Utility groups, the one Nonsolar Utility group, and the Wind Electric Power Engineers group. Four of the 9 Wind Utility Representatives held bachelor's degrees, 1 held a master's degree, 1 held an associate degree, and 3 held no degree. Of the four other Utility groups (a total of 34 respondents), only 1 had less than a bachelor's degree (an associate degree); 1 of the 9 Wind Electric Power Engineers had only an associate degree. One of the Wind Utility Representatives received his/her degree 34 years ago, 1 from 20-25 years ago, 2 from 10-20 years ago, and 2 from 5-10 years ago. Years in which respondents in the other Utility groups received their degrees also varied widely within each group; the majority (5 of the 8 or 63%) of Wind Electric Power Engineers, however, had received their degrees within the past 5-10 years. Of the 6 Wind Utility Representatives who received degrees, 3 were in electrical engineering, 1 in engineering, 1 in public administration, and 1 in organizational management. Engineering degrees were also predominant in the other Utility groups studied and in the Wind Electric Power Engineers group, with the exception of the SHAC Utility group.

In their current profession, 5 of the 9 Wind Utility Representatives mentioned they were managers. Seven of the 9 specifically defined their current profession as electrical engineer (3), public relations manager (1), research manager (1), city manager (1), and member service director (1). Two of the 9 respondents had been in their current profession for 3-5 years, with 7 having over 10 years experience. This level of experience, although the longest of any Utility group or Wind Electric Power Engineer studied, was not significantly different statistically.

7.2 INFORMATION NEEDS OF RESPONDENTS

7.2.1 Technical Area

Wind Utility Representatives were asked to choose those areas in which they were "particularly interested in obtaining information" from a list of selected technical areas of wind energy. All 9 were interested in "control equipment" and "electrical equipment," with 7 of the 9 interested in "small-scale wind systems" and "medium/large-scale wind systems." The areas generating the least interest included "towers" and "rotary equipment"; 6 of the 9 respondents were interested in each area. These results are quite similar to those for Wind Electric Power Engineers (see Section 6.2.1) with one exception; all 9 in the Engineer group were interested in "rotary equipment."

7.2.2 Types of Information

Wind Utility Representatives were asked to name the information about wind energy that was important for them to obtain. All 9 Wind Utility Representatives volunteered one or more items of information which they considered important. Two mentioned state-of-the-art information. Other topics included information on: economic incentives, installation costs, the reliability and performance of wind systems, a "profile of energy received from wind systems," the implementation of protective devices, the efficiency of various units, the location of installations and projects going on in wind energy, feasibility studies on small wind systems, new designs in wind machines, the legal impediments for siting of wind machines, and the voltage variations of wind energy systems.

Information that the Wind Utility Representatives volunteered they needed but were unable to get included climatological data and information on metering.

Choice Between Specific Needs. A list of 11 types of wind information products and 13 types of wind information categories was read to each respondent. Each respondent described the usefulness of each particular item by assigning it a value of "essential," "very useful," "somewhat useful," or "not at all useful." The results are given in Fig. 7-1. For the purpose of comparison, the results for All Solar Utility Representatives (Fig. 7-2) and Nonsolar Utility Representatives (Fig. 7-3) are also included. For comparison to Wind Electric Power Engineers see Fig. 6-1.

Wind Utility Representatives selected the cost information category as most important. The six top-rated information categories/products were:

- Costs of installing and operating a wind energy conversion system compared to a conventional system,
- Costs and performance of systems,
- Local building codes or other regulations,
- Computer models for sizing and predicting performance or costs,
- The state of the art, and
- Expected major developments during the next 10 years.

Wind Utility Representatives assigned the lowest relative ratings to:

- How to market and sell solar systems,
- Marketing statistics and sales projections,
- A bibliography of general readings,
- Calendars of conferences and programs, and
- Educational institutions and other organizations offering courses.

Statistical tests indicated all six of the top categories/products were rated significantly ($P < 0.05$) higher than were the five lowest-rated items.

It should be noted that these lower-rated items are not necessarily of no worth to the Wind Utility Representatives. For example, 3 of the 9 (33%) thought "educational institutions" was either "essential" or "very useful." Thus, these information

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	5		2	5	1	1
Research in progress	7		2	3	4	0
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	1		3	5	1	0
Costs and performance of systems	1		3	5	1	0
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	3		3	3	3	0
Climatological data such as wind, weather, or amount of sunshine	12		2	2	4	1
Marketing Information Categories:						
Marketing statistics and sales projections	23		0	2	5	2
Information on how to market and sell systems including guidelines on obtaining financial support	24		0	2	2	5
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	20		1	2	4	2
Standards, specifications, or certification programs for equipment	9		2	3	3	1
Institutional, social, environmental, and legal aspects of system applications	12		2	2	4	1
Expected major developments during the next 10 years	5		2	4	3	0
Solar system programs, research, industries, and markets outside the United States	NA		NA	NA	NA	NA
Tax credits, grants, or other economic incentives	7		2	4	2	1
Information Products:						
Reference Information Products:						
A bibliography of general readings	21		0	2	6	1
A calendar of conferences and programs	21		0	3	4	2
A list of sources for information	9		1	6	0	2
A list of technical experts	18		1	2	5	1
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	18		0	3	6	0
Descriptive Information Products:						
A non-technical description of how a particular system works	16		1	5	0	3
A technical description of how a particular system works	9		0	6	3	0
System diagrams or schematics	12		0	5	4	0
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	16		1	3	4	1
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	12		1	4	3	1
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	3		2	6	0	1

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

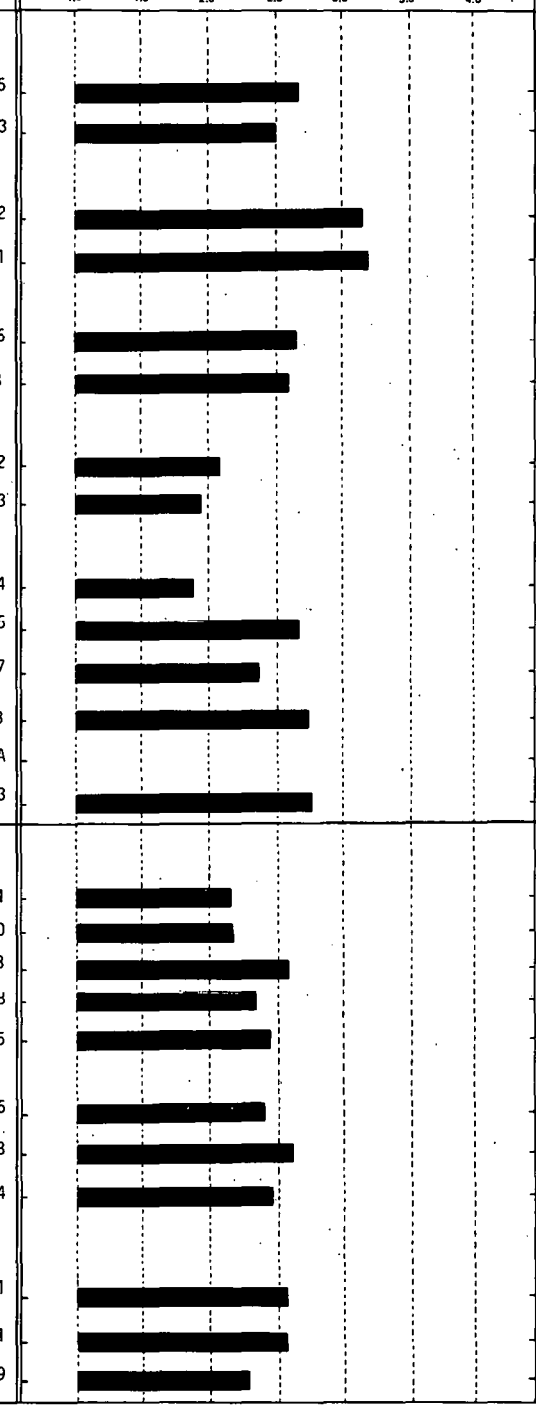
** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 7-1. Usefulness of Selected Information Items: Wind Utility Representatives

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:					
Research Information Categories:					
The state of the art	5	7	15	8	5
Research in progress	13	5	9	20	1
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	2	15	11	8	1
Costs and performance of systems	1	16	12	5	2
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	6	9	8	14	4
Climatological data such as wind, weather, or amount of sunshine	8	9	8	13	5
Marketing Information Categories:					
Marketing statistics and sales projections	22	2	8	16	9
Information on how to market and sell systems including guidelines on obtaining financial support	23	2	6	8	11
Other Information Categories:					
Educational institutions and other organizations offering related courses on system design or application	24	1	5	18	11
Standards, specifications, or certification programs for equipment	6	8	10	13	4
Institutional, social, environmental, and legal aspects of system applications	17	3	12	15	5
Expected major developments during the next 10 years	3	10	9	13	3
Solar system programs, research, industries, and markets outside the United States	NA	NA	NA	NA	NA
Tax credits, grants, or other economic incentives	3	11	10	8	6
Information Products:					
Reference Information Products:					
A bibliography of general readings	21	1	6	24	4
A calendar of conferences and programs	20	3	7	18	7
A list of sources for information	8	5	14	13	3
A list of technical experts	18	4	9	17	5
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	15	6	10	13	6
Descriptive Information Products:					
A non-technical description of how a particular system works	16	4	13	12	6
A technical description of how a particular system works	8	4	16	12	3
System diagrams or schematics	14	3	15	13	4
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	11	6	13	10	6
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	11	7	10	13	5
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	19	5	11	7	12



* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 7-2. Usefulness of Selected Information Items: All Solar Utility Representatives

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:					
Research Information Categories:					
The state of the art	12	0	3	5	0
Research in progress	12	0	3	5	0
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	1	1	6	1	0
Costs and performance of systems	1	2	4	2	0
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	1	3	2	3	0
Climatological data such as wind, weather, or amount of sunshine	6	1	4	2	1
Marketing Information Categories:					
Marketing statistics and sales projections	18	2	0	3	3
Information on how to market and sell systems including guidelines on obtaining financial support	24	0	1	3	4
Other Information Categories:					
Educational institutions and other organizations offering related courses on system design or application	22	0	1	4	3
Standards, specifications, or certification programs for equipment	18	1	0	6	1
Institutional, social, environmental, and legal aspects of system applications	15	0	4	2	2
Expected major developments during the next 10 years	6	0	5	3	0
Solar system programs, research, industries, and markets outside the United States	NA	NA	NA	NA	NA
Tax credits, grants, or other economic incentives	6	1	3	4	0
Information Products:					
Reference Information Products:					
A bibliography of general readings	15	0	3	4	1
A calendar of conferences and programs	21	0	2	3	3
A list of sources for information	5	0	7	0	1
A list of technical experts	12	0	3	5	0
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	4	1	5	2	0
Descriptive Information Products:					
A non-technical description of how a particular system works	6	0	5	3	0
A technical description of how a particular system works	11	0	4	4	0
System diagrams or schematics	15	0	3	4	1
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	6	0	5	3	0
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	20	0	2	4	2
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	22	1	0	3	4

Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4."

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 7-3. Usefulness of Selected Information Items: Non-Solar Utility Representatives

categories/products could be useful to some Wind Utility Representatives but were of a lower relative priority to the entire group.

Statistical tests were also used to determine whether the Wind Utility Representatives rated any of these information items significantly higher (or lower) than they were rated by All Solar Utility Representatives, Nonsolar Utility Representatives and Wind Electric Power Engineers. Some groups, however, tended to give higher scores in general than did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The procedure for calculating the relative rating is described in Appendix E. The average overall rating Wind Utility Representatives gave to all items was 2.57; for All Solar Utility Representatives it was 2.49; for Nonsolar Utility Representatives it was 2.39; and for Wind Electric Power Engineers, 2.62.

A comparison of representatives at Wind Utilities to those at All Solar Utilities and to Wind Electric Power Engineers showed the Wind Utility Representatives to be significantly ($P < 0.05$) more interested in "computer models." All other results were virtually identical. Compared to the Nonsolar Utility group, Wind Utility Representatives were significantly ($P < 0.05$) less interested in "lists of local lenders, (etc.)" and more interested in "computer models."

Compared to Wind Electric Power Engineers, the Wind Utility Representatives gave significantly ($P < 0.05$) higher ratings to "computer models" and somewhat lower ratings to "a list of technical experts."

7.3 ACQUISITION OF INFORMATION BY RESPONDENTS

7.3.1 Use of Selected Information Sources

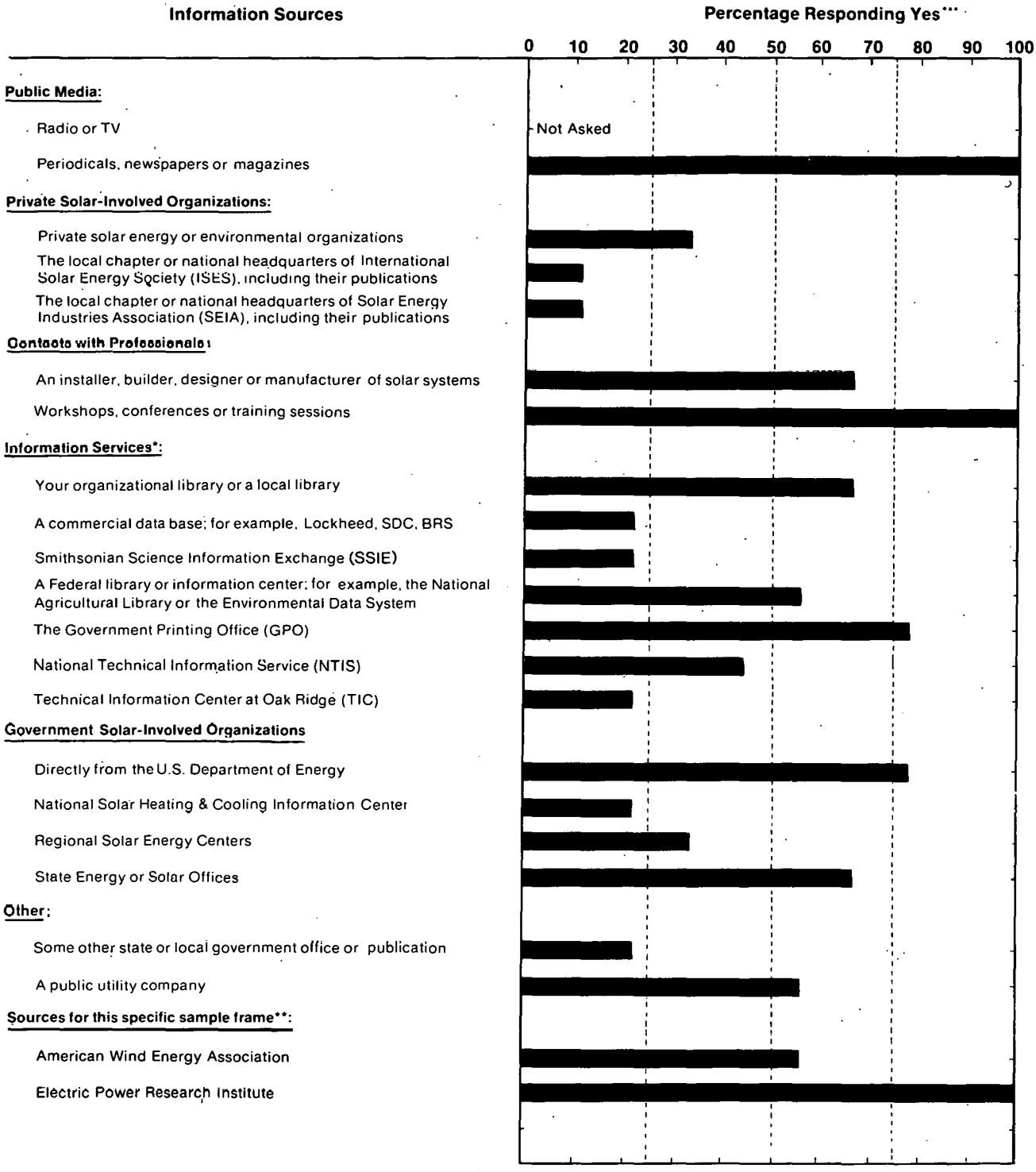
Wind Utility Representatives were asked which of 21 different potential sources of solar information they had used in the past few years. For this question the respondents were not asked if they had obtained information on wind energy, but instead were asked if they had obtained any solar information from each specific source. Thus, the question sought to determine which information sources were the most familiar to the respondents. The results are shown in Fig. 7-4. For the purpose of comparison, the results for All Solar Utility Representatives (Fig. 7-5) and Nonsolar Utility Representatives (Fig. 7-6) are also included. The results for Wind Electric Power Engineers are in Fig. 6-5.

The information sources mentioned most often by Wind Utility Representatives were:

- Periodicals, newspapers, or magazines;
- Workshops, conferences, or training sessions;
- EPRI;
- The Government Printing Office (GPO), and
- Directly from DOE.

Of the above mentioned sources, all Wind Utility Representatives had used EPRI. In comparison, more than half of All Solar Utility Representatives also mentioned the above sources. Wind Electric Power Engineers also frequently relied on "workshops, (etc.),"

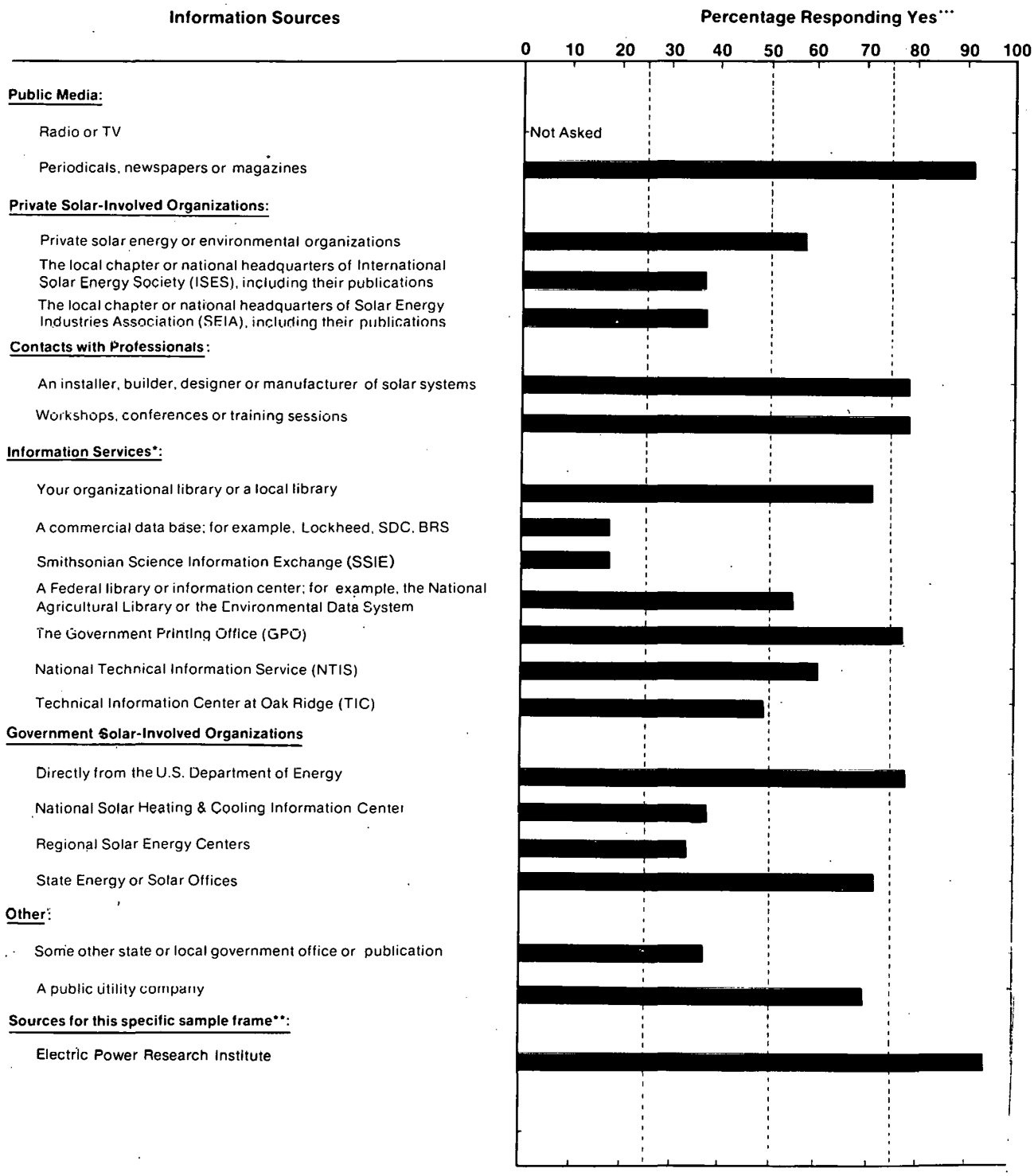
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 9 respondents.

Figure 7-4. Use of Selected Information Sources: Wind Utility Representatives

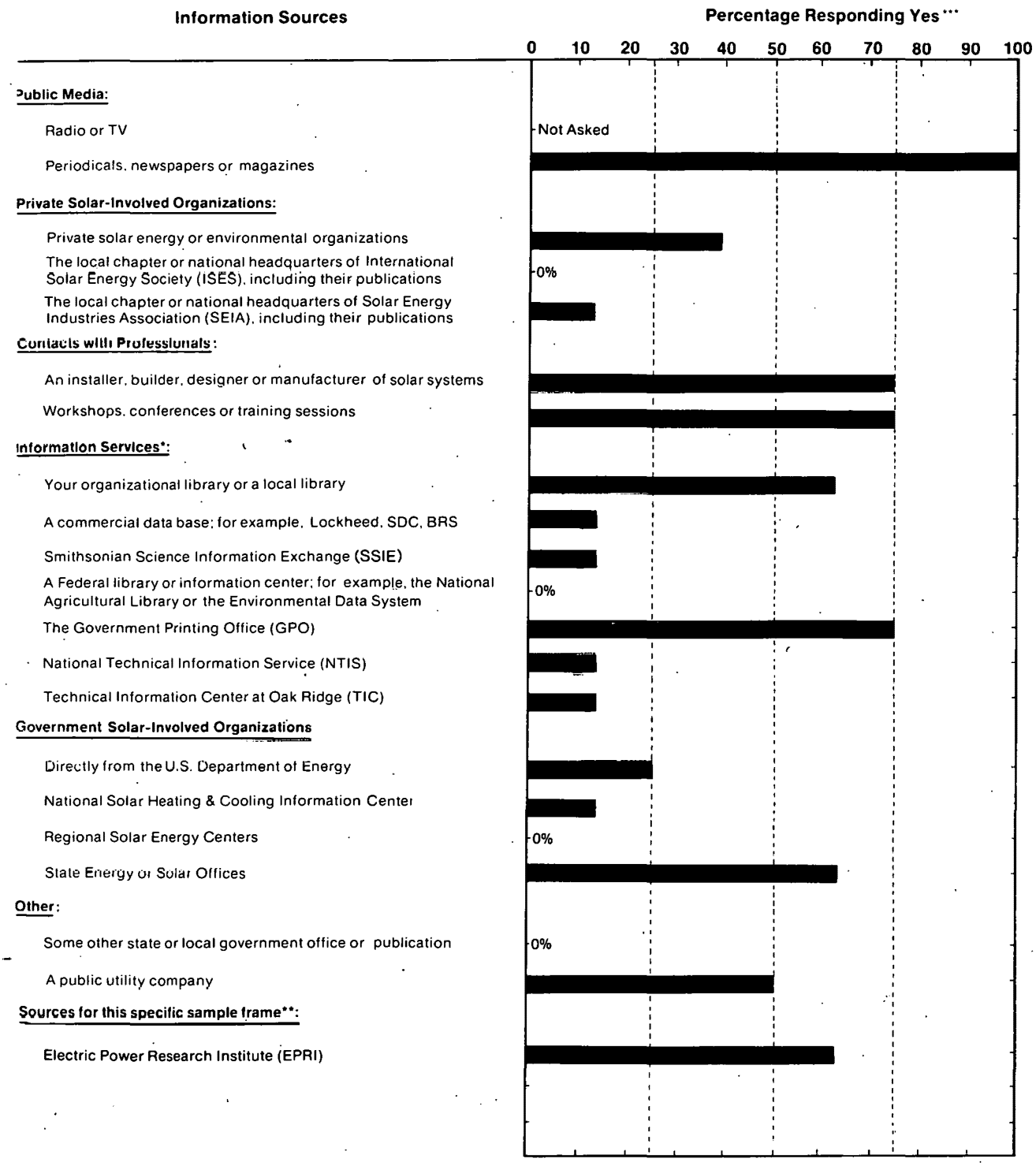
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 35 respondents.

Figure 7-5. Use of Selected Information Sources: All Solar Utility Representatives

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 8 respondents.

Figure 7-6. Use of Selected Information Sources: Non-Solar Utility Representatives

GPO, and DOE. An overall comparison of Solar to Nonsolar Utility Representatives showed that significantly ($P < 0.05$) more respondents in the All Solar Utility group mentioned using "a federal library," DOE, National Technical Information Service (NTIS), DOE, and International Solar Energy Society (ISES); no significant differences were found when compared to Wind Electric Power Engineers.

The information sources mentioned least often by Wind Utility Representatives were:

- ISES,
- Solar Energy Industries Association (SEIA),
- A commercial data base,
- Smithsonian Science Information Exchange (SSIE),
- Technical Information Center (TIC),
- National Solar Heating and Cooling Information Center (NSHCIC), and
- Some other state or local government office or publications.

The sources least used by All Solar Utility Representatives, Nonsolar Utility Representatives, and Wind Electric Power Engineers were "a commercial data base" and "SSIE."

7.3.2 Membership in Solar-Interested Organizations

Five of the 9 Wind Utility Representatives interviewed were members of a professional, technical, or other organization with an interest in solar energy. The organizations (all receiving single mentions) included:

- American Wind Energy Association,
- Cleveland Engineering Society,
- Institute of Electrical and Electronics Engineers,
- Kansas Municipal Utilities,
- National Rural Electric Cooperative Association, and
- Smithsonian Resident Associate Program.

7.3.3 Exposure to Publications on Solar Energy

During the past 6 months, 8 of the 9 Wind Utility Representatives had read publications which included information on wind energy. These publications (and the number of times mentioned) included:

- DOE publications (3),
- Electrical World,
- Electric Energy Association reports,
- Electric Light and Power (2),
- Energy Insider (2),

- Federal government pamphlets,
- Federal Register,
- NASA Lewis Research Center publications,
- NASA report (energy supplied by DOE),
- Science,
- Solar Age,
- Washington Report, and
- Wind Power Digest.

Also mentioned was the "Electric Power BTRI publications," a publication that the authors could not verify.

7.3.4 Use of Special Acquisition Methods

The respondents were asked whether they had obtained any information (not just on wind or solar energy) in the past year by computer terminal, by Computer Output Microform (COM), or by other microform (e.g., microfiche, microfilm sheets or rolls).

Few of the Wind Utility Representatives appeared accustomed to using these special acquisition methods. In the past year, only 1 of the 9 (11%) had used a computer terminal, 2 of the 9 (22%) had used COM, and 4 of the 9 (44%) had used other microform. Use of these methods was also minimal for all other utilities studied, solar and nonsolar.

7.4 SUMMARY AND COMMENTS

This section discussed the results of a study of nine representatives of utilities which were known to have operated, installed, or monitored research on wind energy conversion systems. Five of the nine were in management positions.

Of the five Utility groups interviewed, the Wind group was significantly more involved and slightly more informed than the PV Utility group. Wind Utility Representatives appeared to be the least educated but had the greatest length of professional experience of all six groups.

All nine Wind Utility Representatives were interested in the technical areas of equipment (electrical and control). Preference for size of wind systems (small versus medium/large) did not differ; seven of the nine (78%) respondents expressed interest in each size. However, one of the areas generating the least interest among Wind Utility Representatives ("rotary equipment") generated the highest interest among Wind Electric Power Engineers.

Wind Utility Representatives gave the highest priority to receiving information on:

- Costs of installing and operating a wind energy conversion system compared to a conventional system,
- Costs and performance of wind energy systems,

- Local building codes or other regulations affecting wind energy conversion systems,
- Computer models for sizing and predicting performance or costs,
- The state of the art in wind energy conversion systems, and
- Expected major developments in wind energy during the next 10 years.

Low ratings were given to "how to market and sell wind energy systems," "marketing statistics," a bibliography," "calendars," and "educational institutions."

All Solar Utility Representatives, Nonsolar Utility Representatives, and Wind Electric Power Engineers interviewed placed cost information as the number one priority. They also agreed on assigning the lowest priority to marketing information. The Wind Utility group, however, appeared to place a slightly higher value on "research in progress" and a significantly ($P < 0.05$) higher value on "computer models."

For information on solar energy, the Wind Utility Representatives, as well as representatives of the other four utility groups, referred most often to "periodicals," "workshops (etc.)," EPRI, GPO, and DOE. Popular sources also used by Wind Electric Power Engineers included "workshops," GPO, and DOE. An overall comparison of Solar to Nonsolar Utility Representatives showed that significantly ($P < 0.05$) more respondents in the All Solar Utility group mentioned using "a federal library," NTIS, DOE, and ISES.

SECTION 8.0

WIND ENERGY CONVERSION SYSTEM EDUCATORS

8.1 DESCRIPTION OF RESPONDENTS

8.1.1 Description of Sample

This section describes the results of a telephone study to determine the needs of post-secondary educators for information on wind energy conversion systems. Nine Wind Educators were interviewed.

The sample frame for Wind Educators was constructed by searching the Solar Energy Information Data Bank (SEIDB) Education Data Base [18]. One hundred and three colleges listed courses which included wind information and also identified the instructor for the course. Only names of instructors for advanced-level wind courses were used. Instructors who also appeared in education sample frames for other technologies were eliminated. In many cases, course descriptions named several technologies, and it was necessary to make some arbitrary decisions about the sample frame in which to place the course instructor. Related Researcher and Engineer sample frames were also checked for duplication of contact names, and duplicates were eliminated from the larger sample frame. After all adjustments were made, the 9 interview candidates were randomly selected from a sample frame of 28 names.

Respondents. In making the telephone calls to contact the randomly selected interview candidates, it sometimes occurred that the person could not be reached. In this event another randomly selected name was substituted for the original name. When individuals were contacted, it was verified that they really had been teaching courses on wind and that they would be needing information on wind energy within the next year. If they were not both involved and needing information, they were asked if they could refer the interviewer to someone else in their organization who would be an appropriate respondent. If such a referral was made, a call was then made to this new candidate; if no intraorganizational referral was made, a new candidate was randomly selected from the sample frame. The results of this process may be seen in Table 8-1.

Comparisons. For additional insight into the information needs and the information habits of these Wind Educators, results from this group are compared to the results from all of the educators interviewed in this study (All Educators). In addition to wind energy, the technologies included in All Educators were: solar thermal electric power, active solar heating and cooling, passive solar heating and cooling, photovoltaics, biomass, and solar industrial process heat. In performing any statistical comparisons, the totals for Wind Educators have been subtracted from the totals for All Educators. The data for Wind Educators and for All Educators can be found in Appendix F.

Table 8-1. COMPLETION OF INTERVIEWS: WIND EDUCATORS

Event	Number of Candidates
Interview completed with sample frame candidate	9
Interview completed with referral candidate	0
Refusal or candidate termination	0
Contact attempted: could not reach candidate within three attempts or before interviews were completed	7
Subtotal	16
Contact attempted: invalid candidate (e.g., inappropriate field of interest, no telephone)	3
TOTAL	19
Sample frame error rate[a] (Percent)	16
Completion rate[b] (Percent)	56

[a]Invalid candidates divided by TOTAL
[b]Completed interviews divided by Subtotal

8.1.2 Current Status of Respondents

Role. Eight of the 9 Wind Educators were on the faculties of 4-year colleges or universities; the other taught at a technical institute. They taught courses in the Physics (2), Industrial Technology (2), Mechanical Engineering, Electrical Engineering and Computer Science, Applied Science, Energy and Transportation, and Continuing Education Departments. Two taught courses dealing only with wind energy. The other 7 taught broader courses which included such topics as: small wind power systems (6), central wind power systems (2), and small and central scale electricity generation (3). In describing what they were doing in the area of wind energy, only 3 specifically mentioned teaching. Three were involved in the design and construction of wind energy conversion equipment: turbines, generators, and systems. Two were involved with manufacturing, distributing, servicing, and using wind components and systems. Other activities mentioned included: research on a 3000-W unit, marketing and using wind generators, servicing independent systems, restoring old electric generating wind systems, distributing equipment, and manufacturing electronic controls. One educator mentioned "comparing wind energy systems with other energy systems—their applications," as what he/she was doing in the area of wind energy.

Involvement. Seven of the 9 (78%) Wind Educators said that they were "very involved" in wind. This was higher than the 27 of the 63 (43%) of All Educators who said they were "very involved" in their respective solar technologies. No other Educator group had as many respondents considering themselves "very involved" as did the Wind Educators.

Informedness. Five of the 9 (56%) Wind Educators considered themselves "very informed," compared to 31 of the 63 (49%) of All Educators. All of the Wind Educators considered themselves at least "moderately informed." This was similar to All Educators, where 58 of the 63 (92%) considered themselves at least "moderately informed."

Need for Information. All 9 of the Wind Educators indicated they would need information on wind energy outside the job as well as on the job during the next year. None of the other Educator groups who were asked this question (Industrial Process Heat (IPH) and Solar Thermal Educators were not asked) had all 9 respondents expecting to need information on their solar technology outside of their jobs. The proportion of All Educators who indicated they would need information outside of their job was 31 of the 45 (69%).

8.1.3 Background of Respondents

Six of the 9 (67%) Wind Educators held doctoral degrees, 2 held master's degrees, and 1 held a bachelor's degree. The percentage of Wind Educators holding advanced degrees (beyond bachelor's) was 89%; this was the same as was found for All Educators (5 of the 63, or 89%). Three of the Wind Educators had degrees in industrial education/industrial technology, 2 had degrees in physics, and 1 each had degrees in architecture, applied mechanics, high voltage engineering, and science. Eight of the 9 Wind Educators had received their most recent degree within the past 20 years; 2 of these within the past 10 years, 4 from 10-15 years ago, and 2 from 15-20 years ago. One Wind Educator received his/her degree more than 20 years ago.

Most (6) of the Wind Educators had been in their present profession (not necessarily teaching) for over 10 years, 1 for 6-10 years, and 2 for 3-5 years. Five of the group gave their present profession as educator, professor, or teacher. Other professional descriptions were: architect, expert on wind and solar energy, designer of wind and solar thermal systems, theoretical physicist, and "wind electric technician, manufacturer, and service dealer."

8.2 INFORMATION NEEDS OF RESPONDENTS

8.2.1 Technical Areas

Wind Educators were asked to choose those areas in which they were "particularly interested in obtaining information" from a list of selected technical areas of wind energy. All 9 respondents were interested in "small-scale wind systems," "towers," "control equipment," and "electrical equipment." They were less interested in "medium/large-scale wind systems" (4 of the 9) and "rotary equipment" (5 of the 9).

Some Wind Educators volunteered that they were also interested in wind energy storage and grid connections to utilities.

8.2.2 Types of Information

Wind Educators were asked to name the information about wind energy that was important for them to obtain. All 9 volunteered one or more items of information which they considered important. Included in the items they mentioned were: research in progress (3), planned research projects, up-to-date statistics, updated research on design, latest developments on Savonius rotors, blade design, technical aspects of wind energy, technical and economical types, models on the economics of wind power, existing and new installations, consumer reports, data feedback, climatological data, and grants. One respondent was also interested in information on using water in connection with wind systems.

Three of the 9 (33%) Wind Educators stated that there was information on wind energy which they needed but were unable to get. About the same proportion (35%) of All Educators also felt such a need for information on their solar technologies. Information that the Wind Educators volunteered they needed but were unable to get included: complete tests on Chalk turbines, Clark Y Airfoil Tests, research in progress, tax credits and grants available, and technical information such as actual designs.

Choice Between Specific Needs. A list of 11 types of wind information products and 14 types of wind information categories was read to each respondent. Each respondent described the usefulness of each particular item by assigning it a value of "essential," "very useful," "somewhat useful," or "not at all useful." The results are displayed in Fig. 8-1. For the purpose of comparison, results for All Educators are in Fig. 8-2.

The following three information categories/products were rated highest by Wind Educators:

- Tax credits, grants, or other economic incentives;
- Research in progress; and
- Climatological data.

Wind Educators assigned the lowest relative ratings to:

- A nontechnical description of how a particular system works;
- Solar energy programs, research, industries, and markets outside the United States; and
- Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors.

Statistical tests indicated that differences between the ratings for the three highest and three lowest-rated information items were significant ($P<0.05$) for Wind Educators. It will be noted (see Fig. 8-1) that the range between the top-rated, and the lowest-rated items was not as large for Wind Educators as for most other groups in this study. The Wind Educators tended to see many different items as being useful.

It should be noted that these lower-rated items were not necessarily of no worth to the Wind Educators. For example, 5 of the 9 (56%) thought "lists of local lenders (etc.)" were either "essential" or "very useful." Thus, these information categories/products could be useful to some Wind Educators but were of a lower relative priority to the entire group.

Statistical tests were also used to determine whether the Wind Educators rated any of these information items significantly higher (or lower) than they were rated by All Educators. Some groups, however, tended to give higher scores in general than did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The procedure for calculating the relative rating is described in Appendix E. The average overall rating Wind Educators gave to all items was 2.79; for All Educators it was 2.64. The ratings given by Wind Educators were among the eight highest given by any of the 86 groups studied.

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 – 1.5 – 2.0 – 2.5 – 3.0 – 3.5 – 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	11		3	2	3	1
Research in progress	2		4	2	3	0
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	16		2	4	1	2
Costs and performance of systems	4		3	3	3	0
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	16		2	3	3	1
Climatological data such as wind, weather, or amount of sunshine	2		3	4	2	0
Marketing Information Categories:						
Marketing statistics and sales projections	20		2	1	6	0
Information on how to market and sell systems including guidelines on obtaining financial support	11		2	4	2	1
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	11		2	3	4	0
Standards, specifications, or certification programs for equipment	4		2	5	2	0
Institutional, social, environmental, and legal aspects of system applications	4		3	4	1	1
Expected major developments during the next 10 years	4		2	6	0	1
Solar system programs, research, industries, and markets outside the United States	23		2	2	3	2
Tax credits, grants, or other economic incentives	1		4	3	2	0
Information Products:						
Reference Information Products:						
A bibliography of general readings	16		2	4	1	2
A calendar of conferences and programs	8		2	4	3	0
A list of sources for information	8		2	5	1	1
A list of technical experts	20		2	2	4	1
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	23		2	3	1	3
Descriptive Information Products:						
A non-technical description of how a particular system works	23		2	2	3	2
A technical description of how a particular system works	16		1	5	2	1
System diagrams or schematics	8		2	5	1	1
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	11		3	2	3	1
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	11		2	4	2	1
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	20		2	3	2	2

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass" "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 8-1. Usefulness of Selected Information Items: Wind Educators

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	1		15	35	11	2
Research in progress	7		14	33	14	2
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	4		19	29	10	5
Costs and performance of systems	1		20	23	20	0
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	18		10	22	20	11
Climatological data such as wind, weather, or amount of sunshine	1		21	24	15	3
Marketing Information Categories:						
Marketing statistics and sales projections	23		5	15	26	17
Information on how to market and sell systems including guidelines on obtaining financial support	24		5	17	21	20
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	19		8	26	17	12
Standards, specifications, or certification programs for equipment	17		11	18	26	8
Institutional, social, environmental, and legal aspects of system applications	16		6	30	19	8
Expected major developments during the next 10 years	4		17	31	10	4
Solar system programs, research, industries, and markets outside the United States	25		5	14	23	21
Tax credits, grants, or other economic incentives	8		19	19	22	3
Information Products:						
Reference Information Products:						
A bibliography of general readings	12		12	27	21	3
A calendar of conferences and programs	15		6	30	21	6
A list of sources for information	9		11	32	17	3
A list of technical experts	21		7	19	30	7
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	20		9	22	20	12
Descriptive Information Products:						
A non-technical description of how a particular system works	22		9	11	25	18
A technical description of how a particular system works	6		12	37	11	2
System diagrams or schematics	13		12	28	18	5
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	11		14	25	20	4
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	10		15	25	16	6
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	14		11	23	23	6

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 8-2. Usefulness of Selected Information Items: All Educators

In comparing the results for Wind Educators to the results for All Educators, there were some similarities. "Climatological data" was among the three top-rated items for both groups, and "solar energy programs" was among the three lowest-rated items for both groups. Statistical tests indicated that, compared to All Educators, the Wind Educators rated "a technical description" and "costs of installing" significantly ($P < 0.05$) lower and "how to market" significantly ($P < 0.05$) higher. Wind Educators also seemed to rate "standards," "institutional aspects," and "tax credits" higher, but "state of the art" lower.

8.3 ACQUISITION OF INFORMATION BY RESPONDENTS

8.3.1 Use of Selected Information Sources

Wind Educators were asked which of 21 different potential sources of solar information they had used in the past few years. For this question the respondents were not asked if they had obtained information about wind energy, but instead were asked if they had obtained any solar information from each specific source. Thus, the question sought to determine which information sources were the most familiar to the respondents. The results for Wind Educators are shown in Fig. 8-3. For comparison, those for All Educators are shown in Fig. 8-4.

Wind Educators were very aware of the available sources of information. The information sources mentioned most often by Wind Educators (at least 7 of the 9 had used them) were:

- An installer, builder, designer, or manufacturer;
- Periodicals, newspapers, or magazines;
- An organizational library or a local library;
- Workshops, conferences, or training sessions;
- Private solar energy or environmental organizations;
- The Government Printing Office (GPO);
- The National Technical Information Service (NTIS); and
- Directly from the U.S. Department of Energy (DOE).

In comparing these results to All Educators, seven of the eight sources mentioned most often by Wind Educators were also mentioned most often by All Educators. Only NTIS was not among the top eight sources used by All Educators.

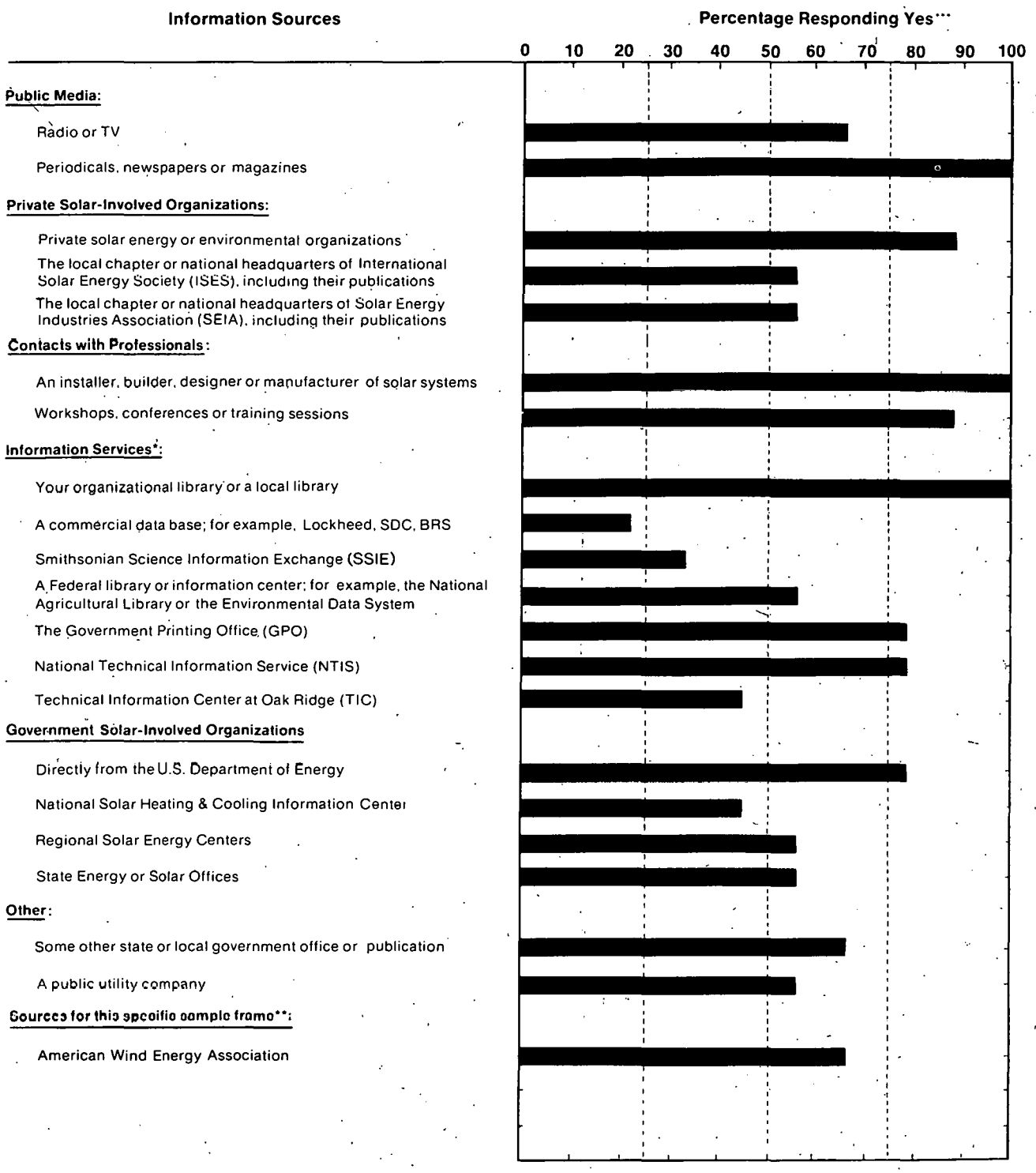
The information sources mentioned least often by Wind Educators were:

- A commercial data base, and
- Smithsonian Science Information Exchange (SSIE).

These two sources were also among the lowest-rated items for All Educators.

In comparing the information sources used by Wind Educators to those used by All Educators, no statistically significant differences were found.

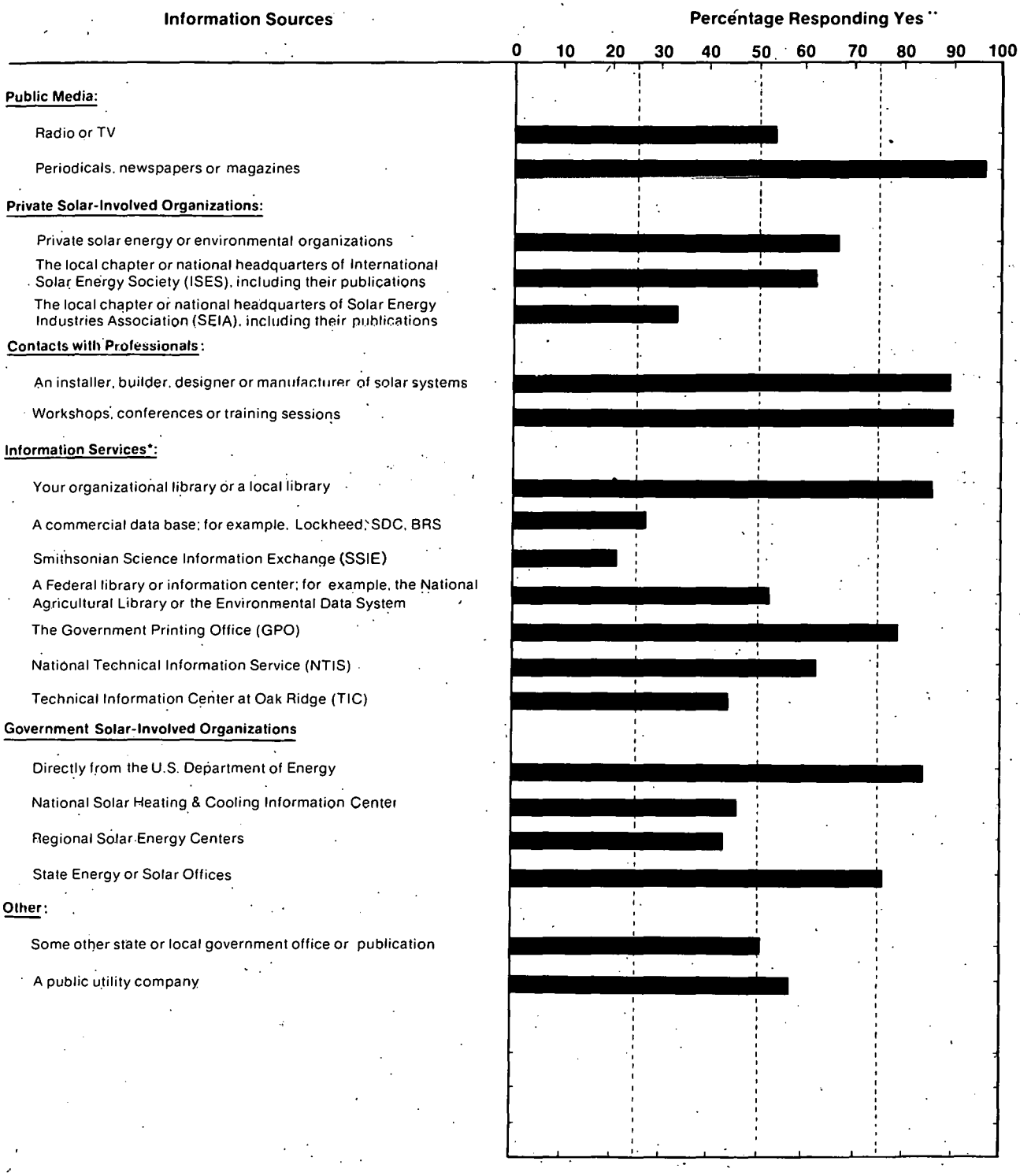
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 9 respondents.

Figure 8-3. Use of Selected Information Sources: Wind Educators

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** These data are based upon a total of 63 respondents.

Figure 8-4. Use of Selected Information Sources: All Educators

8.3.2 Membership in Solar-Interested Organizations

Eight of the 9 Wind Educators interviewed were members of a professional, technical, or other organization with an interest in solar energy. These organizations (each was mentioned by only one respondent) included:

- American Association of Physics Teachers,
- American Institute of Architects,
- American Society of Mechanical Engineers,
- American Wind Energy Association,
- Instrument Society of America,
- International Solar Energy Society,
- New England Solar Energy Society,
- New Mexico Solar Energy Association,
- Northern California Solar Energy Association,
- Solar Energy Association of Connecticut, and
- Solar Utilization of Northwest New York.

Seven of the eleven organizations mentioned were state, local, or national solar energy organizations.

8.3.3 Exposure to Publications on Solar Energy

During the past 6 months, 8 of the 9 Wind Educators had read publications which included information on wind energy. The publications they could specify (and the number of times mentioned) included:

- Alternative Sources of Energy,
- DOE weekly news,
- Federal reports,
- Mother Earth News,
- Solar Age (3),
- Solar Energy,
- Solar Engineering (3),
- Technology Review, and
- Wind Power Digest.

Also mentioned were some publications that the authors could not verify. These included "Environmental News," "PM," "POS," "Shefter (Wind Machine)," "Solar Research and Development," "WACS," and "Wind Energy Digest."

Solar energy publications such as Solar Age and Solar Engineering were the most popular among this group of respondents.

8.3.4 Use of Special Acquisition Methods

The respondents were asked whether they had obtained any information (not just wind or solar energy) in the past year by computer terminal, by Computer Output Microform (COM), or by other microform (e.g., microfiche, microfilm sheets or rolls). Few of the Wind Educators appeared accustomed to using these special acquisition methods. Only 2 (22%) had used a computer terminal in the past year, no one had used COM, and only 2 (22%) had used other microform. These results were similar to those for All Educators where only 22%, 6%, and 33% had used computer terminals, COM, and other microform, respectively.

8.4 SUMMARY AND COMMENTS

Nine postsecondary educators teaching courses that include wind energy topics were interviewed. These Educators had a high level of involvement in wind energy compared to other Educator groups. They needed wind information outside the job (as well as on the job) more than any other Educator group. A possible explanation for these facts is their broad involvement in various areas of wind energy. In addition to teaching courses, they mentioned doing wind research, designing and constructing wind equipment, manufacturing, distributing, and servicing wind components and systems, and being a user of wind systems. Their level of informedness and level of education was similar to that of All Educators.

All of the Wind Educators were interested in obtaining information on "small-scale wind systems," "towers," "control equipment," and "electrical equipment."

Wind Educators gave the highest priority to receiving information on:

- Tax credits, grants, or other economic incentives for wind energy systems;
- Climatological data; and
- Wind energy research in progress.

They gave low ratings to "a nontechnical description," "solar energy programs . . . outside the United States," and "lists of local lenders (etc.)."

Research information appeared to be especially important to the Wind Educators, as it was highly-rated on this question as well as being specifically mentioned (by 4 respondents) as important information for them to obtain.

Wind Educators had access to many information sources. They most often received solar information from "an installer, builder (etc.)," "periodicals, newspapers, or magazines," "an organizational . . . library," "workshops, conferences (etc.)," and "private solar energy or enivornmental organizations." Most of the respondents were members of a solar energy association. Solar Age and Solar Engineering were the most popular publications mentioned by Wind Educators.

SECTION 9.0

COUNTY AGENTS, COOPERATIVE EXTENSION SERVICE

9.1 DESCRIPTION OF RESPONDENTS

9.1.1 Description of Sample

This section describes the results of a telephone study to determine the needs of county agricultural agents in the Cooperative Extension Service (CES) for information on wind energy conversion systems. Nine Wind County Agents were interviewed.

The sample frame for Wind County Agents was selected from the County Agents Directory [19] which listed CES staff members by state and county. Any counties which had 35% or less of total land area in farms according to the County and City Data Book [20] were eliminated from consideration. The 2,160 remaining rural counties were reduced to 300 by selecting every seventh county. (Counties were listed in alphabetical order within states, which were also in alphabetical order.) Every fifth county was then selected as a candidate for the wind information study.* Senior Agricultural Agents (rather than Home Economists, 4-H, or Youth Agents) were identified for each county. The 9 interview candidates were randomly selected from a sample frame of 60 names.

Respondents. In making the telephone calls to contact the randomly selected interview candidates, it sometimes occurred that the person could not be reached. In this event another randomly selected name was substituted for the original name. When individuals were contacted, it was verified that they really had some experience with wind energy, and that they would be needing information on wind energy within the next year. If they were not both involved and needing information, they were asked if they could refer the interviewer to someone else in their organization who would be an appropriate respondent. If such a referral was made, a call was then made to this new candidate; if no intraorganizational referral was made, a new candidate was randomly selected from the sample frame. The results of this process may be seen in Table 9-1.

Comparisons. For additional insight into the information needs and the information habits of these Wind County Agents, results from this group were compared to the results from state level CES specialists in agriculture and information (All State Specialists) and from all of the CES county agricultural agents interviewed in this study (All County Agents). Other technologies represented by All County Agents included passive solar heating and cooling, active solar heating and cooling, biomass, and solar agricultural process heat. In performing any statistical comparisons, the totals for Wind County Agents have been subtracted from the totals for All County Agents. The data for Wind County Agents, All County Agents, and All State Specialists can be found in Appendix F.

*The remaining counties were divided into similar groups, and studies were conducted on active solar heating and cooling, passive solar heating and cooling, biomass energy, and agricultural process heat. The results of these studies are reported in other volumes.

Table 9-1. COMPLETION OF INTERVIEWS: WIND COUNTY AGENTS

Event	Number of Candidates
Interview completed with sample frame candidate	6
Interview completed with referral candidate	3
Refusal or candidate termination	0
Contact attempted: could not reach candidate within three attempts or before interviews were completed	4
Subtotal	13
Contact attempted: invalid candidate (e.g., inappropriate field of interest, no telephone)	9
TOTAL	22
Sample frame error rate[a] (Percent)	41
Completion rate[b] (Percent	69

[a]Invalid candidates divided by TOTAL
[b]Completed interviews divided by Subtotal

9.1.2 Current Status of Respondents

Respondents represented counties in the following nine states:

- Alabama,
- California,
- Colorado,
- Indiana,
- Illinois,
- Iowa,
- Kentucky,
- Michigan, and
- Missouri.

Unfortunately, no Northeastern states appear in the list. All County Agents accounted for 24 states, picking up somewhat more representation of the Northwest and Middle Atlantic. None of the State Specialists from New England or the far West were interviewed. (Geographic distribution by state of respondents in each of the County Agents' and State Specialists' groups are shown in Table B-1, in Appendix B.)

Role. Four of the 9 Wind County Agents were involved with dissemination of information on wind energy. One of the Wind County Agents was "considering having a windmill." One was running an energy program that included wind power. Three of the Wind County Agents were not able to describe any particular activity in the wind area, although they had some interest in wind energy conversion systems and expected to need wind information within the next year.

Involvement. Eight of the 9 (89%) Wind County Agents said that they were only "slightly involved" in wind energy. Only 1 was "moderately involved" and none were "very involved." Compared to Wind County Agents, State Specialists were significantly ($P < 0.05$) more involved, with 13 of the 18 (72%) at least "moderately involved." Involvement levels of County Agents in other technologies, although higher than for Wind County Agents, were not significantly higher. Seventy-one percent (32 of the 45) of All County Agents were only "slightly involved."

Informedness. All of the 9 Wind County Agents said that they were only "slightly informed" about wind energy. Informedness levels of other County Agents (about other technologies) were somewhat higher. Although low levels of informedness were typical of County Agents (33 of the 45, 73% of All County Agents were only "slightly informed"), this was not true for All State Specialists. Eighty-three percent (15 of the 18) of All State Specialists were at least "moderately informed." This was a significantly higher ($P < 0.05$) level of informedness than was found for Wind County Agents.

Need for Information. All respondents indicated they would need information on wind energy on the job during the next year. Four of the 9 (44%) Wind County Agents indicated they would also need information on wind energy outside the job. This level of expected off-the-job information need was comparable to that of All County Agents, where 21 of the 45 (47%) indicated such a need. All State Specialists (7 of the 18, 38%) were even less likely to need solar information outside of their jobs.

9.1.3 Background of Respondents

Seven of the 9 Wind County Agents held master's degrees; the other 2 held bachelor's degrees. They were somewhat more likely to hold advanced degrees (7 of the 9 or 78%) than were All County Agents (29 of the 45 or 64%), but (as expected) less likely to hold advanced degrees than were All State Specialists (15 of the 18 or 83%). Three of the Wind County Agents had degrees in agriculture (including agricultural economics and education), and 2 in the related area of animal science. Three had degrees in education (including vocational and continuing), and 1 a degree in public service. Four of the 9 had received their most recent degrees within the past 10 years, 2 from 10-20 years ago, and 3 over 20 years ago. This was fairly typical for County Agents, as 31 of the 45 (69%) All County Agents had received degrees within the past 20 years.

Six Wind County Agents had been in their current profession for over 10 years, 1 for 6-10 years, and 2 for less than 6 years. None of their references to their current professions included "county agent" or "Extension Agent." Their descriptions included educator or teacher (3), agricultural and/or natural resources advisor (4), farm management specialist, and animal scientist.

9.2 INFORMATION NEEDS OF RESPONDENTS

9.2.1 Technical Areas

Wind County Agents were asked to choose those areas in which they were "particularly interested in obtaining information" from a list of selected technical areas in wind energy technologies. Interest levels were highest (8 of the 9 respondents were inter-

ested) for "small-scale wind systems" and "electrical equipment" and lowest (only 3 of the 9 were interested) for "control equipment." Six of the 9 were interested in "medium- to large-scale systems," "rotary equipment," and "towers."

9.2.2 Types of Information

Wind County Agents were asked to name the information about wind energy that was important for them to obtain. All of the 9 volunteered one or more items of information which they considered important. Four respondents mentioned basic information about how wind energy systems work. Other topics included: economics (3, including one mention of prices for small-scale wind generated electricity), efficiency and amount of energy produced (2), various applications (3, including one mention each for agricultural and water power), diagrams, types of systems available, names of manufacturers, and use of wind energy for greenhouse heating.

Information that Wind County Agents volunteered they needed but were unable to get included: "anything relating to wind energy," design schematics and plans, lists of suppliers and sources, and comparisons of feasibility and costs. Energy conservation techniques in the home and on the farm was also mentioned.

Choice Between Specific Needs. A list of 11 types of wind information products and 12 types of wind information categories was read to each respondent. Each respondent described the usefulness of each particular item by assigning it a value of "essential," "very useful," "somewhat useful," or "not at all useful." The results are displayed in Fig. 9-1. For comparison, results for All County Agents are in Fig. 9-2 and those for All State Specialists in Fig. 9-3.

Wind County Agents selected the two items in the cost class among the most important information items. Their four top-rated information categories/products were:

- Costs and performance of systems,
- Lists of sources for information,
- A nontechnical description of how a particular system works, and
- A technical description of how a particular system works.

The inclusion of both "a technical description" and "a nontechnical description" among the top rated information items is unusual. It was more common for a group (and particularly, a County Agent group) to give widely different ratings for these two items.

Wind County Agents assigned the lowest relative ratings to:

- Computer models for sizing and predicting performance or costs;
- Marketing statistics and sales projections;
- Educational institutions offering related courses;
- Institutional, social, legal, and environmental aspects; and
- Manual methods for sizing and predicting performance or costs.

Statistical tests indicated that, for Wind County Agents, all four of the top-rated information items were rated significantly ($P < 0.05$) higher than the five lowest-rated items.

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 – 1.5 – 2.0 – 2.5 – 3.0 – 3.5 – 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	15		0	3	5	1
Research in progress	10		0	5	3	1
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	5		0	6	3	0
Costs and performance of systems	1		0	8	1	0
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	7		1	4	3	1
Climatological data such as wind, weather, or amount of sunshine	13		0	4	4	1
Marketing Information Categories:						
Marketing statistics and sales projections	22		0	1	5	3
Information on how to market and sell systems including guidelines on obtaining financial support	NA		NA	NA	NA	NA
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	19		0	3	4	2
Standards, specifications, or certification programs for equipment	10		1	2	6	0
Institutional, social, environmental, and legal aspects of system applications	19		0	2	6	1
Expected major developments during the next 10 years	13		0	5	2	2
Solar system programs, research, industries, and markets outside the United States	NA		NA	NA	NA	NA
Tax credits, grants, or other economic incentives	7		1	4	3	1
Information Products:						
Reference Information Products:						
A bibliography of general readings	15		0	3	5	1
A calendar of conferences and programs	15		1	0	8	0
A list of sources for information	2		1	5	3	0
A list of technical experts	15		1	1	6	1
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	5		1	4	4	0
Descriptive Information Products:						
A non-technical description of how a particular system works	2		0	7	2	0
A technical description of how a particular system works	2		1	5	3	0
System diagrams or schematics	7		1	3	5	0
Design Information Products:						
System design handbooks, installation handbooks or reference tables	10		0	5	3	1
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	19		0	3	4	2
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	23		0	1	4	4

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank - Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4".

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 9-1. Usefulness of Selected Information Items: Wind Cooperative Extension Service County Agents

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	15		1	15	25	4
Research in progress	11		2	20	19	4
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	1		8	33	4	0
Costs and performance of systems	2		6	34	5	0
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	19		4	11	21	9
Climatological data such as wind, weather, or amount of sunshine	6		8	23	9	5
Marketing Information Categories:						
Marketing statistics and sales projections	22		0	1	5	3
Information on how to market and sell systems including guidelines on obtaining financial support	NA		NA	NA	NA	NA
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	15		3	13	23	6
Standards, specifications, or certification programs for equipment	14		2	14	24	4
Institutional, social, environmental, and legal aspects of system applications	20		2	6	30	7
Expected major developments during the next 10 years	10		2	23	14	6
Solar system programs, research, industries, and markets outside the United States	NA		NA	NA	NA	NA
Tax credits, grants, or other economic incentives	4		7	24	12	2
Information Products:						
Reference Information Products:						
A bibliography of general readings	13		2	17	20	6
A calendar of conferences and programs	21		1	7	28	9
A list of sources for information	4		6	25	13	1
A list of technical experts	15		3	15	19	8
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	8		6	22	15	2
Descriptive Information Products:						
A non-technical description of how a particular system works	3		5	30	10	0
A technical description of how a particular system works	18		4	13	19	9
System diagrams or schematics	7		6	22	16	1
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	9		3	22	16	4
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	12		2	19	18	6
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	23		0	5	24	15

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1", the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4."

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 9-2. Usefulness of Selected Information Items: All Cooperative Extension Service County Agents

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	5		0	9	9	0
Research in progress	5		1	8	8	1
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	9		2	6	7	3
Costs and performance of systems	3		2	9	5	2
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	9		2	4	11	1
Climatological data such as wind, weather, or amount of sunshine	1		5	7	2	4
Marketing Information Categories:						
Marketing statistics and sales projections	NA		NA	NA	NA	NA
Information on how to market and sell systems including guidelines on obtaining financial support	NA		NA	NA	NA	NA
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	22		0	1	9	8
Standards, specifications, or certification programs for equipment	13		2	6	4	6
Institutional, social, environmental, and legal aspects of system applications	21		0	2	9	7
Expected major developments during the next 10 years	5		2	7	7	2
Solar system programs, research, industries, and markets outside the United States	23		0	1	7	9
Tax credits, grants, or other economic incentives	3		2	8	7	1
Information Products:						
Reference Information Products:						
A bibliography of general readings	20		1	4	8	5
A calendar of conferences and programs	18		0	6	8	4
A list of sources for information	2		2	9	6	1
A list of technical experts	13		1	6	7	4
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	18		1	6	5	6
Descriptive Information Products:						
A non-technical description of how a particular system works	17		0	8	5	5
A technical description of how a particular system works	8		1	9	5	3
System diagrams or schematics	13		2	3	10	3
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	11		2	4	8	3
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	12		1	7	6	4
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	13		0	8	6	4

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4."

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 9-3. Usefulness of Selected Information Items: All Cooperative Extension Service State Specialists

It should be noted that these lower-rated items were not necessarily of no worth to the Wind County Agents. For example, 3 of the 9 (33%) thought information on "educational institutions" was "very useful." Thus, these information categories/products could be useful to some of the Wind County Agents but were of a lower relative priority to the entire group.

Statistical tests were also used to determine whether the Wind County Agents rated any of these information items significantly higher (or lower) than they were rated by All County Agents or by All State Specialists. Some groups, however, tended to give higher scores in general than did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The procedure for calculating the relative rating is described in Appendix E. The average rating for all of the information items was 2.39 for Wind County Agents, compared to 2.47 for All County Agents and 2.27 for All State Specialists.

In comparing the results for Wind County Agents to the results for All County Agents, ratings were very similar. Both gave lowest ratings for the same two items and highest ratings to four of the same items. Wind County Agents rated "a technical description" significantly ($P < 0.05$) higher than did All County Agents and "costs of installing" significantly ($P < 0.05$) lower. Wind County Agents also appeared to give higher ratings to "local building codes."

In comparing the ratings given by Wind County Agents to those given by All State Specialists, the only statistically significant ($P < 0.05$) difference was the lower rating given by Wind County Agents to "computer models." This result was expected, both because of higher levels of involvement on the part of State Specialists and the fact that the State Specialists had more access to computing equipment as a function of their positions at state universities. Wind County Agents also appeared to be more interested in descriptive information but less interested in systems design or research information.

9.3 ACQUISITION OF INFORMATION BY RESPONDENTS

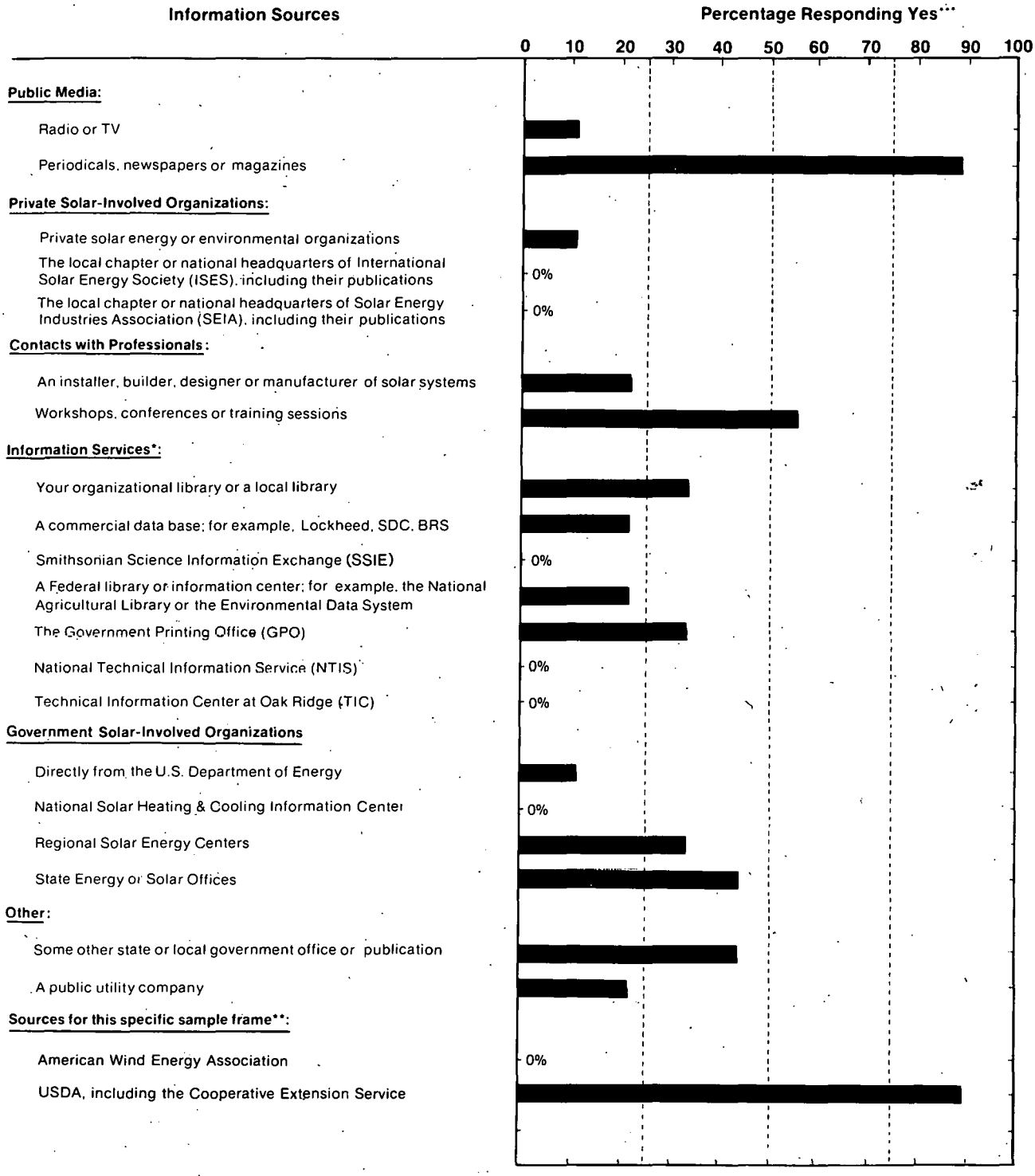
9.3.1 Use of Selected Information Sources

Wind County Agents were asked which of 22 different potential sources of solar information they had used in the past few years. For this question the respondents were not asked if they had obtained information on wind energy, but instead were asked if they had obtained any solar information from each specific source. Thus, the question sought to determine which information sources were the most familiar to the respondents. The results for Wind County Agents are displayed in Fig. 9-4. For comparison, results for All County Agents are in Fig. 9-5 and those for All State Specialists are in Fig. 9-6.

Information sources mentioned most often by Wind County Agents (4 or more had used them) were:

- Periodicals, newspapers, or magazines;
- U.S. Department of Agriculture (USDA);
- Workshops, conferences, or training sessions;

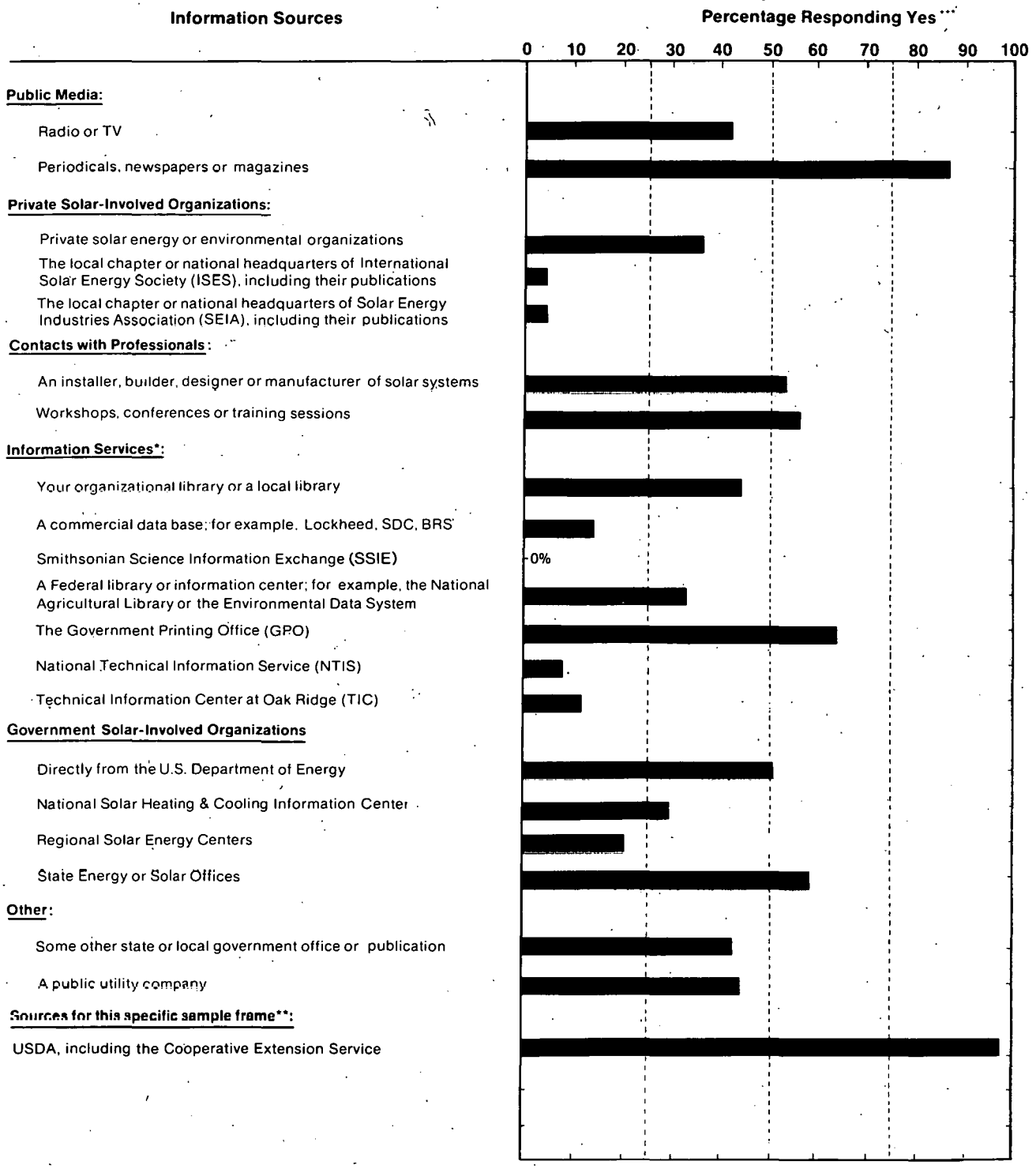
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry"
*** These data are based upon a total of 9 respondents.

Figure 9-4. Use of Selected Information Sources: Wind Cooperative Extension Service County Agents

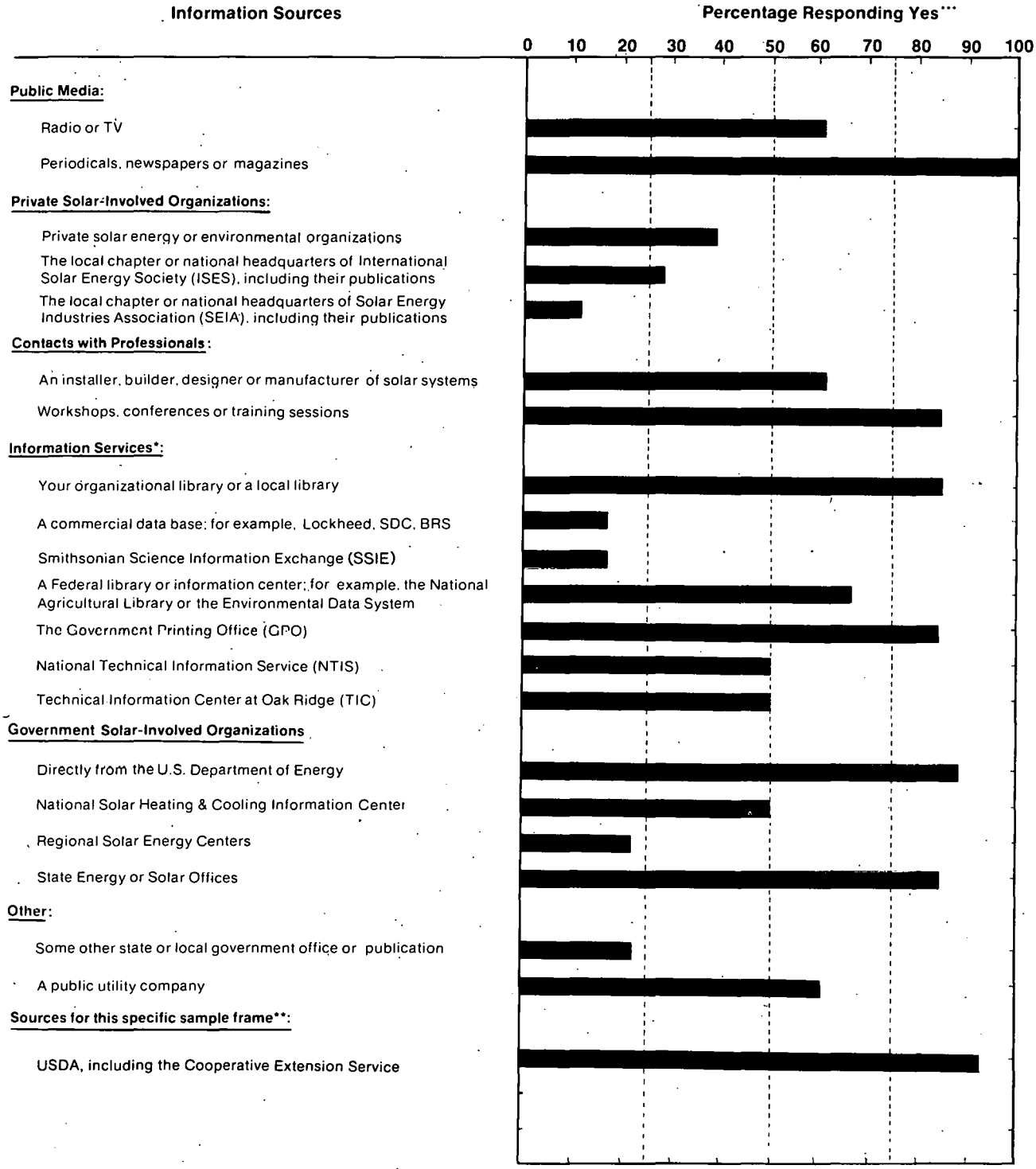
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 45 respondents.

Figure 9-5. Use of Selected Information Sources: All Cooperative Extension Service County Agents

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 18 respondents.

Figure 9-6. Use of Selected Information Sources: All Cooperative Extension Service State Specialists

- State energy or solar offices; and
- Some other state or local government office or publications.

The information sources mentioned least often by Wind County Agents (none of the 9 had used them) were:

- International Solar Energy Society (ISES),
- Solar Energy Industries Association (SEIA),
- Smithsonian Science Information Exchange (SSIE),
- National Technical Information Service (NTIS),
- Technical Information Center (TIC),
- National Solar Heating and Cooling Information Center (NSHCIC), and
- American Wind Energy Association (AWEA).

The familiarity of the respondents with the listed information sources was the lowest for any group of County Agents and one of the three lowest for any of the 86 groups included in the study. In reviewing Figs. 9-4 through 9-6, substantial proportions of all three groups made use of "periodicals" and USDA. Although some Wind County Agents have used state energy or solar offices as well as Regional Solar Energy Centers (RSECs), they were not accustomed to using solar-specific private organizations.

9.3.2 Membership in Solar-Interested Organizations

Only one of the 9 Wind County Agents interviewed mentioned being a member of a professional, technical, or other organization with an interest in solar energy. The organization mentioned was the National Association of County Agricultural Agents.

9.3.3 Exposure to Publications on Solar Energy

During the past 6 months, 4 of the 9 Wind County Agents had read publications which included information on wind energy. The publications they could specify (each mentioned by only 1 respondent) included:

- Mother Earth News,
- New Farm, and
- Time.

Also mentioned was an article on use of wind for pumping water and "popular press." These publications could not be further specified by the authors.

9.3.4 Use of Special Acquisition Methods

The respondents were asked whether they had obtained any information (not just wind or solar energy) in the past year by computer terminal, by Computer Output Microform

(COM), or by other microform (e.g., microfiche, microfilm sheets or rolls). Few of the Wind County Agents appeared accustomed to using these special acquisition methods, a trait common to All County Agents. In the past year, none of the 9 had used computer terminals or COM, and only 1 had used other microforms. Somewhat larger proportions of All State Specialists had used each of the three forms, and larger proportions of All County Agents had used computer terminals and COM. Use of computer terminals by All State Specialists was significantly ($P < 0.05$) greater than that by Wind County Agents.

9.4 SUMMARY AND COMMENTS

Nine CES County Agricultural Agents were interviewed. All were slightly involved with wind energy and expecting to need relevant information within the next year. Four were involved with disseminating information on wind energy systems.

Wind County Agents attached the most usefulness to information on:

- Costs and performance of wind energy systems,
- Lists of sources for information on wind energy systems,
- A nontechnical description of how a particular wind energy conversion system works, and
- A technical description of how a particular wind energy conversion system works.

They attached little utility to "computer models" "marketing statistics and sales projections," "educational institutions," "institutional . . . aspects," and "manual methods."

This group gave the impression of being only marginally involved with wind energy, although perhaps expecting to become more involved over the coming year. They tended to be more interested in small-scale than large-scale systems.

Their usual channels for receiving solar information included "periodicals, newspapers, or magazines," USDA, and "workshops, conferences, or training sessions." They generally were not members of organizations which provided solar information, and only one mentioned membership in the National Association of County Agricultural Agents. They found solar information generally in popular and farm periodicals rather than either the solar press or U.S. Department of Energy (DOE) publications. It is not clear in what form they received solar information from USDA, as no USDA publications were cited.

SECTION 10.0

SMALL WIND ENERGY SYSTEM OWNERS

10.1 DESCRIPTION OF RESPONDENTS

10.1.1 Description of Sample

This section describes the results of a telephone study to determine the needs of owners of small wind energy systems for information on wind energy technologies. Nine owners of Small Wind Energy Conversion Systems (SWECS) were interviewed. The purpose of studying this group was to determine the sources each respondent had used to obtain information for acquiring their wind energy system and to determine, in retrospect, what type of information would have been the most useful. By learning the information needs and the sources used, one can estimate the information needs and information habits of potential SWECS Owners.

The sample frame for SWECS Owners was constructed from seven different sources: Whirlwind Power Company [21] supplied 13 names; Harnessing the Wind for Home Energy [13] provided 7 names; articles from the Solar Law Reporter [22], Alternative Sources of Energy [23], Small Farm Energy Project Focus [24], and Wind Power Digest [25] yielded 10 more names; and finally, The Massachusetts Institute of Technology Research Establishment (MITRE) "Solar Energy Technical Information Dissemination Program. Reference Directory: Wind Energy Conversion" [11] listed 18 wind energy system owners. Some owner's names were for residential buildings and others for commerical buildings. Additional lists of wind system owners had been collected by Rockwell International, but they refused to release these lists to the Solar Energy Research Institute (SERI) for contractual reasons. After eliminating duplicates and those with incomplete addresses, the 9 interview candidates were randomly selected from a sample frame of 35 names.

Respondents. In making the telephone calls to contact the randomly selected interview candidates, it sometimes occurred that the person could not be reached. In this event, another randomly selected name was substituted for the original name. When individuals were contacted, it was verified that they really were owners of wind systems. If they were not a wind system owner, they were asked if they could refer the interviewer to someone else owning a wind energy system who would be an appropriate respondent. If such a referral was made, a call was then made to this new candidate; if no referral was made, a new candidate was randomly selected from the sample frame. The results of this process may be seen in Table 10-1.

Comparisons. For additional insight into the information needs and the information habits of these SWECS Owners, results for this group were compared to the results for Total Active Solar Heating and Cooling (SHAC) Owners/Managers who were interviewed in this study. Total SHAC Owners/Managers is composed of three groups: SHAC Building Owners/Managers, SHAC Water Heating Homeowners, and SHAC Space Heating Homeowners. Since 2 of the SWECS Owners had wind systems providing power to commercial operations and the remaining 7 were using wind power for residential power, the comparison was deemed appropriate. The data for SWECS Owners and for Total SHAC Owners/Managers can be found in Appendix F.

Table 10-1. COMPLETION OF INTERVIEWS: SMALL WIND ENERGY SYSTEM OWNERS

Event	Number of Candidates
Interview completed with sample frame candidate	9
Interview completed with referral candidate	0
Refusal or candidate termination	0
Contact attempted: could not reach candidate within three attempts or before interviews were completed	5
Subtotal	14
Contact attempted: invalid candidate (e.g., inappropriate field of interest, no telephone)	10
TOTAL	24
Sample frame error rate[a] (Percent)	42
Completion rate[b] (Percent	64

[a]Invalid candidates divided by TOTAL
[b]Completed interviews divided by Subtotal

10.1.2 Current Status of Respondents

Seven of the 9 SWECS Owners had owned their system for over 3 years. The other 2 had owned their wind systems for 1-3 years. All 9 of the SWECS Owners were using wind power for residential and/or farm house use. Three respondents specifically mentioned using wind systems for remote seasonal-use cabins and are assumed not to be using wind power for their primary residence. This contrasts somewhat with Total SHAC Owners/Managers, of whom two thirds (Homeowners) used solar for their own residences and one third (Building Owners/Managers) for commercial buildings.

10.1.3 Background of Respondents

Four of 9 SWECS Owners held bachelor's degrees, and 3 held master's degrees. Among the college-degree recipients, 3 had received their most recent degree within the past 10 years, 1 19 years ago, and 3 more than 30 years ago. Four of the SWECS Owners had degrees in engineering (civil, mechanical, wind); the other 3 had degrees in languages, business, and industrial management.

Current professions represented by SWECS Owners included: 2 retired (executive, educator), 4 engineers (professional, consultant), energy consultant, energy advocate, designer, builder, educator, researcher, and inventor (some respondents mentioned multiple professions). At least 2 of the 9 respondents were principals in wind power or solar energy companies; this was ascertained from the address—respondents were not asked about job affiliation.

10.2 INFORMATION NEEDS OF RESPONDENTS

Seven of the 9 (78%) SWECS Owners and 24 of the 27 (89%) SHAC Owners/Managers expected to need information related to their system during the next year. Three of the 9 (33%) SWECS Owners expected to need information on wind energy systems both on their jobs and outside of their jobs in the next year, compared to only 7 of the 27 (26%) Total SHAC Owners/Managers who expected to need SHAC information both on and off the job. SWECS Owners (4 of the 9 or 44%) were less likely than Total SHAC Owners/Managers (19 of the 27 or 70%) to need such information at their jobs. They were marginally more likely, however, to need information off the job (SWECS Owners 4 of the 9, 44%; SHAC Owners/Managers 10 of the 27, 37%).

10.2.1 Technical Areas

Eight of the 9 SWECS Owners were using (or intending to use*) their system for "household electricity." "Household water pumping" was the next most popular use, reported by 5 of the 9 SWECS Owners. Only 3 used the wind system for "farm electricity." However, all of these farm users were also using the system for "household electricity." None of the SWECS Owners were using wind energy for "farm irrigation," although 1 respondent volunteered that the system was used for stock watering. Another use that was volunteered was battery charging. One SWECS Owner reported selling excess power to the local utility company.

10.2.2 Types of Information

SWECS Owners were asked to name, in retrospect, the information about wind energy conversion that they would want to have if they were starting over again and first considering the installation of a wind energy system. All of the 9 respondents volunteered one or more items of information which they considered important. Three mentioned information on local wind speeds. Four mentioned performance data based on the locally available wind resource: output curves for various wind speeds, test results with a trial anemometer, quantity of power produced, and complete performance data. Three considered cost and economic data important: cost of constructing the tower, bank financing, and economic efficiency. Three also mentioned system and component reliability. One considered environmental information important (safety and noise levels). Finally, one respondent indicated that sources of information were important rather than specific information products: Mother Earth News, a local electrician, and "Henry Klewes in Maine."

SWECS Owners were asked if there was wind energy information that they needed when they were considering wind system purchase but couldn't get. This retrospective question elicited 5 responses from SWECS Owners. One respondent stated that both product specifications for small systems and local installation assistance were unavailable. Another SWECS Owner felt that "none" of the items listed in Fig. 10-1 were available at the time the wind system was under consideration. (Although 10 of these 23 items were considered "very useful," only one was considered "essential" by this respondent: "lists of local

*One respondent reported that, although the system had been constructed for over 3 years, it had never actually been used due to problems of vandalism in the remote area in which it was located and because the owners were seldom there.

lenders, insurers, builders, engineers, installers, or distributors for wind energy conversion systems.") All other responses to this question concerned the general difficulty these SWECS Owners had experienced in obtaining information and mentions of the sources which they had finally uncovered: University of Michigan library, Mother Earth News, and "Henry Klewes' booklet." One respondent insisted that no information was available at the time, although he had tried various places.

Choice Between Specific Needs. A list of 11 types of wind energy system information products and 12 types of wind energy information categories was read to each respondent. Each respondent described the usefulness of each particular item by assigning it a value of "essential," "very useful," "somewhat useful," or "not at all useful." The values assigned to each information product/category may indicate the values that would be assigned by the general public interested in wind energy conversion systems. The results for SWECS Owners are displayed in Fig. 10-1. For comparison, those for Total SHAC Owners/Managers are in Fig. 10-2.

SWECS Owners selected both items in the cost category among the most important. Their six top-rated information categories/products were:

- Costs of installing and operating a wind system compared to a conventional system;
- Design handbooks, installation handbooks, or reference tables;
- Cost and performance of systems;
- Climatological data;
- Lists of sources for information; and
- Tax credits, grants, or other economic incentives.

SWECS Owners assigned the lowest ratings to:

- Marketing statistics and sales projections;
- Institutional, social, environmental, and legal aspects;
- Computer models for sizing and predicting performance or costs;
- Educational institutions and other organizations offering courses;
- Standards, specifications, or certification programs; and
- Expected major developments during the next 10 years.

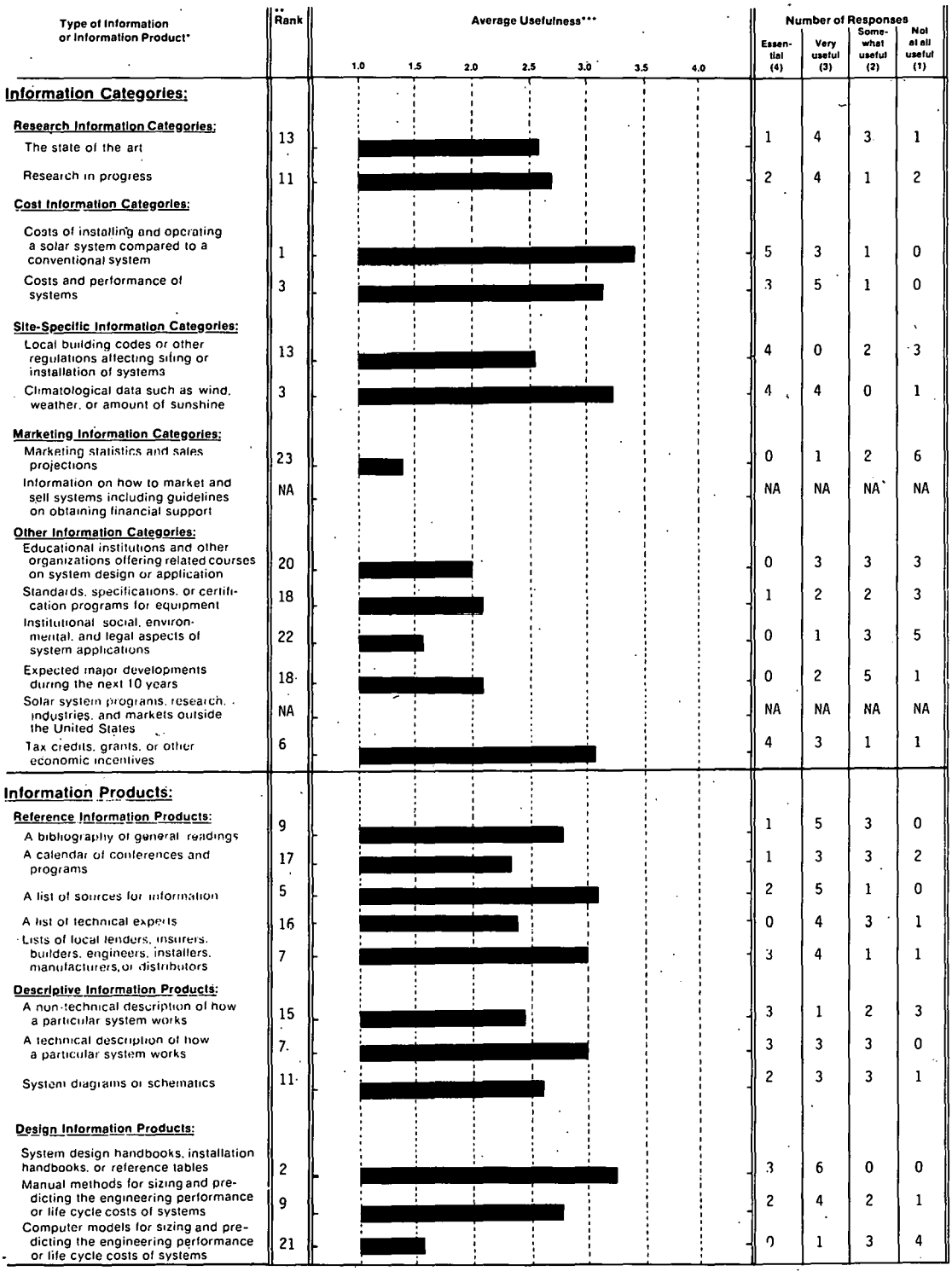
Statistical tests indicated that all six of the top categories/products were rated significantly ($P<0.05$) higher than were the six lowest-rated items.

It should be noted that these lower-rated items were not necessarily of no worth to the SWECS Owners. For example, 3 of the 9 (33%) SWECS Owners thought that "educational institutions" were either "essential" or "very useful." Thus, these information categories/products could be useful to some SWECS Owners but were of a lower relative priority to the entire group.

Statistical tests were used to determine whether these SWECS Owners rated any of these information items significantly higher (or lower) than they were rated by Total SHAC Owners/Managers. Some groups, however, tended to give higher scores in general than

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:					
Research Information Categories:					
The state of the art	13	1	4	3	1
Research in progress	11	2	4	1	2
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	1	5	3	1	0
Costs and performance of systems	3	3	5	1	0
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	13	4	0	2	3
Climatological data such as wind, weather, or amount of sunshine	3	4	4	0	1
Marketing Information Categories:					
Marketing statistics and sales projections	23	0	1	2	6
Information on how to market and sell systems including guidelines on obtaining financial support	NA	NA	NA	NA	NA
Other Information Categories:					
Educational institutions and other organizations offering related courses on system design or application	20	0	3	3	3
Standards, specifications, or certification programs for equipment	18	1	2	2	3
Institutional, social, environmental, and legal aspects of system applications	22	0	1	3	5
Expected major developments during the next 10 years	18	0	2	5	1
Solar system programs, research, industries, and markets outside the United States	NA	NA	NA	NA	NA
Tax credits, grants, or other economic incentives	6	4	3	1	1
Information Products:					
Reference Information Products:					
A bibliography of general readings	9	1	5	3	0
A calendar of conferences and programs	17	1	3	3	2
A list of sources for information	5	2	5	1	0
A list of technical experts	16	0	4	3	1
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	7	3	4	1	1
Descriptive Information Products:					
A non-technical description of how a particular system works	15	3	1	2	3
A technical description of how a particular system works	7	3	3	3	0
System diagrams or schematics	11	2	3	3	1
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	2	3	6	0	0
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	9	2	4	2	1
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	21	0	1	3	4



* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4."

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 10-1. Usefulness of Selected Information Items: Small Wind Energy System Owners

Question #8. I will read a list of potential information or information products on solar systems. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful?

Type of Information or Information Product*	Rank**	Average Usefulness*** (1.0 1.5 2.0 2.5 3.0 3.5 4.0)	Number of Responses: Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:						
Research Information Categories:						
The state of the art	16		4	10	6	6
Research in progress	18		2	6	6	4
Cost Information Categories:						
Costs of installing and operating a solar system compared to a conventional system	2		18	3	4	2
Costs and performance of systems	6		14	7	4	2
Site-Specific Information Categories:						
Local building codes or other regulations affecting siting or installation of systems	1		17	7	1	2
Climatological data such as wind, weather, or amount of sunshine	2		16	6	4	1
Marketing Information Categories:						
Marketing statistics and sales projections	23		3	2	8	14
Information on how to market and sell systems including guidelines on obtaining financial support	NA		NA	NA	NA	NA
Other Information Categories:						
Educational institutions and other organizations offering related courses on system design or application	20		3	5	14	5
Standards, specifications, or certification programs for equipment	9		8	9	5	5
Institutional, social, environmental, and legal aspects of system applications	22		3	5	10	9
Expected major developments during the next 10 years	12		7	5	12	2
Solar system programs, research, industries, and markets outside the United States	NA		NA	NA	NA	NA
Tax credits, grants, or other economic incentives	5		14	8	4	1
Information Products:						
Reference Information Products:						
A bibliography of general readings	17		3	10	8	6
A calendar of conferences and programs	19		4	3	13	5
A list of sources for information	7		9	7	7	3
A list of technical experts	15		7	4	12	3
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	4		16	5	5	1
Descriptive Information Products:						
A non-technical description of how a particular system works	10		8	9	3	6
A technical description of how a particular system works	11		8	6	8	4
System diagrams or schematics	12		9	5	6	6
Design Information Products:						
System design handbooks, installation handbooks, or reference tables	8		9	6	6	4
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	14		7	5	12	3
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	21		4	4	11	8

* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** Rank—Each information product was assigned a rank based on average usefulness. Thus, the product with the highest average usefulness was assigned the rank of "1"; the product with the lowest average usefulness would be ranked "25" where all items were asked. If two or more information products were tied for 2nd, they were both assigned a "2". The next highest ranking was then assigned a "4."

*** Average usefulness was calculated by assigning the responses on a 1-4 scale from a "4" for "essential" to a "1" for "not very useful".

Figure 10-2. Usefulness of Selected Information Items: Total Active Solar Heating and Cooling Owners/Managers

did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The procedure for calculating the relative ratings is described in Appendix E. The average overall rating for all information items was 2.59 for SWECS Owners, somewhat lower than the 2.71 average for Total SHAC Owners/Managers.

The comparison of SWECS Owners to Total SHAC Owners/Managers indicated marked similarities. The only statistically significant difference in ratings by the two groups was the significantly ($P < 0.05$) lower rating for "local building codes" by SWECS Owners. The data also seemed to indicate the SWECS Owners were more interested in "systems design handbooks" and " a bibliography."

10.3 ACQUISITION OF INFORMATION BY RESPONDENTS

10.3.1 Initial Information Sources

Although the SWECS Owners had already gone through the data gathering process, they were asked in retrospect what would be the first thing they would do to obtain information about wind energy conversion systems if they were starting over. Two stated they would contact the American Wind Energy Association (AWEA). Two mentioned (having successfully used this source in the past) they would consult Mother Earth News. Other publications mentioned were Wind Power Digest and newspapers. Three would contact wind machine manufacturers. The "yellow pages" was also mentioned as an information source. Organizations that SWECS Owners would go to included SERI, Northeast Solar Energy Center, state energy offices, and a specific professor at the University of Massachusetts (William Heronemus).

10.3.2 Use of Selected Information Sources

SWECS Owners were asked which of 22 different potential sources of solar information they had used in the past few years. For this question the respondents were not asked if they had obtained information on wind energy systems, but instead were asked if they had obtained any solar information from each specific source. Thus, the question sought to determine which information sources were the most familiar to the respondents. The results for SWECS Owners are graphed in Fig. 10-3. For comparison, the results for Total SHAC Owners/Managers are in Fig. 10-4.

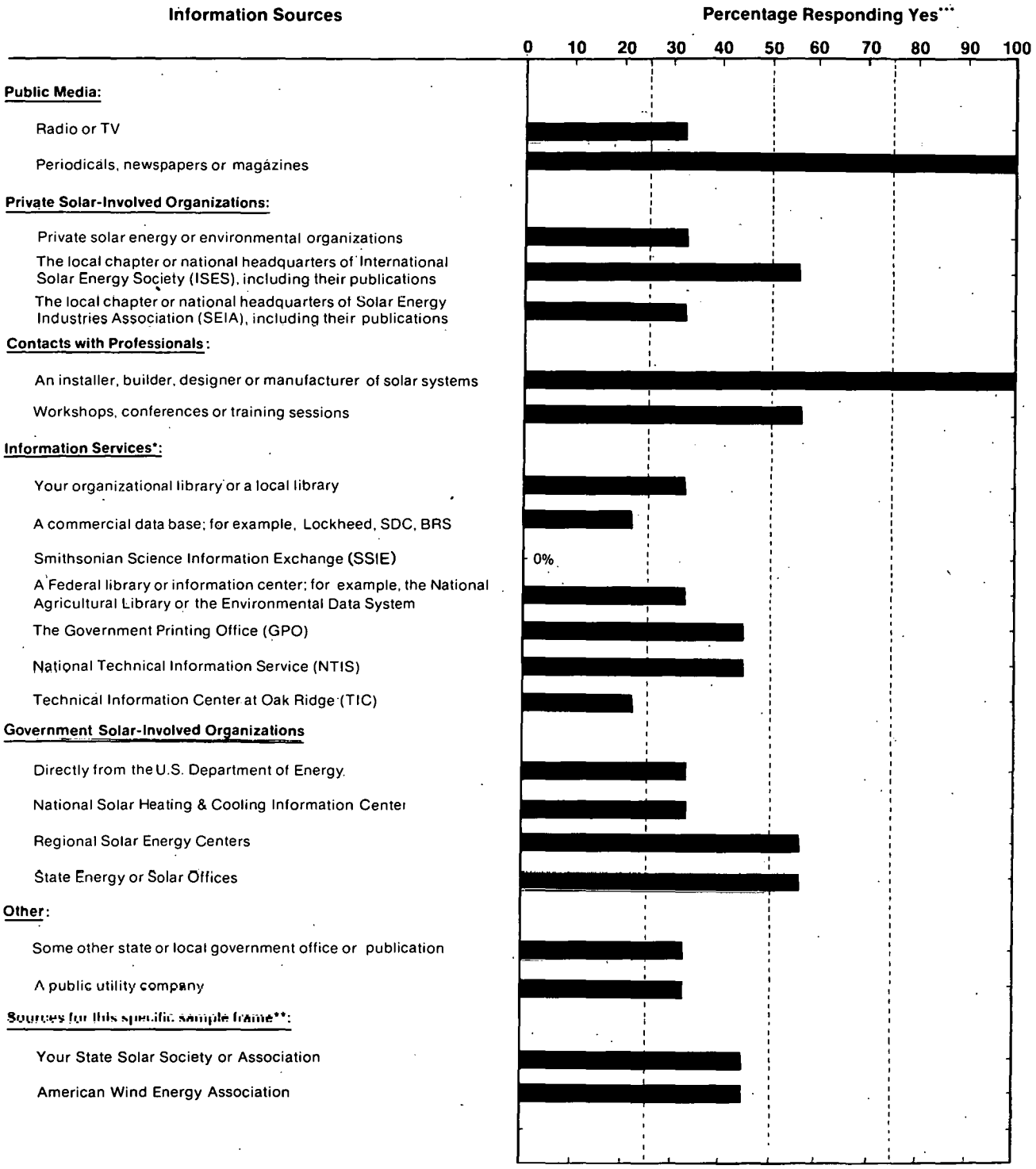
The information sources mentioned by All SWECS Owners were:

- Periodicals, newspapers, or magazines; and
- An installer, builder, designer, or manufacturer.

Other information sources mentioned often were:

- Workshops, conferences, or training sessions;
- Regional Solar Energy Centers (RSECs), and
- State energy or solar offices.

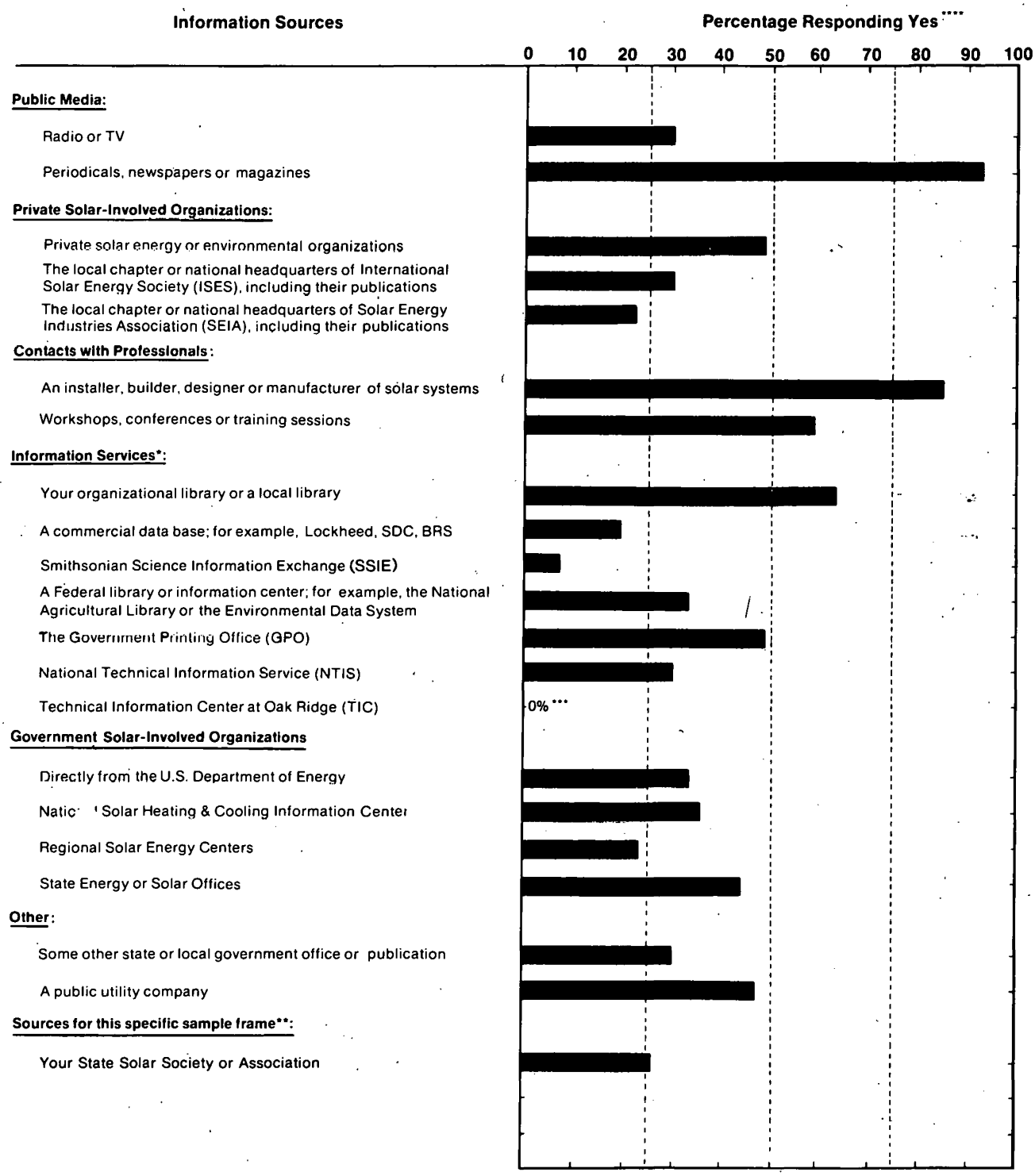
Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** These data are based upon a total of 9 respondents.

Figure 10-3. Use of Selected Information Sources: Small Wind Energy System Owners

Question #11. In the past few years, have you obtained any type of solar information from any of the following sources?



* Services and centers whose primary purpose is to disseminate information.
** Some sample frames were questioned about additional information sources which are applicable to their technology. For example, the manufacturers of biomass conversion equipment were also asked if they have obtained any type of solar information from: "the local or national office of the U.S. Department of Agriculture, including Extension and Forestry."
*** Only asked of SHAC Building Owners/Managers
**** These data are based upon a total of 27 respondents.

Figure 10-4. Use of Selected Information Sources: Total Active Solar Heating and Cooling Owners/Managers

The information sources mentioned least often (no more than 2 respondents had used them) by SWECS Owners were:

- Smithsonian Science Information Exchange (SSIE),
- A commercial data base, and
- Technical Information Center (TIC).

In comparing these results with the results for Total SHAC Owners/Managers, both groups rated contacts with professionals and "periodicals" among the most used sources. The use of RSECs was considerably higher for SWECS Owners (5 of the 9, 56%) than for Total SHAC Owners/Managers (6 of the 27, 22%). Conversely, the SHAC Owners/Managers (17 fo the 27, 63%) more frequently reported using an "organizational or a local library" than did SWECS Owners (3 of the 9, 33%).

10.3.3 Membership in Solar-Interested Organizations

Six of the 9 SWECS Owners were members of a professional, technical, or other organization with an interest in solar energy. These organizations (and the number of times mentioned) included:

- American Association for the Advancement of Science,
- American Society of Heating, Refrigerating and Air Conditioning Engineers, (ASHRAE),
- American Society of Mechanical Engineers (ASME),
- American Society for Testing and Materials,
- AWEA (2),
- British Wind Energy Association,
- International Solar Energy Society (ISES) (4),
- Michigan Solar Energy Association, and
- Rhode Island Solar Energy Association (branch of New England Solar Energy Association).

Of these ASHRAE, ASME, and ISES were also mentioned by Total SHAC Owners/Managers. SWECS Owners used both professional organizations and solar and wind organizations.

10.3.4 Exposure to Publications on Solar Energy

During the past 6 months, 8 of the 9 SWECS Owners had read publications which included information on wind energy. The publications they could specify (and the number of times mentioned) included:

- Alternative Sources of Energy,
- ASME technical papers,
- Co-Evolution Quarterly,

- Mechanical Engineering,
- Mother Earth News (3),
- Popular Science,
- Solar Age (2),
- Solar Energy (2),
- Solar Engineering,
- Time, and
- Wind Power Digest (3).

Also mentioned were several publications that the authors could not verify. These included "Alternate Energy," "Wind Energy Digest," and articles on wind energy. A variety of professional, popular, solar, wind, and alternate energy information sources were mentioned.

10.4 SUMMARY AND COMMENTS

Nine owners of small-scale wind energy conversion systems were interviewed. These systems were used for residential or farm use, including seasonal-use remote cabins. Electricity generation was the primary application, with water pumping also popular. Professions represented among SWECS Owners included retiree, engineer, designer, educator, researcher, and energy consultant.

Seven of these systems were installed more than three years ago. Because of the age of these systems it seems clear that these owners were "early innovators" [3]. As such, these results may not be typical for the potential purchaser of a small wind energy conversion system.

SWECS Owners assigned the greatest utility to information on:

- Costs of installing and operating a wind energy system compared to a conventional system;
- Wind energy system design handbooks, installation handbooks, or reference tables;
- Cost and performance of wind energy conversion systems;
- Climatalogical data;
- Lists of sources for information on wind energy conversion systems; and
- Tax credits, grants, or other economic incentives for wind energy applications.

Relatively low utility was attributed to "marketing statistics," institutional, social, environmental, and legal aspects," "computer models," "educational institutions," "standards, specifications," and "expected major developments."

All SWECS Owners had obtained solar information from "periodicals, newspapers, or magazines" and "an installer, builder, designer, or manufacturer." "Workshops, conferences, or training sessions," RSECs, and state energy or solar offices were also popular

sources for information. All SWECs Owners were also likely to be members of a professional or solar organization which provided them with information; they had read a variety of professional, popular, and solar periodicals. Compared to some other solar system users like Passive Homeowners and SHAC Homeowners, however, they used very few information sources.

SECTION 11.0

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APPENDIX A
GROUPS INCLUDED IN STUDY

The following table (Table A-1) lists the 86 groups included in this study of solar information users. Major headings are the same as those of individual reports. Ten separate reports analyzing the study results by technology will be issued.

In general, results for each group are reported in only one volume, although comparisons to similar groups in other technologies are often part of the analysis. There are two exceptions: the results for Concentrating Collector Manufacturers are discussed in both the Solar Thermal Electric Power and the Industrial and Agricultural Process Heat reports; the results for Nonconcentrating Collector Manufacturers are discussed in both the Active Solar Heating and Cooling and the Industrial and Agricultural Process Heat reports.

Table A-1. GROUPS STUDIED

A. PHOTOVOLTAICS

1. DOE-Funded Researchers
2. Non-DOE-Funded Researchers
3. Researcher Manufacturers
4. Manufacturers
5. Electric Power Engineers
6. Utilities
7. Educators

B. PASSIVE SOLAR HEATING AND COOLING

1. Federally Funded Researchers
2. Manufacturers
3. Architects
4. Builders
5. Educators
6. Cooperative Extension Service (CES) County Agents
7. Homeowners with Passive Systems

C. ACTIVE SOLAR HEATING AND COOLING

1. DOE-Funded Researchers
2. Non-DOE-Funded Researchers
3. Heating and Cooling System Manufacturers
4. Water Heating System Manufacturers
5. Nonconcentrating Collector Manufacturers (see also Industrial and Agricultural Process Heat)
6. Other Component Manufacturers
7. Distributors
8. Installers

Table A-1. GROUPS STUDIED (Continued)

9. Architects
10. Builders
11. Planners
12. Heating, Ventilating, and Air Conditioning Engineers
13. Industrial Engineers
14. Utilities
15. Educators
16. CES County Agents
17. Homeowners with Space Heating Systems
18. Homeowners with Water Heating Systems
19. Owners/Managers of Buildings (with SHAC Systems)

D. BIOMASS ENERGY

1. Federally Funded Researchers in Production and Collection
2. Federally Funded Researchers in Conversion
3. Nonfederally Funded Researchers in Production and Collection
4. Nonfederally Funded Researchers in Conversion
5. Production and Collection Equipment Manufacturers
6. Conversion Equipment Manufacturers
7. State Forestry Offices
8. Private Foresters
9. Forest Products Engineers and Consultants
10. Educators
11. CES County Agents
12. Owners/Managers of Biomass Systems

E. SOLAR THERMAL ELECTRIC POWER

1. DOE-Funded Researchers

Table A-1. GROUPS STUDIED (Continued)

2. Non-DOE-Funded Researchers
3. Concentrating Collector Manufacturers (see also Industrial and Agricultural Process Heat)
4. Electric Power Engineers
5. Utilities
6. Educators

F. INDUSTRIAL (IPH) AND AGRICULTURAL (APH) PROCESS HEAT

1. IPH Researchers
2. APH Researchers
3. Concentrating Collector Manufacturers (see also Solar Thermal Electric Power)
4. Nonconcentrating Collector Manufacturers (see also Active Solar Heating and Cooling)
5. Plant Engineers (IPH)
6. Industrial Engineers (IPH)
7. Private Agricultural Engineers (IPH)
8. Educators (IPH)
9. State Agricultural Offices (APH)
10. CES County Agents (APH)

G. WIND ENERGY

1. DOE-Funded Researchers
2. Non-DOE-Funded Researchers
3. Manufacturers
4. Distributors
5. Wind Engineers
6. Electric Power Engineers
7. Utilities

Table A-1. GROUPS STUDIED (Concluded)

8. Educators
9. CES County Agents
10. Small Wind Energy System Owners

H. OCEAN ENERGY SYSTEMS

1. DOE-Funded Researchers
2. Non-DOE-Funded Researchers

I. SOLAR ENERGY STORAGE

1. DOE-Funded Researchers
2. Non-DOE-Funded Researchers

J. GENERAL SOLAR

1. Loan Officers
2. Real Estate Appraisers
3. Tax Assessors
4. Insurers
5. Lawyers
6. Nonsolar Utilities
7. Public Interest Groups
8. CES State Agricultural Specialists
9. CES State Information Specialists
10. State Energy/Solar Offices (Western SUN states)
11. State Energy/Solar Offices (MASEC states)
12. State Energy/Solar Offices (NESEC states)
13. State Energy/Solar Offices (SSEC states)

APPENDIX B
STUDY DEVELOPMENT AND PROCEDURE

This appendix describes several aspects of the way in which the studies were developed and conducted.

FACTORS IN STUDY DESIGN

Studies of 86, groups each interested either in one of nine specific solar technologies or in solar energy in general, provided an extremely broad view of the information needs of the solar community. Although the sample size of nine respondents per group was small, the data still proved to be quite adequate for planning purposes. It was possible to determine which information was the most important to the respondents and what was the best channel for disseminating that information. There were a number of valid statistical tests that could be made, both to compare the priorities a group gave to different information items and to compare the priorities different groups gave to the same item.

Several major factors resulted in the decision to conduct a study with these characteristics. First, there were very few data available on the information needs and information-acquiring activities of the various segments of the solar community, and those data that did exist were related almost exclusively to the area of active solar heating and cooling (SHAC). Many people had strong opinions as to which information products should be developed first, but data obtained directly from the information users was virtually nonexistent. Due to this general lack of information, most of the potential users of the findings of these studies could not define highly specific questions that they needed to have answered by these studies. Instead, baseline data was needed. It did not make sense to ask a researcher detailed questions on whether he needed a calendar of solar events to be updated monthly or updated quarterly, when no one knew whether he even needed calendars at all. Thus, the lack of baseline data dictated that most of the potential users of study findings framed their questions at the level of "What information do you need the most?" For such a level of questions there was obviously no great need to use large sample sizes to obtain extremely precise, quantitative answers. Since qualitative data would be quite adequate, there was no need for a large sample size.

Further, there was a need to obtain this baseline data as rapidly as possible so that real-time programmatic decisions about development of information products and data bases could be based upon data rather than conjecture. As a result, the decision was made to conduct the studies by telephone in an attempt to speed up the data collection process. Interviewing by telephone also had the result of improving the response rates (over those using a mail questionnaire).

Thus, these factors dictated the final study design: a broad-based study (the final number of groups included, 86, was determined primarily by the number of meaningful sample frames that could be constructed) to collect qualitative data by obtaining completed telephone interviews, with approximately nine randomly selected respondents from each of the 86 groups being interviewed.

Impact on Questionnaires

As a result of using telephone interviews to conduct the studies, it was necessary to limit the number of questions to be asked. Telephone interviews had to be kept relatively short (preferably under 20 minutes) to keep the respondents from prematurely terminating the interview. Even if a respondent did not hang up in mid- questionnaire, his attention span could be tried severely by lengthy interviews; respondents would then answer

questions without much thought in order to terminate the interview as rapidly as possible. In the final study the interviews took an average of about 18 minutes to complete (with a range from 10 minutes to 50 minutes) and incorporated very simple question formats, sometimes open-ended questions. For each of the 86 studies a separate and distinct sample frame, letter of introduction, and questionnaire were developed and separate computer runs and analyses were performed.

Perhaps a more important effect of deciding to do a telephone study was the necessity of using interviewers without solar backgrounds to conduct the study. With almost 800 interviews to be conducted, each requiring an average of 35 to 40 minutes to complete an 18 minute interview (due to callbacks, referrals, busy signals, wrong numbers, etc.), there was too much effort required to conduct the interviews using internal staff. Thus, the effort had to be contracted. The choice was whether to conduct the interviews by contracting solar experts (who would not know anything about interviewing techniques) or by contracting a professional telephone interview firm (whose interviewers would not know anything about solar energy). Due to the significantly lower cost and to the significantly reduced chance of biasing the responses, it was decided to use a professional telephone interview firm.

As a consequence of this decision, there were some problems caused by using nonsolar interviewers to pose questions of solar experts. If a respondent asked for a question to be clarified, the interviewer could not assist. Instead, the interviewer could only repeat the question. The biggest problem involved the open-ended questions. Sometimes the interviewer simply did not understand what the respondents were talking about. Interviewers were briefed in solar terminology and instructed to ask respondents to spell out words the interviewers did not understand. Nevertheless, some of the verbatims (i.e., quotes from the respondents that were copied down verbatim by the interviewers) were not intelligible. For example, one interviewer recorded "small square train feeders" when the respondent really said "small-scale terrain features," another recorded "nel lenses" instead of "Fresnel lenses." To minimize errors in translation, all of the questionable verbatim items listed in this report were reviewed and verified by Solar Energy Research Institute (SERI) technical experts. However, based upon listening to live interviews and comparing the results to the verbatims, usually the interviewers were able to transcribe the salient points of the responses.

Impact on Statistical Characteristics

The sample size of nine respondents per group was limiting for the analyst. To illustrate the lack of precision in the results, if five of the nine respondents answered "yes" to a particular question, there was a 95% chance that the true proportion saying "yes" was between 0.212 and 0.862. Obviously, this was an extremely wide confidence interval. For such a small sample size, it was not feasible to make national estimates (e.g., the number of DOE-funded wind researchers in the country who need bibliographies), and it was not meaningful to construct cross-classification tables (e.g., "type of information needed" versus "degree of informedness"). Because of these small sample sizes, the authors were sometimes forced to propose hypotheses rather than draw conclusions.

Nonetheless, the results were extremely useful when taken as qualitative, baseline results. Certain statistical tests could still be performed (see Appendix E). One could test whether Wind Researchers wanted "state-of-the-art" information significantly more than they wanted "marketing statistics." Several tests could be made comparing one group with another. Thus, one could test whether Passive Architects wanted cost data significantly more than did SHAC Architects. This type of a comparison usually highlighted basic differences between technologies. One could also test whether Wind Researchers responded differently from All Researchers.

Comparisons of this type were valuable for several reasons. First, they allowed the comparison of the information needs of a relatively unknown group against those of a more familiar group. For example, the information needs of Wind Manufacturers were easier to understand when compared to the more familiar information needs of SHAC Manufacturers.

Second, if one can establish basic similarities in information habits and the types of information needed, it will eventually become possible to use the results of other information science studies. For example, many studies have detailed the types of information researchers need and the ways of getting information to them. Thus, if Wind Researchers were quite similar in needs to All Researchers, it was an indication that many of the well-known findings for researchers in general may also apply for Wind Researchers.

STUDY DEVELOPMENT

There were several tasks which had to be completed before the studies could be conducted. These tasks are described in the following subsection.

Development of Sample Frames

Sample frame development was the single most difficult, time-consuming task in the entire study. As discussed in Section 2.2, the initial attempt was to obtain lists of the names, addresses, and phone numbers of members of as many meaningful groups as possible. A total of about 86 such sample frames was the maximum that could be developed adequately within a reasonable amount of time.

The services of reference and research librarians were used in this process, much of it on a subcontractor basis. Over 200 documentary sources (printed, published, and unpublished sources, and data bases) were consulted. Staff searched the Solar Energy Information Center and Denver-area public and academic libraries to examine directories, catalogs, periodicals, and data bases. Directories of professionals, organizations and associations, and solar-related individuals and groups were examined, both to obtain sample frames and to obtain individual names. Periodicals were searched both to identify associations whose members might be eligible for sample frames and to identify authors who could be contacted because they represented certain target groups. Various data bases were identifed which contained names of individuals, categorized by sample frame categories (e.g.; educators, researchers, manufacturers). Lists of conference attendees were accumulated. Sample frames were also constructed by establishing numerous personal contacts with professional, technical, and special interest organizations; with authors of solar articles; technical staff at SERI; federal offices; publishers; solar groups; at least thirty state solar and state energy offices; etc.

Both the Mid-American Solar Energy Complex (MASEC) and the Northeast Solar Energy Center were subcontracted to provide additional names and addresses. Western SUN also provided many names on a voluntary basis. The Southern Solar Energy Center was asked to participate on either a contractual or a voluntary basis, but declined. Additionally, the Technical Information Dissemination (TID) program subcontracted a consulting firm to develop lists of members of the solar community. Although the resulting lists were significantly smaller than had been anticipated, they provided valuable backup information for some sample frames. The National Solar Heating and Cooling Information Center provided several of the data bases and other lists used.

It sometimes occurred that the person contacted was not in the presumed field; for example, an installer was no longer involved with solar energy. The proportion of the time that this or a similar sample-frame error occurred has been calculated for each group and is included in the section documenting the results for the group. Sample frame error included such factors as no known telephone number, individual not in the specific field or specified employment sector, etc. Averaging over all groups, 20%-25% of the candidates in the sample frames were no longer valid.

Pilot Testing

In August 1979 Market Opinion Research (MOR) conducted a pilot test by doing telephone studies of 10 groups (9 respondents for each). The groups were:

- Wind: Engineers,
- Wind: County Extension Agents,
- Active Solar Heating and Cooling: DOE-Funded Researchers,
- Active Solar Heating and Cooling: Installers,
- Active Solar Heating and Cooling: Utilities,
- Active Solar Heating and Cooling: Educators,
- Active Solar Heating and Cooling: Commercial Building Owners,
- Passive Solar Heating and Cooling: Equipment Manufacturers,
- Solar Industrial Process Heat: Industrial Engineers, and
- General Solar Energy: Lawyers.

These groups were selected specifically to test a range of questionnaires, the peculiarities of selected sample frames, and the receptiveness of certain target groups to telephone interviews on solar energy. The persons contacted in the pilot were not contacted in the full study.

The pilot test proved very useful. There were no major revisions resulting, but several refinements improved the interview procedure and the questionnaire content and format. The interviews were completed within a reasonable time, an average of about 18 minutes per interview. The most important finding of the pilot test was the enthusiasm of the respondents for solar energy. Most respondents were very cooperative and were excited about receiving solar information. Because of this attitude, interviewers had no difficulty in getting respondents through long lists of information products and sources or in keeping respondents on the telephone to finish the interview.

SERI personnel visited MOR while the pilot test was being conducted, personally participating in monitoring interviews, reviewing tape recordings of previously conducted interviews, and debriefing interviewers. Based upon these inputs, several changes were made in the basic questionnaire concept, resulting in changes for each of the 86 distinct questionnaires. Among these changes were: addition of a question designed to defuse the respondent by allowing expression of the respondent's individual concerns; deleting two questions which were not working; changing the sequence of a few questions; making a few small wording changes to sharpen questions; and changing MOR's suggested questionnaire format in order to minimize interviewer errors.

Upon realizing that there was more sample frame error than had been anticipated, the screening procedure was revised to a double screening procedure. Only people who said they needed solar information within the next year, and who were truly in the proper group (e.g., "an engineer doing work on wind energy conversion systems") were to be interviewed. The rules for handling referrals were revised to allow interviews with intraorganizational referrals only.

Perhaps the most important change was in the interviewer training procedure. More specific instructions were developed for each question so that the interviewers would know the real point of the question, would ask the question properly, and would know what to emphasize. Lists of words being mispronounced by the interviewers were developed. Specific interviewers with pronunciation problems were singled out for additional coaching. Because of the interviewers' lack of familiarity with solar energy terminology, glossaries and other background information on solar energy were provided to interviewers.

Interviewer Training and Monitoring

The MOR interviewers used for these studies were all experienced interviewers. They went through three separate training sessions: a pilot test briefing, a pilot test debriefing (with question and reaction session), and a full study briefing. The full study briefing was held in four separate sessions so that the interviewers could be trained in small groups. SERI representatives were present for and assisted with the second two sessions.

These training sessions covered the purpose of the study, question wording, recording procedures, the screening procedure, and pronunciation of unfamiliar words. The training was built around the use of an annotated briefing questionnaire. Notes concerning each question were written on a questionnaire which the interviewer studied during the briefing. Additional written materials covered included a list of solar energy terms, a list of common solar acronyms, and a list of words for pronunciation reminders.

Randomized Selection of Respondents

Once the sample frames were developed for each group, a random sample of 30 to 40 potential respondents was drawn by systematic sampling. (If the sample frame for a group only had 30 to 40 names in the beginning, this step was omitted.) These reduced sample frames were then forwarded to MOR. At MOR, these randomly selected names were put through a second randomization process which assigned the order in which these names were to be called. The MOR process used systematic sampling to identify the first 9 candidates for interviewing: the total number of potential candidates was divided by 9 to obtain "i," the "skip interval." Starting from a random point (R), every i^{th} name then became one of the first 9 candidates.

An initial call and up to two callbacks (at different times of day on different days of the week) were made, attempting to reach each designated respondent. If an interview was not completed after three attempts, the interviewer took the questionnaire to the interviewing supervisor. The supervisor then designated the next person in the sequence as the substitute candidate: if the $(R + i)^{th}$ person could not be reached, the $(R + i + 1)^{th}$ became the replacement candidate. If after three attempts to reach the substitute, no interview was completed, this process was repeated. (This time the $(R + i + 2)^{th}$ person would become the candidate, etc.) For the entire study, 54% of the completed interviews were with the originally designated respondent and 26% were with the first substitute. The remainder were completed with a second or higher substitute.

There is evidence that for some sample frames MOR did not use a random starting point to commence the skip interval, but instead used the sequence of 1^{st}, $(1 + i)^{th}$, $(1 + 2i)^{th}$, etc. names for initial candidates. Such a practice clearly does not conform to professional standards. This practice was not critical in those of the sample frames with a large initial size or no particular order, since SERI did a valid random subsampling to reduce the sample size to 30 or 40. In small sample frames or in frames with a definite pattern, however, this procedure could have caused biases. All seven of the Cooperative Extension Service (CES) sample frames were arranged in a state-by-state order. As a result of not randomly changing the starting point, there was a tendency towards sampling from the same states for these sample frames. The final distribution of CES respondents by state is shown in Table B-1. Some clustering did occur for some states. Thus, for these groups results were geographically biased.

STUDY PROCEDURE

The procedure was the same for each study. Each of the potential respondents was sent a letter of introduction one to three weeks before they were telephoned (see Appendix C). This letter explained that the person was selected as a candidate and may be called by MOR, that MOR was calling for SERI, the purpose of the call, the type of information being sought, and that the respondent's identity would be kept confidential.

The telephone interviews were conducted in one of MOR's two telephone rooms, with each individual interviewer in an acoustically insulated booth. Throughout the study, interviews were monitored by MOR's phone room supervisors. They were responsible for randomly listening to interviews to determine whether the operators were conducting the interviews correctly. If mistakes were being made, the supervisor explained the proper procedure to the interviewer. The supervisors were able to monitor calls without the interviewers knowing they were being monitored.

Candidates were telephoned during business hours (except for homeowners who were called during the early evening and weekends). If the interview candidate could not be contacted in the initial call, as many as two additional callbacks were made. These callbacks were made at different times of the day and on different days of the week. If no interview was completed after three attempts, a substitute candidate replaced the initial candidate and the process started over. If a secretary indicated the candidate would be in later at a specified time and day, the callback was scheduled correspondingly. If a candidate was too busy to talk when initially contacted, an appointment was made to call back at a specified time. Only 3% of the candidates contacted refused to be interviewed or terminated the interview before it was completed. Once a candidate was contacted, a screening procedure was used to verify that the respondents being interviewed actually represented the group to which they ostensibly belonged. For example, a respondent who was presumably an educator teaching courses in wind was read the following statement at the beginning of the interview:

> Hello (respondent's name). This is (interviewer's name) of Market Opinion Research. A week or so ago you were sent a letter from the Solar Energy Research Institute describing a survey of solar energy information needs and requesting your participation.
>
> Your name has been provided to us as someone who has been teaching courses related to wind energy conversion. Is that correct?

Table B-1. COOPERATIVE EXTENSION SERVICE (CES): STATES REPRESENTED IN SAMPLES (Number of respondents)

State	County Agents						State Specialists			All CES
	Biomass	Wind	APH	Passive	Active	Total	Info.	Agri.	Total	
Alabama	-	1	-	1	-	2	-	-	-	2
California	-	1	-	-	-	1	-	-	-	1
Colorado	-	1	-	-	1	2	-	-	-	2
Connecticut	-	-	-	-	-	-	1	-	1	1
Delaware	-	-	-	-	-	-	-	1	1	1
Georgia	-	-	-	1	-	1	-	-	-	1
Idaho	-	-	1	-	-	1	1	1	2	3
Illinois	-	1	-	-	-	1	-	-	-	1
Indiana	2	1	-	1	1	5	-	-	-	5
Iowa	-	1	-	-	-	1	-	-	-	1
Kansas	-	-	2	-	1	3	-	-	-	3
Kentucky	-	1	-	1	-	2	1	1	2	4
Louisiana	-	-	-	-	-	-	1	-	1	1
Maryland	1	-	-	-	-	1	-	-	-	1
Michigan	-	1	-	-	-	1	1	1	2	3
Minnesota	-	-	-	1	1	2	-	-	-	2
Missouri	-	1	-	-	-	1	-	-	-	1
Montana	1	-	-	-	1	2	-	-	-	2
Nebraska	-	-	1	1	1	3	1	1	2	5
New Mexico	1	-	-	-	-	1	-	-	-	1
New York	-	-	-	-	-	-	1	1	2	2
N. Carolina	-	-	1	1	-	2	-	-	-	2
Ohio	1	-	-	-	1	2	-	-	-	2
Oklahoma	-	-	1	-	-	1	1	-	1	2
Oregon	1	-	-	-	-	1	-	-	-	1
S. Carolina	-	-	-	-	-	-	-	1	1	1
S. Dakota	-	-	1	1	1	3	1	-	1	4
Tennessee	1	-	1	1	-	3	-	-	-	3
Texas	1	-	1	-	1	3	-	1	1	4
W. Virginia	-	-	-	-	-	-	-	1	1	1
Sample Size by Technology	9	9	9	9	9	45	9	9	18	63
Total States Represented	8	9	8	9	9	24	9	9	13	30[a]

[a]States not represented in any CES samples are: Arizona, Arkansas, Florida, Maine, Massachusetts, Mississippi, Nevada, New Hampshire, New Jersey, North Dakota, Pennsylvania, Rhode Island, Utah, Vermont, Virginia, Washington, Wisconsin, and Wyoming. Alaska and Hawaii were not included in the sample frame.

If the respondent answered "yes," the interview continued. If the respondent answered "no," then the respondent was not interviewed but instead was asked if there was another person within the same university who was teaching courses related to wind. If the initial candidate could give the name of another person, the referral person (or "referral") was called as a substitute for the initial candidate. If no intraorganizational referral was given, another candidate was telephoned.

A second screen was used to eliminate those people who did not feel they would be needing information in the near future. For example, wind respondents were asked the following two questions:

- In the next year do you expect to need information on wind systems for your job?
- In the next year do you expect to need information on wind systems outside your job?

For all respondents other than SWECs Owners, these questions were asked at the beginning of the interview, and if the answer to both questions was "no," the interview was terminated and a substitute candidate telephoned. No request for a referral was made.

Once an interview was completed, the questionnaire was reviewed for completeness by the phone room supervisor. Incomplete questionnaires were returned to interviewers to recall the respondents.

Completed questionnaires were forwarded from the phone rooms to the Coding Department where they were checked in and assigned a unique identification number. They were subsequently sent to the Data Entry Department where they were keyed directly into computer data files. Since no computerized editing system could prevent the incorrect entry of a data value that was within the proper range (e.g., entering a "3" when the correct number was a "2" but where the numbers "1," "2," "3," and "4" are all valid numbers), SERI did a random sample of supposedly correct values to verify that they were correct. Out of 225 allowable values reviewed, only 1 had been incorrectly entered. Once the data were entered on the computer file, data tables were printed and analyzed.

Nonuniform Group Sample Size. The study was originally designed to sample nine respondents from each group. For most groups this was done correctly. Upon analysis of the completed questionnaires, however, it was sometimes apparent that a respondent obviously belonged in a group other than the one in which originally sampled. This was generally due to two simultaneous errors: a sample frame error and a screening error.

First, the person was included on the wrong sample frame. For example, a person listed as doing non-DOE-funded research could have received DOE funding after the sample frames were completed. Second, the screening process did not successfully remove this person from the Non-DOE-Funded Researchers; instead the interview was completed. During the interview the respondent mentioned that he was receiving DOE funds for his research. As a result the analyst received eight interviews completed with Non-DOE-Funded Researchers and one completed with a DOE-Funded Researcher.

For such cases, the dissimilar interview was removed from the original group (in the example above, the Non-DOE-Funded Researchers). If there was another group into which that interview naturally fit (above, the DOE-Funded Researchers), the interview

was included with the interviews for the second group. Although the added interview did not have exactly the same probability of selection as did the original interviews, the resulting inaccuracy was minimal given the qualitative nature of the data.

APPENDIX C
LETTER OF INTRODUCTION

All potential respondents from the initial sample frames were sent the following letter (see Fig. C-1) from one to three weeks prior to being contacted by telephone. There are three phrases (underlined in this example) which were changed to describe the group and the solar technology. For example, "a researcher" was changed to read "a manufacturer" or "an educator," etc., as appropriate for the specific sample frame. Similarly, "passive solar heating and cooling" read "photovoltaics" or "wind energy systems," etc., according to the technology about which this potential respondent was to be interviewed. About 3,500 such letters were mailed over a period of several weeks. Less than 100 were returned as undeliverable.

It should be noted that in cases where the actual respondent was a referral, the respondent had not necessarily received this letter.

There were numerous telephone calls to SERI from people who had received this letter. Most volunteered they were eager to participate (and concerned that they had not yet been called) or that they wanted study results. A few volunteered referrals or gave the best times for them to be called.

September, 1979

Dear Colleague:

The Solar Energy Research Institute (SERI) is currently developing a Solar Energy Information Data Bank (SEIDB). The SEIDB is designed to include many categories of solar information and will serve the needs of a variety of groups: among them, researchers, manufacturers, architects, builders, lawyers, and homeowners. Services provided to you by the SEIDB may include an inquiry response service, computer access to models or large sets of data and free brochures, handbooks, etc.

The U.S. Department of Energy has defined solar energy as encompassing technologies which involve both direct and indirect uses of sunlight; information for all of the following technologies will be included in the SEIDB:

Solar heating and cooling (active)
Solar heating and cooling (passive)
Solar agricultural process heat
Solar industrial process heat
Wind energy conversion systems
Biomass energy systems
Photovoltaics (direct conversion of sunlight to electricity)
Ocean energy systems
Solar thermal electric power
Solar energy storage

So that this data bank can be developed to meet your present or future solar information needs, SERI is surveying information users like yourself. You have been selected as a candidate for this interview because you are a researcher with an active or potential interest in passive solar heating and cooling.

We believe your participation in this survey will be beneficial to you and to the country. If called, you will have an opportunity to express your opinions and to define your solar information needs. This will help us ensure that the data bank will be responsive to the needs of researchers as well as those of other groups.

Market Opinion Research of Detroit, Michigan, has been chosen to conduct this survey for SERI. A trained interviewer may contact you within two weeks to interview you. The telephone interview will last no more than 20 minutes. You can be assured that your responses to this survey are strictly confidential. No names will be used in reporting the results.

If you have questions about this survey, its purpose, or the interview methods to be used, please feel free to contact me at (303) 231-1155. Thank you for your assistance.

Sincerely,

Barbara L. Wood

Barbara L. Wood,
Staff Market Research Information Specialist,
Information Dissemination Branch,
Information Systems Division

Figure C-1. Letter of Introduction

APPENDIX D
STUDY QUESTIONNAIRE


SERI

A different questionnaire was developed for each distinct group in this study. These questionnaires were very similar, however, in that the same type of information was being sought from each of the groups. The individual questionnaires were developed by constructing a core questionnaire, then making appropriate revisions, additions, and deletions to produce a distinctly tailored questionnaire for each group.

Two sample questionnaires are provided in this appendix. A version of the first (Fig. D-1) was used for all samples except for users of solar systems (homeowners, building and plant owners/managers and wind system owners.) The second (Fig. D-2) was used only for users. The basic difference is that phraseology was changed for users so that their queries were related to information about the period of time their system was being considered for purchase or was under construction. The question numbering system for the user questionnaires follows that of the standard core questionnaire although the sequence does not. For example, question B1-6a of the user questionnaire is similiar to question 6a of the standard core questionnaire.

The questionnaires used in the wind technology study were very similar to those used for the other studies. The two instruments which follow (see Figs. D-1 and D-2) contain references to wind technologies in Questions 1 through 9. Questionnaires that were used for respondents from other technologies substituted references to their appropriate technologies instead of to wind technologies.

Certain variations were made in the wind technology questionnaires for different wind technology groups in Questions 8a, 8b, and 11, in that certain items were not asked of groups if the item seemed inappropriate. For example, Wind Researchers were not asked Question 8a (11) about "how to market," and Wind Distributors were not asked Question 11 (7) about Smithsonian Science Information Exchange (SSIE). While it would have been less complicated to have all questions asked of all respondents, concern over questionnaire length and the desire to avoid asking questions that were not relevant to the group led to deleting questions wherever possible. Questions that were not asked of each group may be noted in the data tables (Appendix F) whenever an individual group shows no entries for that item. (Variations for user questionnaires are addressed below.)

Slight variations in wording were made on the questionnaire of each individual group. For example, in Question 11(18), which asked if information had been obtained from "an installer, builder, designer, or manufacturer," the phrase "outside of your organization" was inserted for Wind Manufacturer Representatives.

Standard Core Questionnaire

Question 5. This question asked, "What is the most important information that could be provided to you about wind energy?" This question allowed respondents to volunteer the information need that came to mind spontaneously, without reflecting any of the biases of the questionnaire designers as to what was the most important. Most of the time, however, it did not result in an answer which could be compared to another respondent's answer; for nine respondents, there were typically seven or eight distinct answers given. Since each respondent did not rate these items, it was impossible to determine which of these information needs was the most important. Afforded a second thought, respondents often gave items they had mentioned as "most important" in Question 5 a lower rating in Question 8 than they gave to items that they had not even mentioned in Question 5. As a result, the data from Question 5 could not provide a valid measurement of the most important information items which could be provided to the respondent. There-

Cd 1

1. In the next year do you expect to need information on wind energy. . .

(a) For your job?	Yes.	1	(IF "YES" TO EITHER CONTINUE. OTHERWISE TERMINATE)
	No.	2	
	Don't know. . . .	8	
	NA.	9	
(b) Outside of your job?	Yes.	1	31
	No.	2	
	Don't know. . . .	8	32
	NA.	9	

2. To what extent are you currently involved with wind energy systems? Would you say you are:

Very involved.	4
Moderately involved or	3
Slightly involved.	2
Not at all involved (VOLUNTEERED) .	1
Don't know.	8
NA.	9

33

3. What are you doing in the field of wind energy conversion systems? (ASK AS OPEN END)

Verb.

4. How well informed would you say you are about wind energy systems? Would you say you are:

Very informed.	4
Moderately informed or	3
Slightly informed.	2
Not at all informed (VOLUNTEERED). .	1
Don't know.	8
NA.	9

34

5. What is the most important information that could be provided to you about wind energy systems? (INTERVIEWER: THIS INCLUDES INFORMATION WHICH COULD BE PROVIDED BY AN INFORMATION CENTER)

1st mention

35 C+V

2nd mention

36-42 Blk

Figure D-1. Questionnaire

Cd 2
1-10 as 1
11-17Blk

6. For which of the following areas of wind energy systems are you particularly interested in obtaining information? [READ LIST. CIRCLE ONE RESPONSE PER ITEM.)

	Yes	No	Don't Know	NA	
(1) Small scale wind systems	1	2	8	9	18
(2) Medium or large scale systems (100 kilowatts or more)	1	2	8	9	19
(3) Large scale multi-use systems	1	2	8	9	20
(4) Rotary equipment	1	2	8	9	21
(5) Towers	1	2	8	9	22
(6) Control equipment	1	2	8	9	23
(7) Electrical equipment	1	2	8	9	24

25-75Blk
76 Cd #
77-80 Job#

Are there any other areas of wind energy for which you are especially interested in obtaining information?
(SPECIFY)

Cd 3
1-10 as 1
11-43 Blk

(1st Mention) _____

(2nd Mention) _____

44 C+V
45-51 Blk

7. What publications have you read in the past six months that include information on wind energy?

None. 001

Read, but can't remember titles (VOLUNTEERED) 002

Read too many to name (VOLUNTEERED) 003

(ASK) Which are most important? (RECORD TITLES)

Names publications (RECORD TITLES) 004

52-54

1st Mention _____

2nd Mention _____

3rd Mention _____

CL

55-75 Blk
76 Cd #
77-80 Job #

Figure D-1. Questionnaire (continued)

Cd 1

8a. I will read a list of potential information products on wind energy. For each, please tell me how useful that information would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful? (READ LIST. ROTATE. CIRCLE ONE RESPONSE PER ITEM)

		Essential	Very Useful	Somewhat Useful	Not at all Useful	Don't know	NA	
(1)	A bibliography of general readings on wind energy systems. . . .	4	3	2	1	8	9	43
(2)	A list of sources for information on wind energy systems. . . .	4	3	2	1	8	9	44
(3)	A calendar of upcoming wind energy systems conferences and programs. .	4	3	2	1	8	9	45
(4)	Diagrams or schematics of a wind energy conversion system. . . .	4	3	2	1	8	9	46
(5)	A non-technical description of how a particular wind energy conversion system works.	4	3	2	1	8	9	47
(6)	A technical description of how a particular wind energy conversion system works.	4	3	2	1	8	9	48
(7)	Lists of local lenders, insurers, builders, engineers, installers or distributors for wind systems. . .	4	3	2	1	8	9	49
(8)	Wind system design handbooks, installation handbooks, or reference tables. . .	4	3	2	1	8	9	50
(9)	A list of technical experts in wind energy conversion	4	3	2	1	8	9	51
(10)	Manual methods for sizing and predicting the engineering performance or life cycle costs of wind energy conversion systems. . . .	4	3	2	1	8	9	52
(11)	Computer models for sizing and predicting the engineering performance or life cycle costs.	4	3	2	1	8	9	53

Figure D-1. Questionnaire (continued)

Cd 1
54 B

8b. I will next read a list of types of information on wind energy: for each, please tell me how useful information of that type would be to you. Would the following be: essential, very useful, somewhat useful, or not at all useful? (READ LIST. ROTATE. CIRCLE ONE RESPONSE PER ITEM).

		Essential	Very Useful	Somewhat Useful	Not At All Useful	Don't Know	NA	
(1)	Educational institutions and other organizations offering courses on wind energy conversion systems. . .	4	3	2	1	8	9	55
(2)	Wind energy research currently in progress. . . .	4	3	2	1	8	9	56
(3)	The state-of-the-art in wind energy conversion systems. . . .	4	3	2	1	8	9	57
(4)	Costs and performance of wind energy system installations. . . .	4	3	2	1	8	9	58
(5)	Costs of installing and operating a wind system compared to a conventional system.	4	3	2	1	8	9	59
(6)	Local building codes or other regulations affecting siting or installation of wind energy conversion systems. .	4	3	2	1	8	9	60
(7)	Tax credits, grants, or other economic incentives for wind systems. . .	4	3	2	1	8	9	61
(8)	Standards, specifications, or certification programs for wind equipment and installations. . . .	4	3	2	1	8	9	62
(9)	Marketing statistics and sales projections for wind energy conversion equipment	4	3	2	1	8	9	63
(10)	Wind energy programs, research, industries and markets outside the United States.	4	3	2	1	8	9	64
(11)	Information on how to market and sell wind energy conversion systems, including guidelines on obtaining financial support. . .	4	3	2	1	8	9	65
(12)	Institutional, social, environmental, and legal aspects of wind energy applications.	4	3	2	1	8	9	66
(13)	Expected major developments in wind energy during the next ten years. .	4	3	2	1	8	9	67
(14)	Climatological data such as wind, weather, or amount of sunshine. . .	4	3	2	1	8	9	68

69-75 Blk 76 Cd # 77-80 Job#

Figure D-1. Questionnaire (continued)

Cd 4
1-10 as 1

9. Is there wind energy system information which you need but are not able to get?

- Yes 1
- Yes (BUT CAN'T DESCRIBE). 2
- No. 3
- Don't know. 8
- NA. 9 11

(IF YES) What information do you need?

1st mention

Verb.

2nd mention

10. In the past year have you obtained any information, not just wind or solar, in the following forms? (READ LIST. CIRCLE ONE RESPONSE PER ITEM)

	Yes	No	Don't Know	NA	
(a) On-line access to a central data bank via computer terminal	1	2	8	9	12
(b) Microform from a computer, sometimes referred to as C-O-M	1	2	8	9	13
(c) Other microforms, for example, microfiche, microfilm sheets or rolls	1	2	8	9	14

15-16 Blk

Figure D-1. Questionnaire (continued)

Cd 4

11. Solar information refers to information about any solar technology, and factors which may relate to its use such as weather, economics, legislation, architecture, environment, etc. In the past few years, have you obtained any type of solar information from any of the following sources? (READ LIST. CIRCLE ONE RESPONSE PER ITEM.)

		Yes	No	Don't Know	NA	
(1)	Your organizational library or a local library. . .	1	2	8	9	17
(2)	A public utility company	1	2	8	9	18
(3)	An installer, builder, designer or manufacturer of solar systems	1	2	8	9	19
(4)	Workshops, conferences or training sessions. . .	1	2	8	9	20
(5)	A commercial data base, for example, Lockheed, SDC, BRS. .	1	2	8	9	21
(6)	A federal library or information center, for example, the National Agricultural Library or the Environmental Data System. . .	1	2	8	9	22
(7)	Smithsonian Science Information Exchange (SSIE)	1	2	8	9	23
(8)	The Government Printing Office (GPO) . .	1	2	8	9	24

How would you evaluate the service you received from GPO?

Good	3
Fair	2
Poor	1
Don't know	8
NA	9

25

What are some of the reasons you do not consider their service "good"?

1st Mention_____

2nd Mention_____

Verb.

(9) National Technical Information Service (NTIS). . . . 1 2 8 9 26

How would you evaluate the service you received from NTIS?

Good	3
Fair	2
Poor	1
Don't know	8
NA	9

27

What are some of the reasons you do not consider their service "good"?

1st Mention_____

2nd Mention_____

Verb.

Figure D-1. Questionnaire (continued)

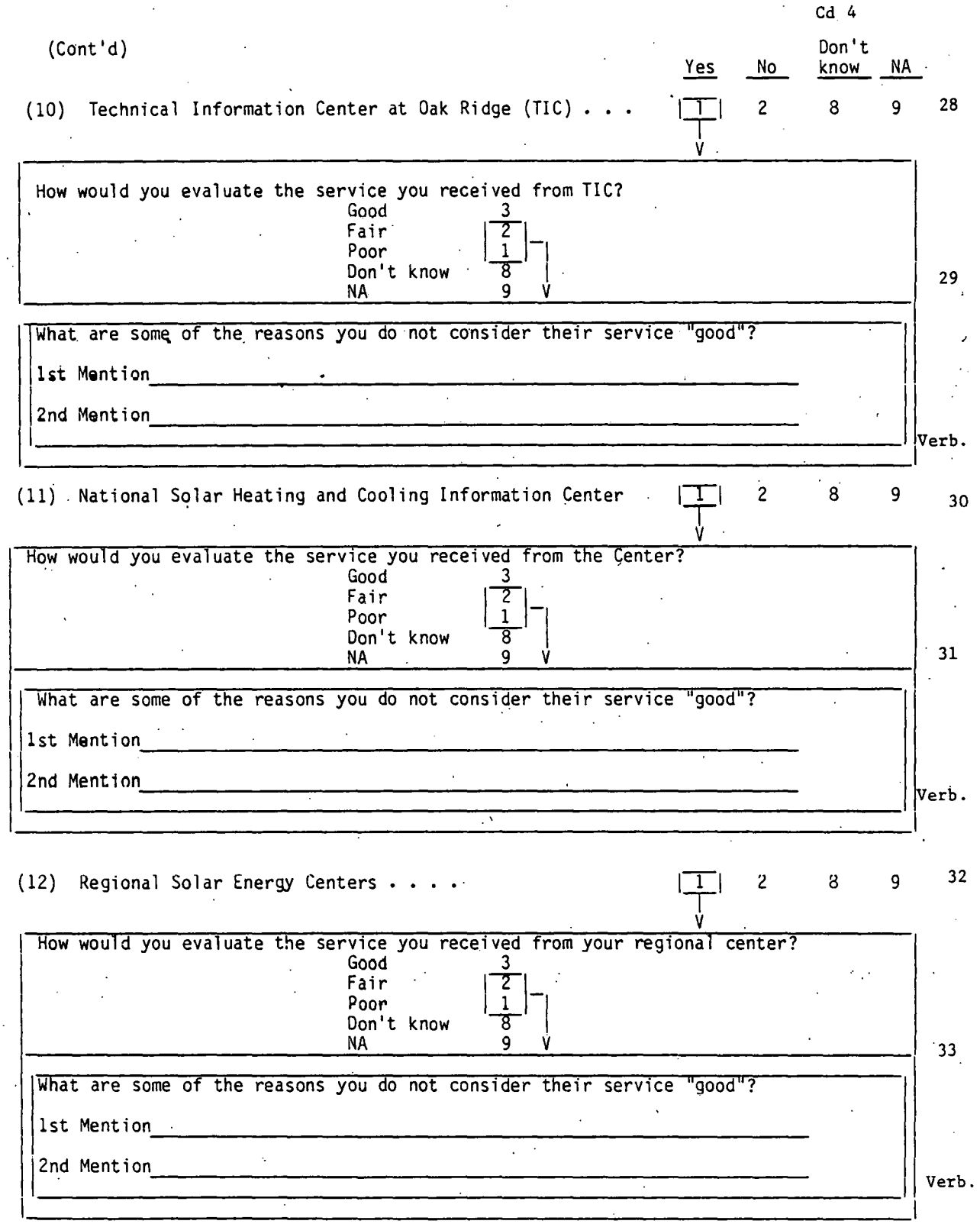

Figure D-1. Questionnaire (continued)

(Cont'd)		Yes	No	Cd 4 Don't Know	NA	
(13)	Directly from the U. S. Department of Energy. . .	1	2	8	9	34
(14)	Radio or TV	1	2	8	9	35
(15)	Periodicals, newspapers or magazines.	1	2	8	9	36
(16)	Private solar energy or environmental organizations . . .	1	2	8	9	37
(17)	State Energy or Solar Offices . . .	1	2	8	9	38
(18)	Some other state or local government office or publication.	1	2	8	9	39
(19)	The local chapter or national headquarters of the International Solar Energy Society (ISES), including their publications.	1	2	8	9	40
(20)	The local chapter or national headquarters of the Solar Energy Industries Association (SEIA), including their publications. . . .	1	2	8	9	41
(21)	American Wind Energy Association (AWEA)	1	2	8	9	42
(22)	NOT ASKED				0	43
(23)	NOT ASKED				0	44
(24)	NOT ASKED				0	45

46-47 Blk

Figure D-1. Questionnaire (continued)

Cd 4

In conclusion, I would like to ask you some questions about yourself. Your answers will be kept completely confidential.

D1a. What is the highest level of education you have completed? (DO NOT READ)

8th grade or less	01
Some high school	02
High school graduate	03
Post high school vocational/ Technical	04
Attended college/University:	
No degree	05
Associate (2 year junior/ Community college)	06
Bachelors	07
Masters	08
Ph.D/Doctorate	09
JD/LLD	10
Other _____ (SPECIFY)	11
Don't know	98
NA	99

48-49

D1b. In what field is your most recent degree? _____ (RECORD)

Ver

D1c. In what year did you get that degree? _____ (YEAR)

50-5

D2a. Please describe your present profession by completing the following statement: "Based on my total education and experience, I now regard myself professionally as a (an) "_____." (AVOID USING JOB TITLE IF POSSIBLE).

Verb

D2b. How many years have you been in this profession? (CIRCLE CODE)

0-2	1
3-5	2
6-10	3
Over 10	4
NA	9

52

Figure D-1. Questionnaire (continued)

Cd 4

D3. Do you belong to any professional, technical, or other organizations which have an interest in solar?

- Yes 1
- Yes (BUT CAN'T NAME) 2
- No 3
- Don't know 8
- NA 9

53

V

a. What organizations?

1st Mention _____

2nd Mention _____ CL

3rd Mention _____

4th Mention _____

54-69 Blk

Thank you very much for your time.

Figure D-1. Questionnaire (concluded)

Cd 2
1-10 as 1
11-75 Blk

B1-15. For what do you use your wind energy system? Do you use it for. . . . . 76 Cd
77-80 Job
Cd 3
1-10 as 1
11-43 Blk

[READ LIST. CIRCLE ONE RESPONSE PER ITEM.]

	Yes	No	Don't Know	NA	*
(1) Household electricity	1	2	8	9	64
(2) Household water pumping	1	2	8	9	65
(3) Farm electricity	1	2	8	9	66
(4) Farm irrigation	1	2	8	9	67

68-75 Blk
76 Cd #
77-80 Job #

Do you use it for any other purpose? (SPECIFY)

(1st Mention) _____ 44 C+V

(2nd Mention) _____ 45-63 Blk

Cd 1

B2-13. How many years have you been the owner of a wind system? (INCLUDE YEARS WHEN SYSTEM WAS UNDER CONSTRUCTION.)

3 months or less 1
Between 3 months and 1 year. . . . 2
1-3 years. 3
Over 3 years 4
Don't know 8
NA 9

39 *

40-42 Blk

B3-5. Knowing what you now know in terms of obtaining information about wind energy conversion systems, please answer the following questions as if you were starting over again and first considering the installation of a wind energy conversion system.

What would be the most important information product or service about wind energy conversion that you would want to have? (PROBE FOR TWO MENTIONS)

1st Mention 35 C+V

2nd Mention

B4-14. What is the first thing you would do to obtain information about wind energy conversion? That is, where would you go or who would you contact to get the information you needed? (PROBE FOR TWO MENTIONS)

1st Mention 36 C+V *

2nd Mention

37-38 Blk

Figure D-2. User Questionnaire

Cd 1

B5-8a. I will read a list of potential information products on wind energy conversion. For each, please tell me how useful that information would be to you if you were obtaining a new system. Would the following be: essential, very useful, somewhat useful, or not at all useful? (READ LIST. ROTATE. CIRCLE ONE RESPONSE PER ITEM.)

	Essential	Very Useful	Somewhat Useful	Not at all Useful	Don't know	NA	
(1) A bibliography of general readings on wind energy systems. . . .	4	3	2	1	8	9	43
(2) A list of sources for information on wind energy systems. . . .	4	3	2	1	8	9	44
(3) A calendar of upcoming wind energy conversion system conferences and programs.	4	3	2	1	8	9	45
(4) Diagrams or schematics of a wind energy conversion system. . . .	4	3	2	1	8	9	46
(5) A non-technical description of how a particular wind energy system works.	4	3	2	1	8	9	47
(6) A technical description of how a particular wind energy system works.	4	3	2	1	8	9	48
(7) Lists of local lenders, insurers, builders, engineers, installers or distributors for wind energy conversion systems.	4	3	2	1	8	9	49
(8) Wind energy system design handbooks, installation handbooks, or reference tables. . .	4	3	2	1	8	9	50
(9) A list of technical experts in wind energy conversion systems . .	4	3	2	1	8	9	51
(10) Manual methods for sizing and predicting the engineering performance or life cycle costs of wind energy conversion systems. . . .	4	3	2	1	8	9	52
(11) Computer models for sizing and predicting the engineering performance or life cycle costs.	4	3	2	1	8	9	53

Figure D-2. User Questionnaire (continued)

Cd 1
54 Blk

B6-8b. I will next read a list of types of information on wind energy conversion: for each please tell me how useful information of that type would be to you if you were obtaining a new system. Would the following be: essential, very useful, somewhat useful, or not at all useful? (READ LIST. ROTATE. CIRCLE ONE RESPONSE PER ITEM.)

		Essential	Very Useful	Somewhat Useful	Not At All Useful	Don't Know	NA	
(1)	Educational institutions and other organizations offering courses on wind energy system design or applications.	4	3	2	1	8	9	55
(2)	Wind energy system research currently in progress.	4	3	2	1	8	9	56
(3)	The state-of-the-art in wind energy conversion	4	3	2	1	8	9	57
(4)	Costs and performance of wind energy installations.	4	3	2	1	8	9	58
(5)	Costs of installing and operating a wind energy conversion system compared to a conventional system . .	4	3	2	1	8	9	59
(6)	Local building codes or other regulations affecting siting or installation of wind energy conversion systems. .	4	3	2	1	8	9	60
(7)	Tax credits, grants, or other economic incentives for wind energy conversion systems.	4	3	2	1	8	9	61
(8)	Standards, specifications, or certification programs for wind energy conversion equipment and installations	4	3	2	1	8	9	62
(9)	Marketing statistics and sales projections for wind energy equipment.	4	3	2	1	8	9	63
(10)	NOT ASKED						0	64
(11)	NOT ASKED						0	65
(12)	Institutional, social, environmental, and legal aspects of wind energy system applications	4	3	2	1	8	9	66
(13)	Expected major developments in wind energy during the next ten years. .	4	3	2	1	8	9	67
(14)	Climatological data such as wind, weather, or amount of sunshine. . .	4	3	2	1	8	9	68

69-75 Blk 76 Cd # 77-80 Job #

Figure D-2. User Questionnaire (continued)

Cd 4
1-10 as 1

B7-9. When your current wind system was being considered for purchase, was there wind energy information which you needed but were not able to get?

- Yes 1
- Yes . . (BUT CAN'T DESCRIBE). . . . 2
- No. 3
- Wasn't there when system was purchased (VOLUNTEERED) 4
- Don't know. 8
- NA. 9

11

V

(IF YES) What wind information couldn't you get?

1st Mention

2nd Mention

Verb.

12-16 Blk

Figure D-2. User Questionnaire (continued)

Cd 4

8-11. Solar information refers to information about any solar technology including wind, and factors which may relate to its use such as weather, economics, legislation, architecture, environment, etc. In the past few years, have you obtained any type of solar information from any of the following sources? (READ LIST. CIRCLE ONE RESPONSE PER ITEM.)

		Yes	No	Don't Know	NA	
(1)	Your organizational library or a local library. . .	1	2	8	9	17
(2)	A public utility company	1	2	8	9	18
(3)	An installer, builder, designer or manufacturer of solar or wind systems	1	2	8	9	19
(4)	Workshops, conferences or training sessions. . .	1	2	8	9	20
(5)	A commercial data base, for example, Lockheed, SDC, BRS. .	1	2	8	9	21
(6)	A federal library or information center, for example, the National Agricultural Library or the Environmental Data System. . .	1	2	8	9	22
(7)	Smithsonian Science Information Exchange (SSIE) . . .	1	2	8	9	23
(8)	The Government Printing Office (GPO) . .	[1]	2	8	9	24

How would you evaluate the service you received from GPO?

Good	3
Fair	2
Poor	1
Don't know	8
NA	9

25

What are some of the reasons you do not consider their service "good"?

1st Mention _____ Verb.

2nd Mention _____

		Yes	No	Don't Know	NA	
(9)	National Technical Information Service (NTIS). . . .	[1]	2	8	9	26

How would you evaluate the service you received from NTIS?

Good	3
Fair	2
Poor	1
Don't know	8
NA	9

27

What are some of the reasons you do not consider their service "good"?

1st Mention _____ Verb

2nd Mention _____

Figure D-2. User Questionnaire (continued)

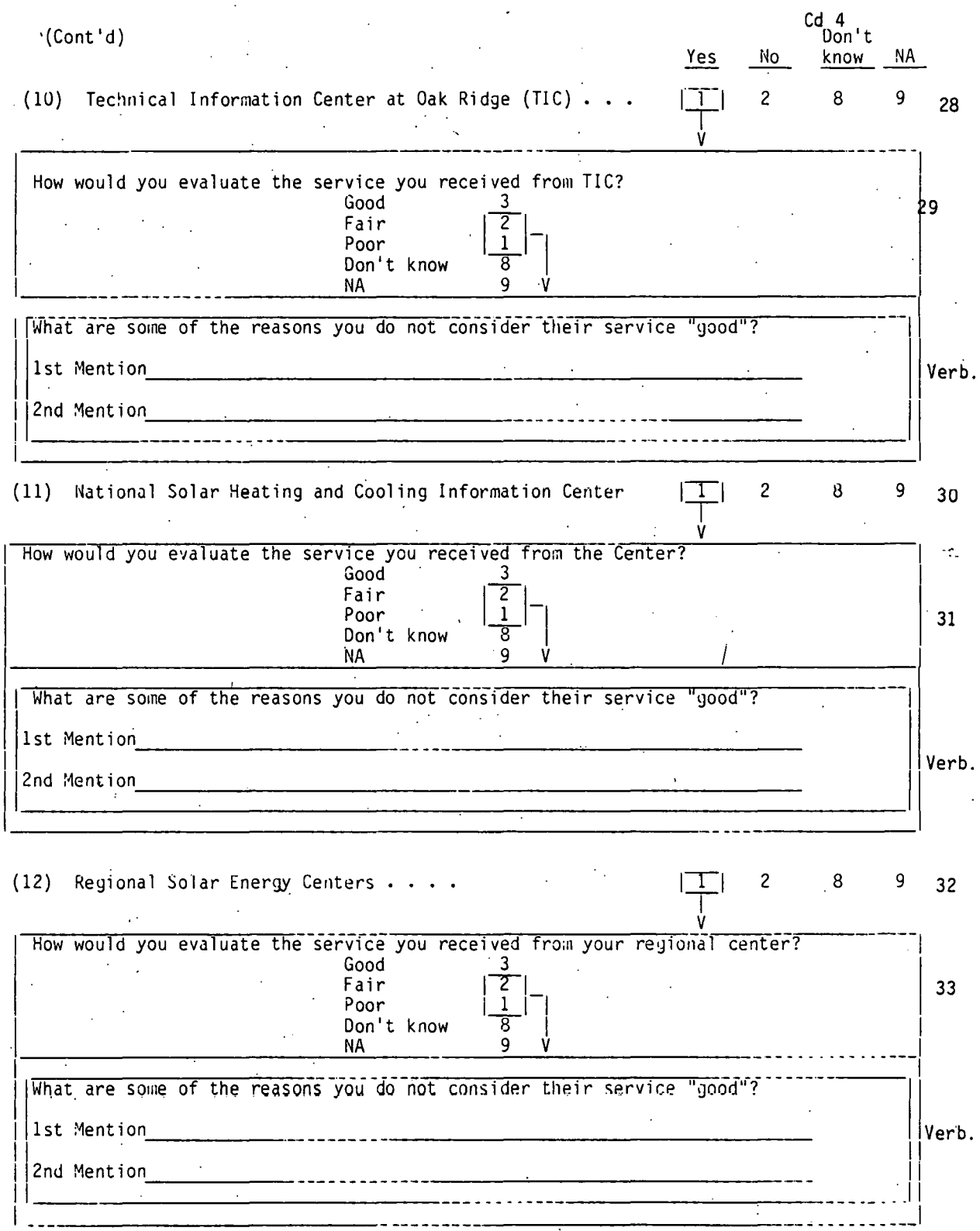

Figure D-2. User Questionnaire (continued)

Cd 4

B8-11. (Cont'd)	Yes	No	Don't Know	NA	
(13) Directly from the U. S. Department of Energy. . .	1	2	8	9	34
(14) Radio or TV	1	2	8	9	35
(15) Periodicals, newspapers or magazines.	1	2	8	9	36
(16) Private solar energy or environmental organizations . . .	1	2	8	9	37
(17) State Energy or Solar Offices . . .	1	2	8	9	38
(18) Some other state or local government office or publication	1	2	8	9	39
(19) The local chapter or national headquarters of the International Solar Energy Society (ISES), including their publications.	1	2	8	9	40
(20) The local chapter or national headquarters of the Solar Energy Industries Association (SEIA), including their publications.	1	2	8	9	41
(21) Your State Solar Society or Association	1	2	8	9	42
(22) The American Wind Energy Association (AWEA)	1	2	8	9	43
(23 NOT ASKED				0	44
(24) NOT ASKED				0	45

46-47 Blk

Cd 3

B9-7. What publications have you read in the past six months that include information on wind energy conversion systems?

- None. 001
- Read, but can't remember titles . 002 (VOLUNTEERED)
- Read too many to name (VOLUNTEERED) 003
  (ASK) Which are most important? (RECORD TITLES)
- Names publications. . . . . 004 (RECORD TITLES)

52-54

1st Mention _____

2nd Mention _____ CL

3rd Mention _____

Figure D-2. User Questionnaire (continued)

Cd 4

In conclusion, I would like to ask you some questions about yourself. Your answers will be kept completely confidential.

D1a. What is the highest level of education you have completed? (DO NOT READ)

- 8th grade or less 01
- Some high school 02
- High school graduate 03
- Post high school vocational/ Technical 04
- Attended college/University:
  - No degree 05
  - Associate (2 year junior/ Community college) 06
  - Bachelors 07
  - Masters 08
  - Ph.D/Doctorate 09
  - JD/LLD 10
  - Other _____ (SPECIFY) 11
- Don't know 98
- NA 99

48-49

D1b. In what field is your most recent degree? _____ (RECORD) Verb.

D1c. In what year did you get that degree? _____ (YEAR) 50-51

Cd 1

B10-1. In the next year do you expect to need additional wind energy information. . . . .

(a) On your job?
- Yes 1
- No 2
- Don't know . . . 8
- NA 9

31

(b) Outside of your job?
- Yes 1
- No 2
- Don't know . . . 8
- NA 9

32

33-34

Blk

Cd 4

D2a. Please describe your present profession by completing the following statement: "Based on my total education and experience, I now regard myself professionally as a (an) "_____." (AVOID USING JOB TITLE IF POSSIBLE).

Verb.

52 Blk

Figure D-2. User Questionnaire (continued)

Cd 4

D3. Do you belong to any professional, technical, or other organizations which have an interest in solar or wind?

Yes	.1
Yes (BUT CAN'T NAME)	.2
No	.3
Don't know	.8
NA	.9

53

V

a. What organizations?

1st Mention_____

2nd Mention_____

3rd Mention_____

4th Mention_____

CL

54-69 Blk

Thank you very much for your time.

Figure D-2. User Questionnaire (concluded)

fore, this report refers to the responses to Question 5 as "information which was important for the respondents to obtain."

Question 6. In this question, a list of different wind energy applications was read to the respondent and the respondent was asked for which application he was particularly interested in obtaining information. After this was completed, respondents were asked "Are there any other areas of wind energy for which you are particularly interested in obtaining information?" Responses to this question fell into one of two areas: additional wind applications of interest or specific types of information wanted. The former were discussed with other results from Question 6; the latter were included with the responses from Question 5.

Question 8. In this question a list of up to 25 specific information products or types of information was read to the respondent. The respondent rated each item as "essential," "very useful," "somewhat useful," or "not at all useful" as it applied to himself. In contrast to Question 5, this question assessed each respondent's ratings for each of a set of items that the study designers thought might be important to the respondents. Question 8 did not allow respondents to add and rate items not already on the list. To reduce the possibility of introducing bias due to item order within Question 8, the interviewers rotated their starting point by randomly selecting which item would be read to the respondent first. Items in Question 8a were rotated separately from those in Question 8b.

Question 9. This question asked "Is there any wind information which you need but are not able to get?" Unfortunately, this question just did not work. Answering Questions 8a and 8b required the respondent to assign a rating to each of 22-25 information items. By the time the respondents had completed Question 8 they were usually starting to get fatigued with the interview. As a result many did not answer Question 9 at all.

Question 11. In this question respondents were not asked if they had obtained solar information from Solar Energy Research Institute (SERI). The principal reason was the probability of obtaining biased responses. All respondents had received a letter describing the Solar Energy Information Data Base (SEIDB) and introducing SERI. It was felt that many respondents would attempt to encourage information flows from SERI by responding positively when asked whether they had used SERI as an information source—whether or not they actually received information directly from SERI. Since explaining the nature of SERI and the SEIDB was necessary to promote a good response rate, no questions about SERI were included.

In Question 11, items 21-23 require some explanation: they are shown as "NOT ASKED" on the sample questionnaire (readers may note that data for items 21-23 does occur on the tables in Appendix F for some groups). These items were left open for the inclusion of specific organizations which seemed most appropriate for each group. Table D-1 lists the organizations, the respondent groups and the question numbers for each item used for the groups covered in this report.

User Questionnaire

B1-15. Users were asked about their present system, rather than areas of interest; the list differs from Question 6 of the standard questionnaire.

B2-13. Asked only of users.

B3-5 and B4-14. These questions differ from the standard Question 5 in that the user respondent is asked about information and information sources that would be sought out if the system were currently being considered for purchase or construction.

B5-8a and B6-8b. These items listed are the same as those on Question 8a and 8b in the standard questionnaire, except that users are asked the qualifying "if you were obtaining a new system."

B7-9. The standard Question 9, is altered by referring to "when your current system was being considered."

B10-1. The standard Question 1 is altered by asking about "additional" wind energy information.

Table D-1. SELECTED ORGANIZATIONS ABOUT WHICH WIND RESPONDENTS WERE ASKED

Group	Item[a]	Organization
Wind DOE-Funded Researchers	21	American Wind Energy Association (AWEA)
Wind Non-DOE-Funded Researchers	21	AWEA
Total Wind Researchers	21	AWEA
Wind Manufacturer Representatives	21	AWEA
Wind Distributors	21	AWEA
Wind Electric Power Engineers	21	AWEA
	22	State or U.S. Department of Agriculture (USDA)
Wind Engineers	21	AWEA
	22	State or USDA
Wind Utility Representatives	21	AWEA
	22	Electric Power Research Institute (EPRI)
All Solar Utility Representatives	22	EPRI
Wind CES County Agents	21	AWEA
	22	USDA, including the Cooperative Extension Service (CES)
All CES County Agents	22	USDA (including CES)
All CES State Specialists	22	USDA (including CES)
Wind Educators	21	AWEA
Wind System Managers	21	AWEA
	22	Your state solar society or association
Total SHAC Owners/Managers	22	Your state solar society or association

[a]The number of the item in which the group was asked about the particular organization. For example, 21 is Item 21 of Question 11.

APPENDIX E
STATISTICAL TESTING

Despite the small sample sizes, selected statistical tests could be used. All of these tests used a 5% rejection region unless otherwise noted. Thus, if a test result indicated that a difference between two means was statistically significant (P 0.05), it meant that there was only a one-out-of-twenty chance that the two means were not different. Actual calculations were made with the Statistical Package for the Social Sciences (SPSS) software and other computer packages.

The tests conducted fell into three main types: tests of proportions between two groups, t-Tests between two groups, and Paired t-Tests within a group. Each of these are discussed below.

For all except Question 8, tests of proportions were used. For example, the proportion of Wind Electric Power Engineers using computer terminals was compared to the proportion of other Wind Engineers using computer terminals. If the sample sizes were small, Exact Binomial Tests were used. When the sample sizes were larger (e.g., a comparison of Wind DOE-Funded Researchers to All Researchers), Chi-Square Tests were used.

For analysis of the results from Question 8, t-Tests were used. In Question 8 each respondent was asked to describe the usefulness of up to 25 information products/categories as either "essential," "very useful," "somewhat useful," or "not at all useful." The "average usefulness" rating that the group assigned an item was then calculated by assigning the responses a "4" for "essential," a "3" for "very useful," a "2" for "somewhat useful," and a "1" for "not very useful," then calculating the average for the entire group. A t-Test was used to determine whether group A rated a specific information item significantly higher (or lower) than it was rated by group B. Some groups, however, tended to give higher scores in general than did other groups. To compensate for this effect, these statistical tests compared the "relative rating" given by one group to the "relative rating" given by the other groups. The relative rating given by a group to a particular item was calculated as follows: take the average usefulness rating the group gave that item (for example, suppose "a bibliography" received a 3.15 rating), then subtract the average overall rating this group gave to all items (suppose the average rating the group gave all items was 2.75); the difference was the relative rating (for this example 3.15 - 2.75 = +0.40). The t-Test then was used for the comparison of the relative rating group A gave to the item to the relative rating group B gave the item.

For the tests of proportions (or the t-Tests involving Question 8), if group A was being compared to group B and group A was a subset of group B (e.g., a comparison of DOE-Funded Wind Researchers to All Researchers), the totals for group A were subtracted from the totals for group B and the proportions (or the relative ratings) for group B were recalculated from the adjusted totals.

For Question 8 it sometimes occurred that the researcher wanted to compare the rating a group gave one item to the rating they gave another item. For example, did Representatives of Wind Manufacturers rate "lists of sources for information" significantly higher (or lower) than they rated "lists of technical experts?" This test was conducted using a Paired t-Test.

APPENDIX F
WIND ENERGY
DATA TABLES

In the following data tables, each table entry shows counts and percentages displayed in the format (%#) where % is the column percentage for each group and # is the number of repondents in each group who gave the response shown in the row title. Each column shows the results for an individual group or for a combination of groups.

Table F-1 lists the groups and combinations for which data are shown in the data tables. Table F-2 shown which groups are included in each of the combination groups listed in Table F-1. Table F-3 lists the data tables and Fig. F-1 contains the data tables themselves.

Table F-1. GROUPS AND COMBINATION GROUPS WITH DATA INCLUDED IN APPENDIX F.

Group	Section
Wind DOE-Funded Researchers (WIND DOE-FUND RES)	3.0
Wind Non-DOE-Funded Researchers (WIND NDOE-FUND RES)	3.0
Total Wind Researchers (TOTAL WIND RES)	3.0
All Researchers (ALL RES)	3.0
Wind Manufacturer Representatives (WIND MANUF)	4.0
All Manufacturer Representatives (ALL MANUF)	4.0
Wind Distributors (WIND DISTR)	5.0
Active Solar Heating and Cooling Distributors (SHAC DISTR)	5.0
Wind Engineers (WIND ENG)	6.0
Wind Electric Power Engineers (WIND ELEC POWER ENG)	6.0
All Electric Power Engineers (ALL ELEC POWER ENG)	6.0
All Engineers (ALL ENG)	6.0
Wind Utility Representatives (WIND UTIL REPS)	7.0
All Solar Utility Representatives (ALL SOLAR UTIL REPS)	7.0
Nonsolar Utility Representatives (NONSOLAR UTIL REPS)	7.0
Wind Educators (WIND EDUC)	8.0
All Educators (ALL EDUC)	8.0
Wind CES County Agents (WIND CES CO AGENT)	9.0
All CES County Agents (ALL CES CO AGENT)	9.0
All CES State Specialists (ALL CES STATE SPEC)	9.0
Small Wind Energy System Owners (WIND SYST OWNER)	10.0
Total Active Solar Heating and Cooling System Owners/ Managers (TOTAL SHAC OWNER MNGR)	10.0

Table F-2. COMBINATION GROUPS

Total Wind Researchers (TOTAL WIND RES)

- Wind DOE-Funded Researchers
- Wind Non-DOE-Funded Researchers

All Researchers (ALL RES)

- Photovoltaics DOE-Funded Researchers
- Photovoltaics Non-DOE-Funded Researchers
- Photovoltaics Researcher Manufacturers
- Biomass Federally Funded Researchers in Production and Collection
- Biomass Federally Funded Researchers in Conversion
- Biomass Nonfederally Funded Researchers in Production and Collection
- Biomass Nonfederally Funded Researchers in Conversion
- Wind DOE-Funded Researchers
- Wind Non-DOE-Funded Researchers
- Solar Thermal Electric Power (STEP) DOE-Funded Researchers
- STEP Non-DOE-Funded Researchers
- Ocean Energy DOE-Funded Researchers
- Ocean Energy Non-DOE-Funded Researchers
- Solar Energy Storage DOE-Funded Researchers
- Solar Energy Storage Non-DOE-Funded Researchers
- Active Solar Heating and Cooling (SHAC) DOE-Funded Researchers
- SHAC Non-DOE-Funded Researchers
- Passive Federally Funded Researchers
- Industrial Process Heat (IPH) Researchers
- Agricultural Process Heat (APH) Researchers

All Manufacturer Representatives (ALL MANUF)

- Total Photovoltaics Manufacturer Representatives
- Biomass Production and Collection Equipment Manufacturer Representatives
- Biomass Conversion Equipment Manufacturer Representatives
- Wind Manufacturer Representatives
- STEP and IPH Concentrating Collector Manufacturer Representatives

Table F-2. COMBINATION GROUPS (Continued)

SHAC Heating and Cooling Systems Manufacturer Representatives
SHAC Water Heating Systems Manufacturer Representatives
SHAC Nonconcentrating Collector Manufacturer Representatives
SHAC Other Component Manufacturer Representatives
Passive Manufacturer Representatives

All Electric Power Engineers (ALL ELEC POWER ENG)

Wind Electric Power Engineers
Photovoltaics Electric Power Engineers
STEP Engineers

All Engineers (ALL ENG)

Photovoltaics Electric Power Engineers
Biomass Forest Products Engineers and Consultants
Wind Engineers
Wind Electric Power Engineers
STEP Engineers
SHAC Heating, Ventilating, and Air Conditioning (HVAC) Engineers
SHAC Industrial Engineers
IPH Plant Engineers
IPH Industrial Engineers
IPH Agricultural Engineers
State Level Cooperative Extension Service (CES) Agricultural Specialists (Agricultural Engineers)

All Solar Utility Representatives (ALL SOLAR UTIL REPS)

Photovoltaics Utility Representatives
SHAC Utility Representatives
Wind Utility Representatives
STEP Utility Representatives

Table F-2. COMBINATIONS GROUPS (Concluded)

All Educators (ALL EDUC)

- Photovoltaics Educators
- Biomass Educators
- Wind Educators
- STEP Educators
- SHAC Educators
- Passive Educators
- IPH Educators

All CES County Agents (ALL CES CO AGENT)

- Passive County Agents
- SHAC County Agents
- Biomass Energy County Agents
- APH County Agents
- Wind County Agents

All CES State Specialists (ALL CES STATE SPEC)

- State CES Agricultural Specialists
- State CES Information Specialists

Total SHAC Owners/Managers (TOTAL SHAC OWNER/MNGR)

- SHAC Space Heating Homeowners
- SHAC Water Heating Homeowners
- SHAC Building Owners/Managers

Table F-3. LIST OF WIND ENERGY DATA TABLES

[a]See Appendix D, Figs. D-1 and D-2 for the wording of each question.

(OCTOBER, 1979)

NEED FOR INFORMATION ON THE JOB AND OUTSIDE THE JOB (QUESTION 1)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
YES FOR JOB	10 100.	7 88.	17 94.	178 98.	9 100.	93 97.	9 100.	9 100.	7 78.	9 100.	25 100.	93 97.
NO FOR JOB		1 13.	1 6.	2 1.		2 2.			2 22.			3 3.
DON'T KNOW/NA				1 1.		1 1.						
Q1B TOTAL	10 100.	8 100.	18 100.	117 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	18 100.	62 100.
YES OUTSIDE JOB	4 40.	3 38.	7 39.	48 41.	4 44.	47 49.	2 22.	3 33.	7 78.	2 22.	4 22.	29 47.
NO OUTSIDE JOB	6 60.	4 50.	10 56.	60 51.	1 11.	33 34.	6 67.	3 33.	2 22.	4 44.	10 56.	27 44.
DON'T KNOW/NA		1 13.	1 6.	9 8.	4 44.	16 17.	1 11.	3 33.		3 33.	4 22.	6 10.
YES, JOB + OUTSIDE	4 40.	2 25.	6 33.	46 39.	4 44.	46 48.	2 22.	3 33.	5 56.	2 22.	4 22.	26 42.

Figure F-1. Wind Energy Data Tables

T-001

(OCTOBER, 1979)

NEED FOR INFORMATION ON THE JOB AND OUTSIDE THE JOB (QUESTION 1)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
YES FOR JOB	9 100.	34 97.	8 100.	9 100.	63 100.	9 100.	44 98.	18 100.	4 44.	19 70.
NO FOR JOB		1 3.							4 44.	7 26.
DON'T KNOW/NA							1 2.			1 4.
Q1B TOTAL	9 100.	27 100.	8 100.	9 100.	45 100.	9 100.	45 100.	18 100.	9 100.	27 100.
YES OUTSIDE JOB	3 33.	13 48.	5 63.	9 100.	31 69.	4 44.	21 47.	7 39.	6 67.	10 37.
NO OUTSIDE JOB	6 67.	14 52.	3 38.		12 27.	5 56.	22 49.	10 56.	2 22.	15 56.
DON'T KNOW/NA					2 4.		2 4.	1 6.		2 7.
YES, JOB + OUTSIDE	3 33.	12 44.	5 63.	9 100.	31 69.	4 44.	20 44.	7 39.	3 33.	7 26.

Figure F-1. Wind Energy Data Tables (continued)

T-002

(OCTOBER, 1973)

INVOLVEMENT (QUESTION 2)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
4. VERY INVOLVED	9 90.	1 13.	10 56.	107 59.	6 67.	77 80.	7 78.	4 44.	3 33.	4 44.	5 20.	25 26.
3. MODERATELY INVOLVED		3 38.	3 17.	43 24.	2 22.	10 10.		2 22.	3 33.	1 11.	4 16.	21 22.
2. SLIGHTLY INVOLVED	1 10.	3 38.	4 22.	29 16.	1 11.	7 7.	2 22.	3 33.	3 33.	4 44.	16 64.	43 45.
1. NOT AT ALL INVOLVED		1 13.	1 6.	1 1.		1 1.						7 7.
DON'T KNOW/NA				1 1.		1 1.						
AVERAGE	3.80	2.50	3.22	3.42	3.56	3.72	3.56	3.11	3.00	3.00	2.56	2.67
STANDARD DEVIATION	.60	.86	.98	.78	.66	.61	.81	.87	.81	.94	.80	.93

Figure F-1. Wind Energy Data Tables (continued)

T-002

(OCTOBER, 1979)

INVOLVEMENT (QUESTION 2)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.
4. VERY INVOLVED	5 56.	12 34.		7 78.	27 43.		1 2.	6 33.
3. MODERATELY INVOLVED	4 44.	15 43.	2 25.	1 11.	22 35.	1 11.	12 27.	7 39.
2. SLIGHTLY INVOLVED		8 23.	5 63.	1 11.	14 22.	8 89.	32 71.	5 28.
1. NOT AT ALL INVOLVED			1 13.					
DON'T KNOW/NA								
AVERAGE	3.56	3.11	2.13	3.67	3.21	2.11	2.31	3.06
STANDARD DEVIATION	.46	.76	.58	.64	.76	.32	.51	.76

Figure F-1. Wind Energy Data Tables (continued)

T-003

(OCTOBER, 1979)

INFORMEDNESS (QUESTION 3)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10	8	18	181	9	96	9	9	9	9	25	96
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
4. VERY INFORMED	8	2	10	117	6	72	5	7	3	2	5	35
	80.	25.	56.	65.	67.	75.	56.	78.	33.	22.	20.	36.
3. MODERATELY INFORMED	2	4	6	59	3	21	4	1	3	5	16	44
	20.	50.	33.	33.	33.	22.	44.	11.	33.	56.	64.	46.
2. SLIGHTLY INFORMED		2	2	5		3		1	3	2	4	17
		25.	11.	3.		3.		11.	33.	22.	16.	18.
1. NOT AT ALL INFORMED												
DON'T KNOW/NA												
AVERAGE	3.80	3.00	3.44	3.62	3.67	3.72	3.56	3.67	3.00	3.00	3.04	3.19
STANDARD DEVIATION	.40	.70	.70	.53	.44	.50	.46	.64	.81	.66	.59	.70

Figure F-1. Wind Energy Data Tables (continued)

T-003

(OCTOBER, 1979)

INFORMEDNESS (QUESTION 3)

WIND ENERGY (CONTINJED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.
4. VERY INFORMED	4 44.	11 31.	1 13.	5 56.	31 49.		1 2.	8 44.
3. MODERATELY INFORMED	4 44.	20 57.	5 63.	4 44.	27 43.		9 20.	7 39.
2. SLIGHTLY INFORMED	1 11.	4 11.	2 25.		5 8.	9 100.	33 73.	3 17.
1. NOT AT ALL INFORMED								
DON'T KNOW/NA							2 4.	
AVERAGE	3.33	3.20	2.88	3.56	3.41	2.00	2.26	3.28
STANDARD DEVIATION	.68	.62	.57	.46	.64		.46	.72

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

INTEREST IN SPECIFIED WIND ENERGY AREAS - CONTINUED (QUESTION 6)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	18 100.	9 100.	9 100.	9 100.		9 100.	9 100.	9 100.	18 100.
TOWERS												
1. YES	5 50.	5 63.	10 56.	10 56.	8 89.	8 89.	7 78.		5 56.	5 56.	5 56.	10 56.
2. NO	5 50.	3 38.	8 44.	8 44.	1 11.	1 11.	2 22.		4 44.	4 44.	4 44.	8 44.
DON'T KNOW/NA												
CONTROL EQUIPMENT												
1. YES	6 60.	7 88.	13 72.	13 72.	5 56.	5 56.	7 78.		7 78.	9 100.	9 100.	16 89.
2. NO	4 40.	1 13.	5 28.	5 28.	4 44.	4 44.	2 22.		2 22.			2 11.
DON'T KNOW/NA												
ELECTRICAL EQUIPMENT												
1. YES	7 70.	7 88.	14 78.	14 78.	6 67.	6 67.	8 89.		7 78.	9 100.	9 100.	16 89.
2. NO	2 20.	1 13.	3 17.	3 17.	3 33.	3 33.	1 11.		2 22.			2 11.
DON'T KNOW/NA	1 10.		1 6.	1 6.								

Figure F-1. Wind Energy Data Tables (continued)

T-006

(OCTOBER, 1979)

INTEREST IN SPECIFIED WIND ENERGY AREAS (QUESTION 6)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC
	100.9	100.9		100.9	100.9	100.9	100.9	
SMALL SCALE WIND SYSTEMS								
1. YES	78.7	78.7		100.9	100.9	89.8	89.8	
2. NO	22.2	22.2				11.1	11.1	
DON'T KNOW/NA								
MED/LARGE SCALE SYSTEMS								
1. YES	78.7	78.7		44.4	44.4	67.6	67.6	
2. NO	22.2	22.2		56.5	56.5	33.3	33.3	
DON'T KNOW/NA								
ROTARY EQUIPMENT								
1. YES	67.6	67.6		56.5	56.5	67.6	67.6	
2. NO	22.2	22.2		22.2	22.2	33.3	33.3	
DON'T KNOW/NA	11.1	11.1		22.2	22.2			

Figure F-1. Wind Energy Data Tables (continued)

T-006

(OCTOBER, 1979)

INTEREST IN SPECIFIED WIND ENERGY AREAS (QUESTION 6)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	18 100.	9 100.	9 100.	9 100.		9 100.	9 100.	9 100.	18 100.
SMALL SCALE WIND SYSTEMS												
1. YES	9 90.	6 75.	15 83.	15 83.	9 100.	9 100.	7 78.		8 89.	5 56.	5 56.	13 72.
2. NO	1 10.	2 25.	3 17.	3 17.			2 22.		1 11.	4 44.	4 44.	5 28.
DON'T KNOW/NA												
MED/LARGE SCALE SYSTEMS												
1. YES	8 80.	7 88.	15 83.	15 83.	5 56.	5 56.	5 56.		6 67.	6 67.	6 67.	12 67.
2. NO	2 20.	1 13.	3 17.	3 17.	4 44.	4 44.	4 44.		3 33.	3 33.	3 33.	6 33.
DON'T KNOW/NA												
ROTARY EQUIPMENT												
1. YES	6 60.	5 63.	11 61.	11 61.	6 67.	6 67.	6 67.		5 56.	9 100.	9 100.	14 78.
2. NO	4 40.	2 25.	6 33.	6 33.	1 11.	1 11.	3 33.		4 44.			4 22.
DON'T KNOW/NA		1 13.	1 6.	1 6.	2 22.	2 22.						

Figure F-1. Wind Energy Data Tables (continued)

INTEREST IN SPECIFIED WIND ENERGY AREAS - CONTINUED (QUESTION 6)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC
	100.9	100.9		100.9	100.9	100.9	100.9	
TOWERS								
1. YES	67.6	67.6		100.9	100.9	67.6	67.6	
2. NO	22.2	22.2				22.2	22.2	
DON'T KNOW/NA	11.1	11.1				11.1	11.1	
CONTROL EQUIPMENT								
1. YES	100.9	100.9		100.9	100.9	33.3	33.3	
2. NO						67.6	67.6	
DON'T KNOW/NA								
ELECTRICAL EQUIPMENT								
1. YES	100.9	100.9		100.9	100.9	89.8	89.8	
2. NO						11.1	11.1	
DON'T KNOW/NA								

Figure F-1. Wind Energy Data Tables (continued)

T-024

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8A(1) BIBLIOGRAPHY	10 100.	8 100.	18 100.	181 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL	1 10.		1 6.	15 8.	1 11.	5 5.			1 11.		1 4.	6 6.
VERY USEFUL	2 20.	4 50.	6 33.	55 30.	1 11.	14 15.	3 33.	3 33.	1 11.	3 33.	5 20.	25 26.
SOMEWHAT USEFUL	7 70.	4 50.	11 61.	89 49.	6 67.	52 55.	3 33.	5 56.	7 78.	6 67.	16 64.	51 53.
NOT AT ALL USEFUL				22 12.	1 11.	24 25.	2 22.	1 11.			3 12.	14 15.
ESSENTIAL + VERY USEFUL	3 30.	4 50.	7 39.	70 39.	2 22.	19 20.	3 33.	3 33.	2 22.	3 33.	6 24.	31 32.
DON'T KNOW							1 11.					
AVERAGE	2.40	2.50	2.44	2.35	2.22	2.00	2.13	2.22	2.33	2.33	2.16	2.24
STANDARD DEVIATION	.66	.50	.61	.79	.79	.78	.76	.63	.67	.48	.67	.77
Q8A(2) LIST OF SOURCES	9 100.	8 100.	17 100.	180 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL	1 11.	1 13.	2 12.	23 13.	1 11.	10 11.	1 11.	1 11.		3 33.	4 16.	14 15.
VERY USEFUL	3 33.	5 63.	8 47.	79 44.	3 33.	37 39.	4 44.	4 44.	4 44.	3 33.	11 44.	41 43.
SOMEWHAT USEFUL	5 56.	2 25.	7 41.	67 37.	4 44.	34 36.	2 22.	4 44.	5 56.	3 33.	8 32.	32 33.
NOT AT ALL USEFUL				11 6.	1 11.	14 15.	2 22.				2 8.	9 9.
ESSENTIAL + VERY USEFUL	4 44.	6 75.	10 59.	102 57.	4 44.	47 49.	5 56.	5 56.	4 44.	6 67.	15 60.	55 57.
DON'T KNOW												
AVERAGE	2.56	2.88	2.71	2.63	2.44	2.45	2.44	2.67	2.44	3.00	2.68	2.63
STANDARD DEVIATION	.66	.57	.64	.79	.84	.87	.96	.65	.51	.81	.83	.82

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8A(1) BIBLIOGRAPHY	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL		1 3.		2 22.	12 19.		2 4.	1 6.	1 11.	3 11.
VERY USEFUL	2 22.	6 17.	3 38.	4 44.	27 43.	3 33.	17 38.	4 22.	5 56.	10 37.
SOMEWHAT USEFUL	6 67.	24 69.	4 50.	1 11.	21 33.	5 56.	20 44.	8 44.	3 33.	8 30.
NOT AT ALL USEFUL	1 11.	4 11.	1 13.	2 22.	3 5.	1 11.	6 13.	5 28.		6 22.
ESSENTIAL + VERY USEFUL	2 22.	7 20.	3 38.	6 67.	39 62.	3 33.	19 42.	5 28.	6 67.	13 48.
DON'T KNOW										
AVERAGE	2.11	2.11	2.25	2.67	2.76	2.22	2.33	2.06	2.78	2.37
STANDARD DEVIATION	.57	.63	.66	1.04	.81	.63	.77	.83	.61	.95
Q8A(2) LIST OF SOURCES	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	1 11.	5 14.		2 22.	11 17.	1 11.	6 13.	2 11.	2 22.	9 33.
VERY USEFUL	6 67.	14 40.	7 88.	5 56.	32 51.	5 56.	25 56.	9 50.	5 56.	7 26.
SOMEWHAT USEFUL		13 37.		1 11.	17 27.	3 33.	13 29.	6 33.	1 11.	7 26.
NOT AT ALL USEFUL	2 22.	3 9.	1 13.	1 11.	3 5.		1 2.	1 6.		3 11.
ESSENTIAL + VERY USEFUL	7 78.	19 54.	7 88.	7 78.	43 68.	6 67.	31 69.	11 61.	7 78.	16 59.
DON'T KNOW									1 11.	1 4.
AVERAGE	2.67	2.60	2.75	2.89	2.81	2.76	2.80	2.67	3.13	2.85
STANDARD DEVIATION	.93	.83	.66	.87	.77	.61	.68	.73	.57	1.03

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8A(3) CALENDAR-CONFERENCES/ PROGRAMS	10 100.	8 100.	18 100.	181 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL	2 20.	1 13.	3 17.	19 10.	2 22.	10 11.	1 11.	1 11.		1 11.	1 4.	5 5.
VERY USEFUL	6 60.	3 38.	9 50.	69 38.	3 33.	33 35.	2 22.	3 33.	2 22.	3 33.	7 28.	23 24.
SOMEWHAT USEFUL	2 20.	4 50.	6 33.	71 39.	3 33.	36 38.	3 33.	5 56.	5 56.	4 44.	10 40.	45 47.
NOT AT ALL USEFUL				22 12.	1 11.	16 17.	3 33.		2 22.	1 11.	7 28.	23 24.
ESSENTIAL + VERY USEFUL	8 80.	4 50.	12 67.	88 49.	5 56.	43 45.	3 33.	4 44.	2 22.	4 44.	8 32.	28 29.
DON'T KNOW												
AVERAGE	3.00	2.63	2.83	2.47	2.67	2.39	2.11	2.56	2.00	2.44	2.08	2.10
STANDARD DEVIATION	.63	.67	.70	.83	.93	.88	.99	.66	.66	.84	.84	.83
Q8A(4) DIAGRAMS/SCHEMATICS	10 100.	8 100.	18 100.	179 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL				14 8.		5 5.	1 11.	2 22.	2 22.	3 33.	5 20.	20 21.
VERY LSEFUL	2 20.	4 50.	6 33.	62 35.	5 56.	44 46.	3 33.	2 22.	4 44.		3 12.	30 31.
SOMEWHAT USEFUL	8 80.	2 25.	10 56.	78 44.	4 44.	39 41.	3 33.	4 44.	2 22.	4 44.	11 44.	32 33.
NOT AT ALL USEFUL		2 25.	2 11.	25 14.		7 7.	2 22.	1 11.	1 11.	2 22.	6 24.	13 14.
ESSENTIAL + VERY USEFUL	2 20.	4 50.	6 33.	76 42.	5 56.	49 52.	4 44.	4 44.	6 67.	3 33.	8 32.	50 52.
DON'T KNOW												1 1.
AVERAGE	2.20	2.25	2.22	2.36	2.56	2.49	2.33	2.56	2.78	2.44	2.28	2.60
STANDARD DEVIATION	.40	.82	.63	.82	.47	.72	.95	.94	.90	1.17	1.04	.96

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8A(3) CALENDAR-CONFERENCES/ PROGRAMS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL		3 9.		2 22.	6 10.	1 11.	1 2.		1 11.	4 15.
VERY USEFUL	3 33.	7 20.	2 25.	4 44.	30 48.		7 16.	6 33.	3 33.	3 11.
SOMEWHAT USEFUL	4 44.	18 51.	3 38.	3 33.	21 33.	8 89.	28 62.	8 44.	3 33.	13 46.
NOT AT ALL USEFUL	2 22.	7 20.	3 38.		6 10.		9 20.	4 22.	2 22.	5 18.
ESSENTIAL + VERY USEFUL	3 33.	10 29.	2 25.	6 67.	36 57.	1 11.	8 18.	6 33.	4 44.	7 26.
DON'T KNOW										2 8.
AVERAGE	2.11	2.17	1.88	2.89	2.57	2.22	2.00	2.11	2.33	2.24
STANDARD DEVIATION	.74	.84	.76	.73	.79	.63	.66	.74	.95	.95
Q8A(4) DIAGRAMS/SCHEMATICS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL		3 9.		2 22.	12 19.	1 11.	6 13.	2 11.	2 22.	9 33.
VERY USEFUL	5 56.	15 43.	3 38.	5 56.	28 44.	3 33.	22 49.	3 17.	3 33.	5 18.
SOMEWHAT USEFUL	4 44.	13 37.	4 50.	1 11.	18 29.	5 56.	16 36.	10 56.	3 33.	6 22.
NOT AT ALL USEFUL		4 11.	1 13.	1 11.	5 8.		1 2.	3 17.	1 11.	6 22.
ESSENTIAL + VERY USEFUL	5 56.	18 51.	3 38.	7 78.	40 63.	4 44.	28 62.	5 28.	5 56.	14 52.
DON'T KNOW										1 4.
AVERAGE	2.56	2.49	2.25	2.89	2.75	2.56	2.73	2.22	2.67	2.65
STANDARD DEVIATION	.47	.79	.66	.87	.84	.66	.72	.85	.93	1.17

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8A(5) NON-TECHNICAL DESCRIPTION	10 100.	8 100.	18 100.	153 100.	9 100.	68 100.	9 100.	9 100.				62 100.
ESSENTIAL				3 2.	2 22.	3 4.		1 11.				3 5.
VERY USEFUL	1 10.	1 13.	2 11.	18 12.	1 11.	13 19.	3 33.	1 11.				16 26.
SOMEWHAT USEFUL	2 20.	4 50.	6 33.	62 41.	3 33.	32 47.	2 22.	4 44.				22 35.
NOT AT ALL USEFUL	7 70.	3 38.	10 56.	70 46.	3 33.	20 29.	4 44.	3 33.				21 34.
ESSENTIAL + VERY USEFUL	1 10.	1 13.	2 11.	21 14.	3 33.	16 24.	3 33.	2 22.				19 31.
DON'T KNOW												
AVERAGE	1.40	1.75	1.56	1.70	2.22	1.99	1.89	2.00				2.02
STANDARD DEVIATION	.66	.66	.67	.74	1.13	.80	.87	.94				.88
Q8A(6) TECHNICAL DESCRIPTION	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL	1 10.		1 6.	18 10.	2 22.	13 14.	1 11.	3 33.	2 22.	3 33.	5 20.	20 21.
VERY USEFUL	2 20.	6 75.	8 44.	84 46.	3 33.	45 47.	3 33.	2 22.	5 56.	3 33.	9 36.	44 46.
SOMEWHAT USEFUL	7 70.	2 25.	9 50.	63 35.	3 33.	25 26.	2 22.	3 33.	1 11.	1 11.	6 24.	21 22.
NOT AT ALL USEFUL				16 9.	1 11.	12 13.	3 33.	1 11.	1 11.	2 22.	5 20.	11 11.
ESSENTIAL + VERY USEFUL	3 30.	6 75.	9 50.	102 56.	5 56.	58 60.	4 44.	5 56.	7 78.	6 67.	14 56.	64 67.
DON'T KNOW						1 1.						
AVERAGE	2.40	2.75	2.56	2.57	2.67	2.62	2.22	2.78	2.89	2.78	2.56	2.76
STANDARD DEVIATION	.66	.43	.57	.80	.93	.87	1.03	1.02	.87	1.12	1.02	.91

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8A(5) NON-TECHNICAL DESCRIPTION	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	1 11.	4 11.		2 22.	9 14.		5 11.		3 33.	8 30.
VERY USEFUL	5 56.	13 37.	5 63.	2 22.	11 17.	7 78.	30 67.	8 44.	1 11.	9 33.
SOMEWHAT USEFUL		12 34.	3 38.	3 33.	25 40.	2 22.	10 22.	5 28.	2 22.	3 11.
NOT AT ALL USEFUL	3 33.	6 17.		2 22.	18 29.			5 28.	3 33.	6 22.
ESSENTIAL + VERY USEFUL	6 67.	17 49.	5 63.	4 44.	20 32.	7 78.	35 78.	8 44.	4 44.	17 63.
DON'T KNOW										1 4.
AVERAGE	2.44	2.43	2.63	2.44	2.17	2.78	2.89	2.17	2.44	2.73
STANDARD DEVIATION	1.07	.69	.45	1.07	1.01	.40	.56	.82	1.26	1.13
Q8A(6) TECHNICAL DESCRIPTION	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL		4 11.		1 11.	12 19.	1 11.	4 9.	1 6.	3 33.	8 30.
VERY USEFUL	6 67.	16 46.	4 50.	5 56.	37 59.	5 56.	13 29.	9 50.	3 33.	6 22.
SOMEWHAT USEFUL	3 33.	12 34.	4 50.	2 22.	11 17.	3 33.	19 42.	5 28.	3 33.	8 30.
NOT AT ALL USEFUL		3 9.		1 11.	2 3.		9 20.	3 17.		4 15.
ESSENTIAL + VERY USEFUL	6 67.	20 57.	4 50.	6 67.	49 78.	6 67.	17 38.	10 56.	6 67.	14 52.
DON'T KNOW					1 2.					1 4.
AVERAGE	2.67	2.60	2.50	2.67	2.95	2.78	2.27	2.44	3.00	2.69
STANDARD DEVIATION	.45	.80	.50	.80	.71	.61	.87	.84	.81	1.07

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8A(7) LISTS OF SUPPLIERS	10 100.	8 100.	18 100.	146 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL	1 10.		1 6.	12 8.	2 22.	19 20.	1 11.	4 44.	2 22.	3 33.	4 16.	11 11.
VERY USEFUL	1 10.	1 13.	2 11.	39 27.	4 44.	36 38.	6 67.	2 22.	3 33.		6 24.	26 27.
SOMEWHAT USEFUL	6 60.	7 88.	13 72.	56 38.	2 22.	27 28.	1 11.	3 33.	3 33.	3 33.	9 36.	33 34.
NOT AT ALL USEFUL	2 20.		2 11.	39 27.	1 11.	13 14.	1 11.		1 11.	3 33.	6 24.	26 27.
ESSENTIAL + VERY USEFUL	2 20.	1 13.	3 17.	51 35.	6 67.	55 57.	7 78.	6 67.	5 56.	3 33.	10 40.	37 39.
DON'T KNOW						1 1.						
AVERAGE	2.10	2.13	2.11	2.16	2.78	2.64	2.78	3.11	2.67	2.33	2.32	2.23
STANDARD DEVIATION	.83	.29	.66	.92	.90	.95	.77	.87	.93	1.25	1.00	.97
Q8A(8) HANDBOOKS/TABLES	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	95 100.
ESSENTIAL		1 13.	1 6.	17 9.	2 22.	9 9.	2 22.	3 33.	2 22.	1 11.	3 12.	17 18.
VERY USEFUL	7 70.	3 38.	10 56.	67 37.	2 22.	40 42.	4 44.	3 33.	4 44.	2 22.	8 32.	45 47.
SOMEWHAT USEFUL	1 10.	4 50.	5 28.	65 36.	4 44.	33 34.	1 11.	2 22.	3 33.	5 56.	12 48.	28 29.
NOT AT ALL USEFUL	2 20.		2 11.	31 17.	1 11.	14 15.	2 22.	1 11.		1 11.	2 8.	5 5.
ESSENTIAL + VERY USEFUL	7 70.	4 50.	11 61.	84 46.	4 44.	49 51.	6 67.	6 67.	6 67.	3 33.	11 44.	62 65.
DON'T KNOW				1 1.								
AVERAGE	2.50	2.63	2.56	2.39	2.56	2.46	2.67	2.89	2.89	2.33	2.48	2.78
STANDARD DEVIATION	.80	.67	.74	.87	.94	.84	1.04	.99	.73	.82	.80	.79

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8A(7) LISTS OF SUPPLIERS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL		6 17.	1 13.	2 22.	9 14.	1 11.	6 13.	1 6.	3 33.	16 59.
VERY USEFUL	3 33.	10 29.	5 63.	3 33.	22 35.	4 44.	22 49.	6 33.	4 44.	5 18.
SOMEWHAT USEFUL	6 67.	13 37.	2 25.	1 11.	20 32.	4 44.	15 33.	5 28.	1 11.	5 18.
NOT AT ALL USEFUL		6 17.		3 33.	12 19.		2 4.	6 33.	1 11.	1 4.
ESSENTIAL + VERY USEFUL	3 33.	16 46.	6 75.	5 56.	31 49.	5 56.	28 62.	7 39.	7 78.	21 78.
DON'T KNOW										
AVERAGE	2.33	2.46	2.88	2.44	2.44	2.67	2.71	2.11	3.00	3.33
STANDARD DEVIATION	.48	.95	.57	1.17	.96	.65	.75	.93	.94	.90
Q8A(8) HANDBOOKS/TABLES	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	17 100.	9 100.	26 100.
ESSENTIAL	1 11.	6 17.		3 33.	14 22.		3 7.	2 12.	3 33.	9 35.
VERY USEFUL	3 33.	13 37.	5 63.	2 22.	25 40.	5 56.	22 49.	4 24.	6 67.	6 23.
SOMEWHAT USEFUL	4 44.	10 29.	3 38.	3 33.	20 32.	3 33.	16 36.	8 47.		6 23.
NOT AT ALL USEFUL	1 11.	6 17.		1 11.	4 6.	1 11.	4 9.	3 18.		4 15.
ESSENTIAL + VERY USEFUL	4 44.	19 54.	5 63.	5 56.	39 62.	5 56.	25 56.	6 35.	9 100.	15 56.
DON'T KNOW										1 4.
AVERAGE	2.44	2.54	2.63	2.78	2.78	2.44	2.53	2.29	3.33	2.80
STANDARD DEVIATION	.84	.97	.45	1.02	.85	.70	.75	.90	.49	1.10

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY		WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
		10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8A(9)	TECHNICAL EXPERTS LIST	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
	ESSENTIAL		1 13.	1 6.	16 9.	1 11.	11 11.			1 11.	2 22.	3 12.	9 9.
	VERY USEFUL	4 40.	2 25.	6 33.	66 36.	4 44.	30 31.	3 33.	4 44.	3 33.	5 56.	11 44.	27 28.
	SOMEWHAT USEFUL	5 50.	5 63.	10 56.	72 40.	4 44.	36 38.	4 44.	3 33.	4 44.	2 22.	7 28.	44 46.
	NOT AT ALL USEFUL	1 10.		1 6.	27 15.		19 20.	2 22.	2 22.	1 11.		4 16.	16 17.
	ESSENTIAL + VERY USEFUL	4 40.	3 38.	7 39.	82 45.	5 56.	41 43.	3 33.	4 44.	4 44.	7 78.	14 56.	36 38.
	DON'T KNOW												
	AVERAGE	2.30	2.50	2.39	2.39	2.67	2.34	2.11	2.22	2.44	3.00	2.52	2.30
	STANDARD DEVIATION	.64	.70	.67	.85	.65	.93	.74	.79	.84	.66	.89	.86
Q8A(10)	MANUAL METHODS	10 100.	8 100.	18 100.	181 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
	ESSENTIAL	1 10.	2 25.	3 17.	30 17.	2 22.	19 20.	1 11.	4 44.	2 22.	3 33.	5 20.	19 20.
	VERY USEFUL	3 30.	3 38.	6 33.	65 36.	4 44.	34 36.	2 22.	2 22.	5 56.	3 33.	9 36.	45 47.
	SOMEWHAT USEFUL	4 40.	3 38.	7 39.	53 29.	1 11.	26 27.	4 44.	3 33.	2 22.	3 33.	9 36.	27 28.
	NOT AT ALL USEFUL	2 20.		2 11.	33 18.	2 22.	16 17.	1 11.				2 8.	5 5.
	ESSENTIAL + VERY USEFUL	4 40.	5 63.	9 50.	95 52.	6 67.	53 56.	3 33.	6 67.	7 78.	6 67.	14 56.	64 67.
	DON'T KNOW							1 11.					
	AVERAGE	2.30	2.88	2.56	2.51	2.67	2.59	2.38	3.11	3.00	3.00	2.68	2.81
	STANDARD DEVIATION	.90	.76	.88	.96	1.04	.98	.84	.87	.66	.81	.88	.81

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8A(9) TECHNICAL EXPERTS LIST	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	1 11.	4 11.		2 22.	7 11.	1 11.	3 7.	1 6.		7 26.
VERY USEFUL	2 22.	9 26.	3 38.	2 22.	19 30.	1 11.	15 33.	6 33.	4 44.	4 15.
SOMEWHAT USEFUL	5 56.	17 49.	5 63.	4 44.	30 48.	6 67.	19 42.	7 39.	3 33.	12 44.
NOT AT ALL USEFUL	1 11.	5 14.		1 11.	7 11.	1 11.	8 18.	4 22.	1 11.	3 11.
ESSENTIAL + VERY USEFUL	3 33.	13 37.	3 38.	4 44.	26 41.	2 22.	18 40.	7 39.	4 44.	11 41.
DON'T KNOW									1 11.	1 4.
AVERAGE	2.33	2.34	2.38	2.56	2.41	2.22	2.29	2.22	2.38	2.58
STANDARD DEVIATION	.82	.86	.45	.94	.83	.79	.83	.85	.67	1.01
Q8A(10) MANUAL METHODS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	1 11.	7 20.		2 22.	15 24.		2 4.	1 6.	2 22.	7 26.
VERY USEFUL	4 44.	10 29.	2 25.	4 44.	25 40.	3 33.	19 42.	7 39.	4 44.	5 18.
SOMEWHAT USEFUL	3 33.	13 37.	4 50.	2 22.	16 25.	4 44.	18 40.	6 33.	2 22.	12 44.
NOT AT ALL USEFUL	1 11.	5 14.	2 25.	1 11.	6 10.	2 22.	6 13.	4 22.	1 11.	3 11.
ESSENTIAL + VERY USEFUL	5 56.	17 49.	2 25.	6 67.	40 63.	3 33.	21 47.	8 44.	6 67.	12 44.
DON'T KNOW					1 2.					
AVERAGE	2.56	2.54	2.00	2.78	2.79	2.11	2.38	2.28	2.78	2.59
STANDARD DEVIATION	.81	.97	.70	.90	.91	.74	.76	.86	.90	.99

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

T-029

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
COMPUTER MODELS	10 100.	8 100.	18 100.	181 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL	3 30.	1 13.	4 22.	28 15.	1 11.	8 8.	2 22.	2 22.		1 11.	3 12.	11 11.
VERY USEFUL	3 30.	4 50.	7 39.	51 28.	2 22.	33 35.	1 11.	3 33.	5 56.	2 22.	5 20.	35 36.
SOMEWHAT USEFUL	2 20.	3 38.	5 28.	62 34.	3 33.	29 31.	3 33.	3 33.	1 11.	3 33.	10 40.	28 29.
NOT AT ALL USEFUL	2 20.		2 11.	40 22.	3 33.	25 26.	2 22.	1 11.	3 33.	3 33.	7 28.	22 23.
ESSENTIAL/VERY USEFUL	6 60.	5 63.	11 61.	79 44.	3 33.	41 43.	3 33.	5 56.	5 56.	3 33.	8 32.	46 48.
DON'T KNOW							1 11.					
AVERAGE	2.70	2.75	2.72	2.37	2.11	2.25	2.38	2.67	2.22	2.11	2.16	2.36
STANDARD DEVIATION	1.10	.66	.93	.99	.99	.94	1.10	.93	.92	.99	.96	.97

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

T-029

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGEN-	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
COMPUTER MODELS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	2 22.	5 14.	1 13.	2 22.	11 17.					4 15.
VERY USEFUL	6 67.	11 31.		3 33.	23 37.	1 11.	5 11.	8 44.	1 11.	4 15.
SOMEWHAT USEFUL		7 20.	3 38.	2 22.	23 37.	4 44.	24 53.	6 33.	3 33.	11 41.
NOT AT ALL USEFUL	1 11.	12 34.	4 50.	2 22.	6 10.	4 44.	15 33.	4 22.	4 44.	8 30.
ESSENTIAL/VERY USEFUL	8 89.	16 46.	1 13.	5 56.	34 54.	1 11.	5 11.	8 44.	1 11.	8 30.
DON'T KNOW							1 2.		1 11.	
AVERAGE	3.00	2.26	1.75	2.56	2.62	1.67	1.77	2.22	1.63	2.15
STANDARD DEVIATION	.81	1.07	.96	1.05	.87	.65	.64	.79	.68	1.01

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8B(1) EDUCATIONAL INSTITUTIONS	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL				1 1.	3 33.	8 8.		1 11.	1 11.			4 4.
VERY USEFUL	2 20.	2 25.	4 22.	26 14.	2 22.	15 16.	1 11.	3 33.	3 33.	2 22.	4 16.	19 20.
SOMEWHAT USEFUL	6 60.	6 75.	12 67.	99 55.	4 44.	43 45.	6 67.	5 56.	3 33.	5 56.	16 64.	49 51.
NOT AT ALL USEFUL	2 20.		2 11.	54 30.		30 31.	2 22.		2 22.	2 22.	5 20.	24 25.
ESSENTIAL + VERY USEFUL	2 20.	2 25.	4 22.	27 15.	5 56.	23 24.	1 11.	4 44.	4 44.	2 22.	4 16.	23 24.
DON'T KNOW				1 1.								
AVERAGE	2.00	2.25	2.11	1.86	2.89	2.01	1.89	2.56	2.33	2.00	1.96	2.03
STANDARD DEVIATION	.63	.43	.57	.65	.87	.89	.56	.66	.95	.66	.59	.78
Q8B(2) RESEARCH IN PROGRESS	10 100.	8 100.	18 100.	181 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL	2 20.	1 13.	3 17.	33 18.	2 22.	22 23.	3 33.		2 22.	2 22.	2 8.	11 11.
VERY USEFUL	6 60.	5 63.	11 61.	102 56.	4 44.	38 40.	3 33.	5 56.	4 44.	2 22.	9 36.	35 36.
SOMEWHAT USEFUL	2 20.	2 25.	4 22.	39 22.	2 22.	26 27.	2 22.	3 33.	3 33.	5 56.	13 52.	42 44.
NOT AT ALL USEFUL				7 4.	1 11.	9 9.	1 11.	1 11.			1 4.	8 8.
ESSENTIAL + VERY USEFUL	8 80.	6 75.	14 78.	135 75.	6 67.	60 63.	6 67.	5 56.	6 67.	4 44.	11 44.	46 48.
DON'T KNOW												
AVERAGE	3.00	2.88	2.94	2.89	2.78	2.77	2.89	2.44	2.89	2.67	2.48	2.51
STANDARD DEVIATION	.63	.57	.64	.73	.90	.90	.99	.70	.73	.80	.69	.80

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8B(1) EDUCATIONAL INSTITUTIONS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	1 11.	1 3.		2 22.	8 13.		3 7.			3 11.
VERY USEFUL	2 22.	5 14.	1 13.	3 33.	26 41.	3 33.	13 29.	1 6.	3 33.	5 18.
SOMEWHAT USEFUL	4 44.	18 51.	4 50.	4 44.	17 27.	4 44.	23 51.	9 50.	3 33.	14 52.
NOT AT ALL USEFUL	2 22.	11 31.	3 38.		12 19.	2 22.	6 13.	8 44.	3 33.	5 18.
ESSENTIAL + VERY USEFUL	3 33.	6 17.	1 13.	5 56.	34 54.	3 33.	16 36.	1 6.	3 33.	8 30.
DON'T KNOW										
AVERAGE	2.22	1.89	1.75	2.78	2.48	2.11	2.29	1.61	2.00	2.22
STANDARD DEVIATION	.92	.73	.66	.77	.93	.74	.77	.59	.81	.87
Q8B(2) RESEARCH IN PROGRESS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	18 100.
ESSENTIAL	2 22.	5 14.		4 44.	14 22.		2 4.	1 6.	2 22.	2 11.
VERY USEFUL	3 33.	9 26.	3 38.	2 22.	33 52.	5 56.	20 44.	8 44.	4 44.	6 33.
SOMEWHAT USEFUL	4 44.	20 57.	5 63.	3 33.	14 22.	3 33.	19 42.	8 44.	1 11.	6 33.
NOT AT ALL USEFUL		1 3.			2 3.	1 11.	4 9.	1 6.	2 22.	4 22.
ESSENTIAL + VERY USEFUL	5 56.	14 40.	3 38.	6 67.	47 75.	5 56.	22 49.	9 50.	6 67.	8 44.
DON'T KNOW										
AVERAGE	2.78	2.51	2.38	3.11	2.94	2.44	2.44	2.50	2.67	2.33
STANDARD DEVIATION	.77	.78	.45	.87	.73	.70	.73	.68	1.04	.94

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q83(3) STATE OF ART	10 100.	8 100.	18 100.	181 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	95 100.
ESSENTIAL	2 20.	1 13.	3 17.	34 19.	2 22.	23 24.	3 33.	1 11.	3 33.	3 33.	6 24.	19 20.
VERY USEFUL	7 70.	6 75.	13 72.	93 51.	3 33.	34 36.	3 33.	2 22.	3 33.	4 44.	14 56.	38 40.
SOMEWHAT USEFUL	1 10.	1 13.	2 11.	44 24.	3 33.	26 27.	1 11.	5 56.	3 33.	2 22.	4 16.	34 36.
NOT AT ALL USEFUL				9 5.	1 11.	10 11.	2 22.	1 11.			1 4.	4 4.
ESSENTIAL + VERY USEFUL	9 90.	7 88.	16 89.	127 70.	5 56.	57 60.	6 67.	3 33.	6 67.	7 78.	20 80.	57 60.
DON'T KNOW				1 1.		2 2.						
AVERAGE	3.10	3.00	3.06	2.84	2.67	2.75	2.78	2.33	3.00	3.11	3.00	2.76
STANDARD DEVIATION	.53	.50	.49	.79	.93	.95	1.12	.82	.81	.74	.74	.81
Q88(4) COSTS/PERFORMANCE	10 100.	8 100.	18 100.	180 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
ESSENTIAL	1 10.	3 38.	4 22.	39 22.	3 33.	19 20.	2 22.	2 22.	2 22.	4 44.	8 32.	24 25.
VERY USEFUL	4 40.	4 50.	8 44.	78 43.	2 22.	44 46.	5 56.	5 56.	4 44.	2 22.	11 44.	47 49.
SOMEWHAT USEFUL	5 50.	1 13.	6 33.	49 27.	3 33.	26 27.	1 11.	2 22.	3 33.	2 22.	5 20.	21 22.
NOT AT ALL USEFUL				14 8.	1 11.	6 6.	1 11.			1 11.	1 4.	4 4.
ESSENTIAL + VERY USEFUL	5 50.	7 88.	12 67.	117 65.	5 56.	63 66.	7 78.	7 78.	6 67.	6 67.	19 76.	71 74.
DON'T KNOW												
AVERAGE	2.60	3.25	2.89	2.79	2.78	2.80	2.89	3.00	2.89	3.00	3.04	2.95
STANDARD DEVIATION	.66	.66	.73	.86	1.02	.82	.87	.66	.73	1.05	.82	.78

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8B(3) STATE OF ART	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	2 22.	7 20.		3 33.	15 24.		1 2.		1 11.	4 15.
VERY USEFUL	5 56.	15 43.	3 38.	2 22.	35 56.	3 33.	15 33.	9 50.	4 44.	10 37.
SOMEWHAT USEFUL	1 11.	8 23.	5 63.	3 33.	11 17.	5 56.	25 56.	9 50.	3 33.	6 22.
NOT AT ALL USEFUL	1 11.	5 14.		1 11.	2 3.	1 11.	4 9.		1 11.	6 22.
ESSENTIAL + VERY USEFUL	7 78.	22 63.	3 38.	5 56.	50 79.	3 33.	16 36.	9 50.	5 56.	14 52.
DON'T KNOW										1 4.
AVERAGE	2.89	2.69	2.38	2.78	3.00	2.22	2.29	2.50	2.56	2.46
STANDARD DEVIATION	.87	.93	.45	1.02	.73	.63	.65	.50	.81	1.01
Q8B(4) COSTS/PERFORMANCE	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	3 33.	16 46.	2 25.	3 33.	20 32.		6 13.	2 11.	3 33.	14 52.
VERY USEFUL	5 56.	12 34.	4 50.	3 33.	23 37.	8 89.	34 76.	9 50.	5 56.	7 26.
SOMEWHAT USEFUL	1 11.	5 14.	2 25.	3 33.	20 32.	1 11.	5 11.	5 28.	1 11.	4 15.
NOT AT ALL USEFUL		2 6.						2 11.		2 7.
ESSENTIAL + VERY USEFUL	8 89.	28 80.	6 75.	6 67.	43 68.	8 89.	40 89.	11 61.	8 89.	21 78.
DON'T KNOW										
AVERAGE	3.22	3.20	3.00	3.00	3.00	2.89	3.02	2.61	3.22	3.22
STANDARD DEVIATION	.63	.88	.70	.81	.79	.30	.50	.82	.63	.96

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

	WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
		10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8B(5)	COSTS INSTALL/OPERATE	10 100.	8 100.	18 100.	163 100.	9 100.	94 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
	ESSENTIAL	1 10.	2 25.	3 17.	32 20.	2 22.	19 20.	2 22.	2 22.	3 33.	5 56.	7 28.	22 23.
	VERY USEFUL	4 40.	4 50.	8 44.	70 43.	3 33.	43 46.	4 44.	5 56.	3 33.	3 33.	14 56.	47 49.
	SOMEWHAT USEFUL	2 20.	2 25.	4 22.	45 28.	3 33.	23 24.	1 11.	2 22.	3 33.		2 8.	21 22.
	NOT AT ALL USEFUL	3 30.		3 17.	16 10.	1 11.	8 9.	2 22.			1 11.	2 8.	6 6.
	ESSENTIAL + VERY USEFUL	5 50.	6 75.	11 61.	102 63.	5 56.	62 66.	6 67.	7 78.	6 67.	8 89.	21 84.	69 72.
	DON'T KNOW						1 1.						
	AVERAGE	2.30	3.00	2.61	2.72	2.67	2.78	2.67	3.00	3.00	3.33	3.04	2.89
	STANDARD DEVIATION	1.00	.70	.95	.90	.93	.88	1.04	.66	.81	.95	.82	.81
Q8B(6)	BUILDING CODES/REGS	10 100.	8 100.	18 100.	163 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
	ESSENTIAL	2 20.		2 11.	19 12.	3 33.	21 22.	4 44.	2 22.	1 11.	3 33.	5 20.	18 19.
	VERY USEFUL	4 40.		4 22.	38 23.	4 44.	32 34.	2 22.	4 44.	5 56.	3 33.	8 32.	24 25.
	SOMEWHAT USEFUL	2 20.	7 88.	9 50.	58 36.	1 11.	23 24.	2 22.	1 11.	2 22.	2 22.	8 32.	38 40.
	NOT AT ALL USEFUL	2 20.	1 13.	3 17.	48 29.	1 11.	19 20.	1 11.	2 22.	1 11.	1 11.	4 16.	16 17.
	ESSENTIAL + VERY USEFUL	6 60.		6 33.	57 35.	7 78.	53 56.	6 67.	6 67.	6 67.	6 67.	13 52.	42 44.
	DON'T KNOW												
	AVERAGE	2.60	1.88	2.28	2.17	3.00	2.58	3.00	2.67	2.67	2.89	2.56	2.46
	STANDARD DEVIATION	1.01	.30	.86	.98	.94	1.03	1.05	1.04	.80	.99	.98	.97

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8B(5) COSTS INSTALL/OPERATE	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	3 33.	15 43.	1 13.	2 22.	19 30.		8 18.	2 11.	5 56.	18 67.
VERY USEFUL	5 56.	11 31.	6 75.	4 44.	29 46.	6 67.	33 73.	6 33.	3 33.	3 11.
SOMEWHAT USEFUL	1 11.	8 23.	1 13.	1 11.	10 16.	3 33.	4 9.	7 39.	1 11.	4 15.
NOT AT ALL USEFUL		1 3.		2 22.	5 8.			3 17.		2 7.
ESSENTIAL + VERY USEFUL	8 89.	26 74.	7 88.	6 67.	48 76.	6 67.	41 91.	8 44.	8 89.	21 78.
DON'T KNOW										
AVERAGE	3.22	3.14	3.00	2.67	2.98	2.67	3.09	2.39	3.44	3.37
STANDARD DEVIATION	.63	.87	.50	1.04	.89	.45	.50	.88	.70	.99
Q8B(6) BUILDING CODES/REGS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	3 33.	9 26.	3 38.	2 22.	10 16.	1 11.	4 9.	2 11.	4 44.	17 63.
VERY USEFUL	3 33.	8 23.	2 25.	3 33.	22 35.	4 44.	11 24.	4 22.		7 26.
SOMEWHAT USEFLL	3 33.	14 40.	3 38.	3 33.	20 32.	3 33.	21 47.	11 61.	2 22.	1 4.
NOT AT ALL USEFUL		4 11.		1 11.	11 17.	1 11.	9 20.	1 6.	3 33.	2 7.
ESSENTIAL + VERY USEFUL	6 67.	17 49.	5 63.	5 56.	32 51.	5 56.	15 33.	6 33.	4 44.	24 89.
DON'T KNOW										
AVERAGE	3.00	2.63	3.00	2.67	2.49	2.56	2.22	2.39	2.56	3.44
STANDARD DEVIATION	.81	.98	.86	.93	.96	.81	.87	.75	1.33	.87

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10	8	18	181	9	96	9	9	9	9	25	96
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
Q8B(7) TAX/ECONOMIC INCENTIVE	10	8	18	163	9	95	9	9	9	9	25	96
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
ESSENTIAL	3		3	27	4	30	5	4	1	3	5	16
	30.		17.	17.	44.	32.	56.	44.	11.	33.	20.	17.
VERY USEFUL		2	2	44	4	41	2	3	3	3	8	41
		25.	11.	27.	44.	43.	22.	33.	33.	33.	32.	43.
SOMEWHAT USEFUL	4	5	9	52		15	1	2	4	2	8	28
	40.	63.	50.	32.		16.	11.	22.	44.	22.	32.	29.
NOT AT ALL USEFUL	3	1	4	40	1	9	1		1	1	4	11
	30.	13.	22.	25.	11.	9.	11.		11.	11.	16.	11.
ESSENTIAL + VERY USEFUL	3	2	5	71	8	71	7	7	4	6	13	57
	30.	25.	28.	44.	89.	75.	78.	78.	44.	67.	52.	59.
DON'T KNOW												
AVERAGE	2.30	2.13	2.22	2.36	3.22	2.97	3.22	3.22	2.44	2.89	2.56	2.65
STANDARD DEVIATION	1.18	.58	.98	1.01	.92	.91	1.03	.79	.84	.99	.98	.87
Q8B(8) STANDARDS/SPECS	10	8	18	163	9	96	9	9	9	9	25	96
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
ESSENTIAL	2		2	18	4	29	5	2		2	5	13
	20.		11.	11.	44.	30.	56.	22.		22.	20.	14.
VERY USEFUL	3	5	8	55	3	28	2	3	3	4	6	29
	30.	63.	44.	34.	33.	29.	22.	33.	33.	44.	24.	30.
SOMEWHAT USEFUL	3	1	4	53	2	31	1	3	5	3	9	42
	30.	13.	22.	33.	22.	32.	11.	33.	56.	33.	36.	44.
NOT AT ALL USEFUL	2	2	4	37		8	1	1	1		5	12
	20.	25.	22.	23.		8.	11.	11.	11.		20.	13.
ESSENTIAL + VERY USEFUL	5	5	10	73	7	57	7	5	3	6	11	42
	50.	63.	56.	45.	78.	59.	78.	56.	33.	67.	44.	44.
DON'T KNOW												
AVERAGE	2.50	2.38	2.44	2.33	3.22	2.81	3.22	2.67	2.22	2.89	2.44	2.45
STANDARD DEVIATION	1.02	.84	.96	.95	.79	.96	1.03	.93	.63	.73	1.02	.87

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8B(7) TAX/ECONOMIC INCENTIVE	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	2 22.	11 31.	1 13.	4 44.	19 30.	1 11.	7 16.	2 11.	4 44.	14 52.
VERY USEFUL	4 44.	10 29.	3 38.	3 33.	19 30.	4 44.	24 53.	8 44.	3 33.	8 30.
SOMEWHAT USEFUL	2 22.	8 23.	4 50.	2 22.	22 35.	3 33.	12 27.	7 39.	1 11.	4 15.
NOT AT ALL USEFUL	1 11.	6 17.			3 5.	1 11.	2 4.	1 6.	1 11.	1 4.
ESSENTIAL + VERY USEFUL	6 67.	21 60.	4 50.	7 78.	38 60.	5 56.	31 69.	10 56.	7 78.	22 82.
DON'T KNOW										
AVERAGE	2.78	2.74	2.63	3.22	2.86	2.56	2.80	2.61	3.11	3.30
STANDARD DEVIATION	.90	1.08	.67	.79	.89	.81	.74	.75	.99	.85
Q8B(8) STANDARDS/SPECS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
ESSENTIAL	2 22.	8 23.	1 13.	2 22.	11 17.	1 11.	2 4.	2 11.	1 11.	8 30.
VERY USEFUL	3 33.	10 29.		5 56.	18 29.	2 22.	14 31.	6 33.	2 22.	9 33.
SOMEWHAT USEFUL	3 33.	13 37.	6 75.	2 22.	26 41.	6 67.	24 53.	4 22.	2 22.	5 18.
NOT AT ALL USEFUL	1 11.	4 11.	1 13.		8 13.		4 9.	6 33.	3 33.	5 18.
ESSENTIAL + VERY USEFUL	5 56.	18 51.	1 13.	7 78.	29 46.	3 33.	16 36.	8 44.	3 33.	17 63.
DON'T KNOW							1 2.		1 11.	
AVERAGE	2.67	2.63	2.13	3.00	2.51	2.44	2.32	2.22	2.13	2.74
STANDARD DEVIATION	.93	.95	.76	.66	.91	.70	.69	1.03	1.04	1.07

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10	8	18	181	9	96	9	9	9	9	25	96
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
Q8B(9) MARKETING/SALES DATA	10	8	18	146	9	95	9	9	9	9	25	78
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
ESSENTIAL	1		1	14	3	22	4	2		1	2	3
	10.		6.	10.	33.	23.	44.	22.		11.	8.	4.
VERY USEFUL	2	2	4	38	2	30	3	1	2	1	7	13
	20.	25.	22.	26.	22.	32.	33.	11.	22.	11.	28.	17.
SOMEWHAT USEFUL	5	5	10	56	3	34	1	3	3	4	9	34
	50.	63.	56.	38.	33.	36.	11.	33.	33.	44.	36.	44.
NOT AT ALL USEFUL	2	1	3	38	1	9	1	3	4	3	7	28
	20.	13.	17.	26.	11.	9.	11.	33.	44.	33.	28.	36.
ESSENTIAL + VERY USEFUL	3	2	5	52	5	52	7	3	2	2	9	16
	30.	25.	28.	36.	56.	55.	78.	33.	22.	22.	36.	21.
DON'T KNOW												
AVERAGE	2.20	2.13	2.17	2.19	2.78	2.68	3.11	2.22	1.78	2.00	2.16	1.88
STANDARD DEVIATION	.87	.58	.75	.93	1.02	.94	.99	1.13	.78	.94	.92	.82
Q8B(10) OUTSIDE US RESEARCH/ INDUSTRY	10	8	18	180	9	96	9	9	9	9	25	96
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
ESSENTIAL	1		1	13	3	14	3	1			1	5
	10.		6.	7.	33.	15.	33.	11.			4.	5.
VERY USEFUL	3		3	51	3	25		1	1	2	4	13
	30.		17.	28.	33.	26.		11.	11.	22.	16.	14.
SOMEWHAT USEFUL	6	6	12	68	3	34	4	3	3	3	6	30
	60.	75.	67.	38.	33.	35.	44.	33.	33.	33.	24.	31.
NOT AT ALL USEFUL		2	2	48		23	2	4	5	4	14	48
		25.	11.	27.		24.	22.	44.	56.	44.	56.	50.
ESSENTIAL + VERY USEFUL	4		4	64	6	39	3	2	1	2	5	18
	40.		22.	36.	67.	41.	33.	22.	11.	22.	20.	19.
DON'T KNOW												
AVERAGE	2.50	1.75	2.17	2.16	3.00	2.31	2.44	1.89	1.56	1.78	1.68	1.74
STANDARD DEVIATION	.67	.43	.67	.90	.81	.99	1.17	.99	.67	.78	.88	.88

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8B(9) MARKETING/SALES DATA	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	9 100.		9 100.	27 100.
ESSENTIAL		2 6.	2 25.	2 22.	5 8.					3 11.
VERY USEFUL	2 22.	8 23.		1 11.	15 24.	1 11.	1 11.		1 11.	2 7.
SOMEWHAT USEFUL	5 56.	16 46.	3 38.	6 67.	26 41.	5 56.	5 56.		2 22.	8 30.
NOT AT ALL USEFUL	2 22.	9 26.	3 38.		17 27.	3 33.	3 33.		6 67.	14 52.
ESSENTIAL + VERY USEFUL	2 22.	10 29.	2 25.	3 33.	20 32.	1 11.	1 11.		1 11.	5 18.
DON'T KNOW										
AVERAGE	2.00	2.09	2.13	2.56	2.13	1.78	1.78		1.44	1.78
STANDARD DEVIATION	.66	.83	1.15	.81	.89	.62	.62		.69	.99
Q8B(10) OUTSIDE US RESEARCH/ INDUSTRY				9 100.	63 100.			17 100.		
ESSENTIAL				2 22.	5 8.					
VERY USEFUL				2 22.	14 22.			1 6.		
SOMEWHAT USEFUL				3 33.	23 37.			7 41.		
NOT AT ALL USEFUL				2 22.	21 33.			9 53.		
ESSENTIAL + VERY USEFUL				4 44.	19 30.			1 6.		
DON'T KNOW										
AVERAGE				2.44	2.05			1.53		
STANDARD DEVIATION				1.07	.92			.60		

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

	WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
		10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8B(11)	INFO ON MARKETING				18 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	18 100.	35 100.
	ESSENTIAL				3 17.	3 33.	22 23.	3 33.	2 22.	1 11.	1 11.	1 6.	2 6.
	VERY USEFUL					1 11.	17 18.	4 44.	3 33.	1 11.	1 11.	3 17.	7 20.
	SOMEWHAT USEFUL				7 39.	4 44.	33 35.	1 11.	2 22.	2 22.	2 22.	6 33.	11 31.
	NOT AT ALL USEFUL				8 44.	1 11.	23 24.	1 11.	2 22.	5 56.	5 56.	8 44.	15 43.
	ESSENTIAL + VERY USEFUL				3 17.	4 44.	39 41.	7 78.	5 56.	2 22.	2 22.	4 22.	9 26.
	DON'T KNOW												
	AVERAGE				1.89	2.67	2.40	3.00	2.56	1.78	1.78	1.83	1.89
	STANDARD DEVIATION				1.04	1.04	1.08	.94	1.05	1.02	1.02	.90	.90
Q8B(12)	INST/SOCIAL/ENVIRON/ LEGAL	10 100.	8 100.	18 100.	163 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	95 100.
	ESSENTIAL	2 20.		2 11.	13 8.	2 22.	9 9.	1 11.		1 11.	3 33.	4 16.	11 12.
	VERY USEFUL	4 40.	3 38.	7 39.	51 31.	3 33.	24 25.	1 11.	4 44.	5 56.	1 11.	8 32.	26 27.
	SOMEWHAT USEFUL	4 40.	5 63.	9 50.	73 45.	3 33.	41 43.	6 67.	4 44.		4 44.	9 36.	33 35.
	NOT AT ALL USEFUL				26 16.	1 11.	21 22.	1 11.	1 11.	3 33.	1 11.	4 16.	25 26.
	ESSENTIAL + VERY USEFUL	6 60.	3 38.	9 50.	64 39.	5 56.	33 35.	2 22.	4 44.	6 67.	4 44.	12 48.	37 39.
	DON'T KNOW												
	AVERAGE	2.80	2.38	2.61	2.31	2.67	2.22	2.22	2.33	2.44	2.67	2.48	2.24
	STANDARD DEVIATION	.74	.45	.68	.84	.93	.89	.79	.67	1.07	1.04	.94	.97

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)		WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
		9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8B(11)	INFO ON MARKETING	9 100.	27 100.	8 100.	9 100.	63 100.					
	ESSENTIAL		2 7.		2 22.	5 8.					
	VERY USEFUL	2 22.	6 22.	1 13.	4 44.	17 27.					
	SOMEWHAT USEFUL	2 22.	8 30.	3 38.	2 22.	21 33.					
	NOT AT ALL USEFUL	5 56.	11 41.	4 50.	1 11.	20 32.					
	ESSENTIAL + VERY USEFUL	2 22.	8 30.	1 13.	6 67.	22 35.					
	DON'T KNOW										
	AVERAGE	1.67	1.96	1.63	2.78	2.11					
	STANDARD DEVIATION	.80	.96	.68	.90	.94					
Q8B(12)	INST/SOCIAL/ENVIRON/ LEGAL	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
	ESSENTIAL	2 22.	3 9.		3 33.	6 10.		2 4.			3 11.
	VERY USEFUL	2 22.	12 34.	4 50.	4 44.	30 48.	2 22.	6 13.	2 11.	1 11.	5 18.
	SOMEWHAT USEFUL	4 44.	15 43.	2 25.	1 11.	19 30.	6 67.	30 67.	9 50.	3 33.	10 37.
	NOT AT ALL USEFUL	1 11.	5 14.	2 25.	1 11.	8 13.	1 11.	7 16.	7 39.	5 56.	9 33.
	ESSENTIAL + VERY USEFUL	4 44.	15 43.	4 50.	7 78.	36 57.	2 22.	8 18.	2 11.	1 11.	8 30.
	DON'T KNOW										
	AVERAGE	2.56	2.37	2.25	3.00	2.54	2.11	2.07	1.72	1.56	2.07
	STANDARD DEVIATION	.94	.83	.82	.94	.83	.57	.66	.65	.67	.98

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

	WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
		10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q8B(13)	EXPECTED DEVELOPMENTS	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
	ESSENTIAL	3 30.	1 13.	4 22.	24 13.	4 44.	19 20.		4 44.	1 11.	4 44.	6 24.	13 14.
	VERY USEFUL	5 50.	3 38.	8 44.	88 49.	2 22.	36 38.	3 33.	4 44.	4 44.	1 11.	10 40.	39 41.
	SOMEWHAT USEFUL	1 10.	4 50.	5 28.	51 28.	3 33.	33 34.	4 44.		3 33.	3 33.	7 28.	34 35.
	NOT AT ALL USEFUL	1 10.		1 6.	17 9.		8 8.	2 22.	1 11.	1 11.	1 11.	2 8.	10 10.
	ESSENTIAL + VERY USEFUL	8 80.	4 50.	12 67.	112 62.	6 67.	55 57.	3 33.	8 89.	5 56.	5 56.	16 64.	52 54.
	DON'T KNOW				1 1.								
	AVERAGE	3.00	2.63	2.83	2.66	3.11	2.69	2.11	3.22	2.56	2.89	2.80	2.57
	STANDARD DEVIATION	.89	.67	.84	.82	.87	.87	.74	.92	.81	1.09	.89	.85
Q8B(14)	CLIMATOLOGICAL DATA	10 100.	8 100.	18 100.	163 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
	ESSENTIAL	4 40.	1 13.	5 28.	34 21.	5 56.	28 29.	3 33.	2 22.	6 67.	5 56.	7 28.	29 30.
	VERY USEFUL	4 40.	4 50.	8 44.	55 34.	3 33.	28 29.	2 22.	3 33.	3 33.	1 11.	8 32.	38 40.
	SOMEWHAT USEFUL	2 20.	2 25.	4 22.	46 28.	1 11.	20 21.	3 33.	2 22.		2 22.	5 20.	16 17.
	NOT AT ALL USEFUL		1 13.	1 6.	28 17.		19 20.	1 11.	2 22.		1 11.	5 20.	13 14.
	ESSENTIAL + VERY USEFUL	8 80.	5 63.	13 72.	89 55.	8 89.	56 59.	5 56.	5 56.	9 100.	6 67.	15 60.	67 70.
	DON'T KNOW												
	AVERAGE	3.20	2.63	2.94	2.58	3.44	2.68	2.78	2.56	3.67	3.11	2.68	2.86
	STANDARD DEVIATION	.74	.84	.86	1.00	.70	1.10	1.02	1.05	.44	1.10	1.08	1.00

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

WIND ENERGY (CONTINUED)		WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
		9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q8B(13)	EXPECTED DEVELOPMENTS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
	ESSENTIAL	2 22.	10 29.		2 22.	17 27.		2 4.	2 11.		7 26.
	VERY USEFUL	4 44.	9 26.	5 63.	6 67.	31 49.	5 56.	23 51.	7 39.	2 22.	5 18.
	SOMEWHAT USEFUL	3 33.	13 37.	3 38.		10 16.	2 22.	14 31.	7 39.	5 56.	12 44.
	NOT AT ALL USEFUL		3 9.		1 11.	4 6.	2 22.	6 13.	2 11.	1 11.	2 7.
	ESSENTIAL + VERY USEFUL	6 67.	19 54.	5 63.	8 89.	48 76.	5 56.	25 56.	9 50.	2 22.	12 44.
	DON'T KNOW					1 2.				1 11.	1 4.
	AVERAGE	2.89	2.74	2.63	3.00	2.98	2.33	2.47	2.50	2.13	2.65
	STANDARD DEVIATION	.73	.97	.45	.81	.84	.82	.76	.83	.58	.96
Q8B(14)	CLIMATOLOGICAL DATA	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
	ESSENTIAL	2 22.	9 26.	1 13.	3 33.	21 33.		8 18.	5 28.	4 44.	16 59.
	VERY USEFUL	2 22.	8 23.	4 50.	4 44.	24 38.	4 44.	23 51.	7 39.	4 44.	6 22.
	SOMEWHAT USEFUL	4 44.	13 37.	2 25.	2 22.	15 24.	4 44.	9 20.	2 11.		4 15.
	NOT AT ALL USEFUL	1 11.	5 14.	1 13.		3 5.	1 11.	5 11.	4 22.	1 11.	1 4.
	ESSENTIAL + VERY USEFUL	4 44.	17 49.	5 63.	7 78.	45 71.	4 44.	31 69.	12 67.	8 89.	22 82.
	DON'T KNOW										
	AVERAGE	2.56	2.60	2.63	3.11	3.00	2.33	2.76	2.72	3.22	3.37
	STANDARD DEVIATION	.94	1.01	.84	.74	.87	.67	.85	1.10	.92	.87

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Wind Energy Data Tables (continued)

T-038

(OCTOBER, 1979)

USE OF SPECIAL ACQUISITION METHODS (QUESTION 10)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q10A COMPUTER TERMINAL												
1. YES	2 20.	2 25.	4 22.	62 34.	2 22.	22 23.	2 22.	1 11.	3 33.	3 33.	7 28.	33 34.
2. NO	8 80.	6 75.	14 78.	116 64.	7 78.	74 77.	6 67.	8 89.	6 67.	6 67.	18 72.	62 65.
8. DON'T KNOW/NA				3 2.			1 11.					1 1.
Q10B MICROFORM - COMPUTER												
1. YES		2 25.	2 11.	16 9.		5 5.	1 11.		2 22.	3 33.	4 16.	13 14.
2. NO	8 80.	6 75.	14 78.	155 86.	9 100.	87 91.	7 78.	8 89.	7 78.	6 67.	18 72.	78 81.
8. DON'T KNOW/NA	2 20.		2 11.	10 6.		4 4.	1 11.	1 11.			3 12.	5 5.
Q10C OTHER MICROFORM												
1. YES	5 50.	5 63.	10 56.	72 40.	1 11.	19 20.	3 33.		4 44.	2 22.	5 20.	24 25.
2. NO	5 50.	3 38.	8 44.	108 60.	8 89.	76 79.	6 67.	9 100.	5 56.	7 78.	20 80.	72 75.
8. DON'T KNOW/NA				1 1.		1 1.						

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SPECIAL ACQUISITION METHODS (QUESTION 10)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.
Q10A COMPUTER TERMINAL								
1. YES	1 11.	7 20.	1 13.	2 22.	14 22.		7 16.	8 44.
2. NO	8 89.	28 80.	7 88.	7 78.	49 78.	9 100.	38 84.	10 56.
8. DON'T KNOW/NA								
Q10B MICROFORM - COMPUTER								
1. YES	2 22.	4 11.			4 6.		3 7.	5 28.
2. NO	7 78.	30 86.	8 100.	9 100.	58 92.	9 100.	41 91.	11 61.
8. DON'T KNOW/NA		1 3.			1 2.		1 2.	2 11.
Q10C OTHER MICROFORM								
1. YES	4 44.	10 29.	2 25.	2 22.	21 33.	1 11.	4 9.	6 33.
2. NO	5 56.	25 71.	6 75.	7 78.	42 67.	8 89.	41 91.	12 67.
8. DON'T KNOW/NA								

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES (QUESTION 11)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(1) LIBRARY (ORG/LOCAL)	10 100.	8 100.	18 100.	179 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	9 90.	8 100.	17 94.	150 84.	5 56.	63 66.	6 67.	4 44.	8 89.	7 78.	19 76.	61 64.
2. NO	1 10.		1 6.	28 16.	4 44.	33 34.	3 33.	5 56.	1 11.	2 22.	6 24.	35 36.
8. DON'T KNOW				1 1.								
Q11(2) PUBLIC UTILITY	10 100.	8 100.	18 100.	180 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	6 60.	6 75.	12 67.	91 51.	3 33.	41 43.	5 56.	6 67.	5 56.	5 56.	17 68.	48 50.
2. NO	4 40.	2 25.	6 33.	88 49.	6 67.	55 57.	3 33.	3 33.	4 44.	4 44.	8 32.	48 50.
8. DON'T KNOW				1 1.			1 11.					
Q11(3) INSTALLER/BUILDER/ DESIGNER	10 100.	8 100.	18 100.	180 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	8 80.	5 63.	13 72.	117 65.	7 78.	66 69.	9 100.	9 100.	8 89.	9 100.	24 96.	83 86.
2. NO	2 20.	3 38.	5 28.	63 35.	2 22.	30 31.			1 11.		1 4.	13 14.
8. DON'T KNOW												
Q11(4) WORKSHOPS/CONFERENCES	10 100.	8 100.	18 100.	180 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	10 100.	7 88.	17 94.	159 88.	8 89.	72 75.	7 78.	8 89.	6 67.	6 67.	20 80.	69 72.
2. NO		1 13.	1 6.	21 12.	1 11.	24 25.	2 22.	1 11.	3 33.	3 33.	5 20.	27 28.
8. DON'T KNOW												

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES (QUESTION 11)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(1) LIBRARY (ORG/LOCAL)	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	6 67.	25 71.	5 63.	9 100.	54 86.	3 33.	20 44.	15 83.	3 33.	17 63.
2. NO	3 33.	10 29.	3 38.		9 14.	6 67.	25 56.	3 17.	6 67.	10 37.
8. DON'T KNOW										
Q11(2) PUBLIC UTILITY	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	5 56.	25 71.	4 50.	5 56.	36 57.	2 22.	20 44.	11 61.	3 33.	12 44.
2. NO	4 44.	10 29.	4 50.	4 44.	27 43.	7 78.	23 51.	7 39.	6 67.	14 52.
8. DON'T KNOW							2 4.			1 4.
Q11(3) INSTALLER/BUILDER/ DESIGNER	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	6 67.	27 77.	6 75.	9 100.	56 89.	2 22.	24 53.	11 61.	9 100.	23 85.
2. NO	3 33.	8 23.	2 25.		7 11.	7 78.	21 47.	7 39.		4 15.
8. DON'T KNOW										
Q11(4) WORKSHOPS/CONFERENCES	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	9 100.	27 77.	6 75.	8 89.	57 90.	5 56.	25 56.	15 83.	5 56.	16 59.
2. NO		8 23.	2 25.	1 11.	6 10.	4 44.	20 44.	3 17.	4 44.	10 37.
8. DON'T KNOW										1 4.

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(5) COMMERCIAL DATA BASE	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	95 100.
1. YES	3 30.	3 38.	6 33.	68 38.	2 22.	21 22.	3 33.	2 22.	4 44.	1 11.	7 28.	23 24.
2. NO	7 70.	4 50.	11 61.	110 61.	7 78.	75 78.	5 56.	7 78.	5 56.	8 89.	17 68.	70 74.
8. DON'T KNOW		1 13.	1 6.	3 2.			1 11.				1 4.	2 2.
Q11(6) FEDERAL LIBRARY/INFO CENTER	10 100.	8 100.	18 100.	180 100.	9 100.	95 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	4 40.	4 50.	8 44.	97 54.	4 44.	44 46.	4 44.	7 78.	6 67.	3 33.	13 52.	44 46.
2. NO	6 60.	4 50.	10 56.	78 43.	5 56.	50 53.	4 44.	2 22.	3 33.	6 67.	10 40.	50 52.
8. DON'T KNOW				5 3.		1 1.	1 11.				2 8.	2 2.
Q11(7) SSIE - SMITHSONIAN	10 100.	8 100.	18 100.	181 100.		42 100.			9 100.	9 100.	25 100.	70 100.
1. YES	2 20.	2 25.	4 22.	30 17.		3 7.			1 11.	1 11.	3 12.	8 11.
2. NO	8 80.	6 75.	14 78.	146 81.		39 93.			8 89.	8 89.	21 84.	61 87.
8. DON'T KNOW				5 3.							1 4.	1 1.

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(5) COMMERCIAL DATA BASE	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	2 22.	6 17.	1 13.	2 22.	17 27.	2 22.	6 13.	3 17.	2 22.	5 19.
2. NO	7 78.	28 80.	7 88.	7 78.	46 73.	7 78.	39 87.	15 83.	6 67.	22 81.
8. DON'T KNOW		1 3.							1 11.	
Q11(6) FEDERAL LIBRARY/INFO CENTER	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	5 56.	19 54.		5 56.	33 52.	2 22.	15 33.	12 67.	3 33.	9 33.
2. NO	4 44.	16 46.	8 100.	4 44.	30 48.	7 78.	30 67.	6 33.	6 67.	18 67.
8. DON'T KNOW										
Q11(7) SSIE - SMITHSONIAN	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	9 100.	18 100.	9 100.	27 100.
1. YES	2 22.	6 17.	1 13.	3 33.	13 21.			3 17.		2 7.
2. NO	7 78.	29 83.	7 88.	6 67.	48 76.	9 100.	9 100.	14 78.	8 89.	25 93.
8. DON'T KNOW					2 3.			1 6.	1 11.	

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(8) GOV'T PRINTING OFFICE-GPO	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	8 80.	7 88.	15 83.	134 74.	6 67.	72 75.	8 89.	4 44.	8 89.	7 78.	21 84.	73 76.
2. NO	2 20.	1 13.	3 17.	44 24.	3 33.	24 25.	1 11.	5 56.	1 11.	2 22.	4 16.	23 24.
8. DON'T KNOW				3 2.								
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(9) NATIONAL TECHNICAL INFORMATION SERVICE-NTIS	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	8 80.	6 75.	14 78.	115 64.	3 33.	42 44.	5 56.	5 56.	7 78.	5 56.	13 52.	45 47.
2. NO	2 20.	2 25.	4 22.	59 33.	6 67.	52 54.	3 33.	4 44.	2 22.	4 44.	12 48.	49 51.
8. DON'T KNOW				7 4.		2 2.	1 11.					2 2.
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(10) TECHNICAL INFORMATION CENTER - TIC	10 100.	8 100.	18 100.	180 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	2 20.	2 25.	4 22.	72 40.	3 33.	20 21.	1 11.	2 22.	3 33.	3 33.	7 28.	32 33.
2. NO	7 70.	5 63.	12 67.	100 56.	6 67.	73 76.	5 56.	6 67.	5 56.	6 67.	16 64.	60 63.
8. DON'T KNOW	1 10.	1 13.	2 11.	8 4.		3 3.	3 33.	1 11.	1 11.		2 8.	4 4.

Figure F-1. Wind Energy Data Tables (continued)

T-041

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(8) GOV'T PRINTING OFFICE-GPO	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	7 78.	27 77.	6 75.	7 78.	50 79.	3 33.	29 64.	15 83.	4 44.	13 48.
2. NO	2 22.	8 23.	2 25.	2 22.	12 19.	5 56.	15 33.	3 17.	5 56.	14 52.
8. DON'T KNOW					1 2.	1 11.	1 2.			
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(9) NATIONAL TECHNICAL INFORMATION SERVICE-NTIS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	4 44.	21 60.	1 13.	7 78.	40 63.		3 7.	9 50.	4 44.	8 30.
2. NO	5 56.	14 40.	7 88.	2 22.	22 35.	9 100.	39 87.	9 50.	5 56.	18 67.
8. DON'T KNOW					1 2.		3 7.			1 4.
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(10) TECHNICAL INFORMATION CENTER - TIC	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	9 100.
1. YES	2 22.	17 49.	1 13.	4 44.	28 44.		5 11.	9 50.	2 22.	
2. NO	7 78.	17 49.	7 88.	5 56.	31 49.	9 100.	39 87.	9 50.	7 78.	9 100.
8. DON'T KNOW		1 3.			4 6.		1 2.			

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(11) NATL SOLAR HEATING + COOLING INFO CTR	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.			16 100.	78 100.
1. YES	1 10.	4 50.	5 28.	53 29.	2 22.	40 42.	4 44.	8 89.			7 44.	28 36.
2. NO	9 90.	3 38.	12 67.	120 66.	7 78.	54 56.	4 44.	1 11.			8 50.	47 60.
8. DON'T KNOW		1 13.	1 6.	8 4.		2 2.	1 11.				1 6.	3 4.
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(12) REGIONAL SOLAR ENERGY CENTERS	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	2 20.	4 50.	6 33.	41 23.	3 33.	34 35.	3 33.	3 33.	5 56.	3 33.	12 48.	26 27.
2. NO	8 80.	4 50.	12 67.	133 73.	6 67.	62 65.	5 56.	4 44.	3 33.	6 67.	12 48.	66 69.
8. DON'T KNOW				7 4.			1 11.	2 22.	1 11.		1 4.	4 4.

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(11) NATL SOLAR HEATING + COOLING INFO CTR	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	2 22.	13 37.	1 13.	4 44.	29 46.		13 29.	9 50.	3 33.	10 37.
2. NO	7 78.	18 51.	7 88.	5 56.	34 54.	8 89.	30 67.	8 44.	6 67.	14 52.
8. DON'T KNOW		4 11.				1 11.	2 4.	1 6.		3 11.
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(12) REGIONAL SOLAR ENERGY CENTERS	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	3 33.	12 34.		5 56.	27 43.	3 33.	9 20.	4 22.	5 56.	6 22.
2. NO	6 67.	21 60.	8 100.	4 44.	34 54.	6 67.	32 71.	13 72.	4 44.	20 74.
8. DON'T KNOW		2 6.			2 3.		4 9.	1 6.		1 4.

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(13) US DEPT. OF ENERGY	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	10 100.	5 63.	15 83.	144 80.	6 67.	71 74.	7 78.	6 67.	8 89.	8 89.	15 60.	60 63.
2. NO		3 38.	3 17.	36 20.	3 33.	24 25.	2 22.	2 22.	1 11.	1 11.	9 36.	34 35.
8. DON'T KNOW				1 1.		1 1.		1 11.			1 4.	2 2.
Q11(14) RADIO/TV				80 100.		51 100.	9 100.	9 100.				17 100.
1. YES				22 28.		21 41.	5 56.	5 56.				10 59.
2. NO				57 71.		30 59.	4 44.	4 44.				7 41.
8. DON'T KNOW				1 1.								
Q11(15) PERIODICALS/ NEWSPAPERS	10 100.	8 100.	18 100.	109 100.	8 100.	86 100.	9 100.	9 100.			16 100.	51 100.
1. YES	10 100.	8 100.	18 100.	103 94.	8 100.	83 97.	9 100.	9 100.			16 100.	50 98.
2. NO				6 6.		3 3.						1 2.
8. DON'T KNOW												
Q11(16) PRIVATE SOLAR/ ENVIRONMENTAL ORG.	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	6 60.	4 50.	10 56.	96 53.	6 67.	62 65.	7 78.	7 78.	6 67.	3 33.	12 48.	39 41.
2. NO	4 40.	4 50.	8 44.	82 45.	3 33.	31 32.	2 22.	2 22.	3 33.	6 67.	13 52.	56 58.
8. DON'T KNOW				3 2.		3 3.						1 1.

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(13) US DEPT. OF ENERGY	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	7 78.	27 77.	2 25.	7 78.	53 84.	1 11.	23 51.	16 89.	3 33.	9 33.
2. NO	2 22.	8 23.	6 75.	2 22.	10 16.	6 67.	20 44.	2 11.	6 67.	16 59.
8. DON'T KNOW						2 22.	2 4.			2 7.
Q11(14) RADIO/TV				9 100.	62 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES				6 67.	33 53.	1 11.	19 42.	11 61.	3 33.	8 30.
2. NO				3 33.	28 45.	7 78.	25 56.	7 39.	6 67.	19 70.
8. DON'T KNOW					1 2.	1 11.	1 2.			
Q11(15) PERIODICALS/ NEWSPAPERS	9 100.	34 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	9 100.	32 94.	8 100.	9 100.	61 97.	8 89.	39 87.	18 100.	9 100.	25 93.
2. NO		2 6.			2 3.	1 11.	6 13.			2 7.
8. DON'T KNOW										
Q11(16) PRIVATE SOLAR/ ENVIRONMENTAL ORG.	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	3 33.	20 57.	3 38.	8 89.	42 67.	1 11.	16 36.	7 39.	3 33.	13 48.
2. NO	6 67.	13 37.	5 63.	1 11.	21 33.	8 89.	27 60.	11 61.	6 67.	14 52.
8. DON'T KNOW		2 6.					2 4.			

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
Q11(17) STATE ENERGY OR SOLAR OFFICES	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	5 50.	5 63.	10 56.	86 48.	4 44.	56 58.	5 56.	6 67.	5 56.	4 44.	13 52.	54 56.
2. NO	5 50.	3 38.	8 44.	94 52.	5 56.	40 42.	3 33.	3 33.	4 44.	5 56.	11 44.	40 42.
8. DON'T KNOW				1 1.			1 11.				1 4.	2 2.
Q11(18) OTHER STATE/ LOCAL GOV'T. SOURCE	10 100.	8 100.	18 100.	178 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	1 10.	2 25.	3 17.	49 28.	6 67.	40 42.	5 56.	4 44.	4 44.	4 44.	7 28.	29 30.
2. NO	9 90.	5 63.	14 78.	128 72.	3 33.	54 56.	3 33.	5 56.	5 56.	5 56.	18 72.	66 69.
8. DON'T KNOW		1 13.	1 6.	1 1.		2 2.	1 11.					1 1.
Q11(19) INTL SOLAR ENERGY SOCIETY-ISES	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	5 50.	3 38.	8 44.	87 48.	3 33.	48 50.	6 67.	6 67.	7 78.	3 33.	9 36.	36 38.
2. NO	5 50.	5 63.	10 56.	92 51.	6 67.	47 49.	1 11.	2 22.	2 22.	6 67.	16 64.	60 63.
8. DON'T KNOW				2 1.		1 1.	2 22.	1 11.				
Q11(20) SOLAR ENERGY INDUSTRIES ASSOC.-SEIA	10 100.	8 100.	18 100.	181 100.	9 100.	96 100.	9 100.	9 100.	9 100.	9 100.	25 100.	96 100.
1. YES	2 20.	2 25.	4 22.	60 33.	2 22.	45 47.	2 22.	5 56.	4 44.	2 22.	7 28.	21 22.
2. NO	8 80.	5 63.	13 72.	118 65.	6 67.	49 51.	6 67.	4 44.	5 56.	7 78.	18 72.	73 76.
8. DON'T KNOW		1 13.	1 6.	3 2.	1 11.	2 2.	1 11.					2 2.

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGEN	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
Q11(17) STATE ENERGY OR SOLAR OFFICES	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	6 67.	25 71.	5 63.	5 56.	48 76.	4 44.	26 58.	15 83.	5 56.	12 44.
2. NO	3 33.	10 29.	3 38.	4 44.	15 24.	5 56.	19 42.	3 17.	4 44.	15 56.
8. DON'T KNOW										
Q11(18) OTHER STATE/ LOCAL GOV'T. SOURCE	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	2 22.	13 37.		6 67.	32 51.	4 44.	19 42.	4 22.	3 33.	8 30.
2. NO	7 78.	21 60.	8 100.	3 33.	31 49.	5 56.	25 56.	14 78.	6 67.	19 70.
8. DON'T KNOW		1 3.					1 2.			
Q11(19) INTL SOLAR ENERGY SOCIETY-ISES	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	1 11.	13 37.		5 56.	39 62.		2 4.	5 28.	5 56.	8 30.
2. NO	7 78.	19 54.	8 100.	4 44.	24 38.	9 100.	43 96.	13 72.	4 44.	17 63.
8. DON'T KNOW	1 11.	3 9.								2 7.
Q11(20) SOLAR ENERGY INDUSTRIES ASSOC.-SEIA	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES	1 11.	13 37.	1 13.	5 56.	21 33.		2 4.	2 11.	3 33.	6 22.
2. NO	7 78.	18 51.	7 88.	4 44.	42 67.	9 100.	42 93.	15 83.	6 67.	20 74.
8. DON'T KNOW	1 11.	4 11.					1 2.	1 6.		1 4.

Figure F-1. Wind Energy Data Tables (continued)

T-048

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	WIND MANUF	WIND DISTR	WIND ENG	WIND ELEC POWER ENG
	10 100.	8 100.	18 100.	9 100.	9 100.	9 100.	9 100.
Q11(21) QUESTIONNAIRE SOURCE (AWEA)	10 100.	8 100.	18 100.	9 100.	9 100.	9 100.	9 100.
1. YES	10 100.	4 50.	14 78.	8 89.	8 89.	3 33.	2 22.
2. NO		3 38.	3 17.	1 11.	1 11.	5 56.	7 78.
8. DON'T KNOW		1 13.	1 6.			1 11.	
Q11(22) QUESTIONNAIRE SOURCE (USDA or State Dept. of Agri.)						9 100.	9 100.
1. YES						4 44.	2 22.
2. NO						5 56.	7 78.
8. DON'T KNOW							

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	WIND EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	100.[9]		100.[9]	100.[3]			100.[9]	
Q11(21) QUESTIONNAIRE SOURCE (AWEA)	100.[9]		100.[9]	100.[3]			44.[4]	
1. YES	56.[5]		67.[6]				56.[5]	
2. NO	44.[4]		33.[3]	100.[9]				
8. DON'T KNOW								
Q11(22) QUESTIONNAIRE SOURCE	100.[9]	100.[17]		100.[9]	100.[45]	100.[18]	100.[9]	100.[27]
1. YES	100.[9]	94.[16]		89.[8]	98.[44]	94.[17]	100.[9]	100.[27]
2. NO		6.[1]		11.[1]	2.[1]	6.[1]	44.[4]	26.[7]
8. DON'T KNOW	(EPRI)	(EPRI)		(USDA)	(USDA)	(USDA)	56.[5]	70.[19]
							(YOUR STATE SOLAR SOCIETY OR ASSOCIATION)	

Figure F-1. Wind Energy Data Tables (continued)

T-051

(OCTOBER, 1979)

YEARS IN CURRENT PROFESSION (QUESTION D2B)

WIND ENERGY	WIND COE-FUND RES	WIND NOOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10	8	18	181	9	96	9	9	9	9	25	96
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
1. 0-2 YEARS				10	3	9	1	1	1	1	1	4
				6.	33.	9.	11.	11.	11.	11.	4.	4.
2. 3-5 YEARS	1		1	35		22	4	4	1	1	5	16
	10.		6.	19.		23.	44.	44.	11.	11.	20.	17.
3. 6-10 YEARS	3	3	6	33	3	21		2	2	3	6	19
	30.	38.	33.	18.	33.	22.		22.	22.	33.	24.	20.
4. OVER 10	6	5	11	103	3	44	4	2	5	4	12	56
	60.	63.	61.	57.	33.	46.	44.	22.	56.	44.	48.	58.
DON'T KNOW/NA											1	1
											4.	1.

Figure F-1. Wind Energy Data Tables (continued)

T-051

(OCTOBER, 1979)

YEARS IN CURRENT PROFESSION (QUESTION D2B)

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.
1. 0-2 YEARS					1 2.		3 7.	
2. 3-5 YEARS	2 22.	9 26.		2 22.	8 13.	2 22.	9 20.	3 17.
3. 6-10 YEARS		5 14.	4 50.	1 11.	13 21.	1 11.	3 7.	4 22.
4. OVER 10	7 78.	21 60.	4 50.	6 67.	41 65.	6 67.	30 67.	11 61.
DON'T KNOW/NA								

Figure F-1. Wind Energy Data Tables (continued)

T-052

(OCTOBER, 1979)

MEMBERSHIP IN SOLAR-INTERESTED ORGANIZATIONS (QUESTION D3)
MEMBERSHIPS WITH INTEREST IN SOLAR

WIND ENERGY	WIND DOE-FUND RES	WIND NDOE-FUND RES	TOTAL WIND RES	ALL RES	WIND MANUF	ALL MANUF	WIND DISTR	SHAC DISTR	WIND ENG	WIND ELEC POWER ENG	ALL ELEC POWER ENG	ALL ENG
	10	6	18	181	9	96	9	9	9	9	25	96
	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
1. YES BELONG, NAME	8	7	15	136	5	62	6	6	7	9	23	81
	80.	88.	83.	75.	56.	65.	67.	67.	78.	100.	92.	84.
2. YES BELONG, CAN'T NAME				4								
				2.								
3. NO, DON'T BELONG	2	1	3	40	4	34	3	3	2		1	14
	20.	13.	17.	22.	44.	35.	33.	33.	22.		4.	15.
DON'T KNOW/NA				1							1	1
				1.							4.	1.

Figure F-1. Wind Energy Data Tables (continued)

T-052

(OCTOBER, 1979)

MEMBERSHIP IN SOLAR-INTERESTED ORGANIZATIONS (QUESTION D3)
MEMBERSHIPS WITH INTEREST IN SOLAR

WIND ENERGY (CONTINUED)	WIND UTIL REPS	ALL SOLAR UTIL REPS	NON-SOLAR UTIL REPS	WIND EDUC	ALL EDUC	WIND CES CO AGENT	ALL CES CO AGENT	ALL CES STATE SPEC	WIND SYST OWNER	TOTAL SHAC OWNER MNGR
	9 100.	35 100.	8 100.	9 100.	63 100.	9 100.	45 100.	18 100.	9 100.	27 100.
1. YES BELONG, NAME	5 56.	24 69.	5 63.	7 78.	56 89.	1 11.	17 38.	11 61.	6 67.	10 37.
2. YES BELONG, CAN'T NAME		3 9.								1 4.
3. NO, DON'T BELONG	4 44.	8 23.	3 38.	1 11.	5 8.	8 89.	28 62.	7 39.	3 33.	16 59.
DON'T KNOW/NA				1 11.	2 3.					

Figure F-1. Wind Energy Data Tables (continued)

(OCTOBER, 1979)

SPECIFIED TYPES OF WIND ENERGY SYSTEM USED (QUESTION 6)

USERS	WIND SYST OWNER
	9 100.
HOUSEHOLD ELECTRICITY	9 100.
YES	7 78.
NO	2 22.
DON'T KNOW/NO ANSWER	
HOUSEHOLD WATER PUMPING	9 100.
YES	4 44.
NO	5 56.
DON'T KNOW/NO ANSWER	
FARM ELECTRICITY	9 100.
YES	3 33.
NO	6 67.
DON'T KNOW/NO ANSWER	
FARM IRRIGATION	9 100.
YES	
NO	9 100.
DON'T KNOW/NO ANSWER	

Figure F-1. Wind Energy Data Tables (continued)

T-112

(OCTOBER, 1979)

QUESTION B2-13/B3-13 NUMBER OF YEARS

USERS	TOTAL SHAC OWNER MNGF	WIND SYST OWNER
	27	9
	100.	100.
3 MONTHS OR LESS		
BETWEEN 3 MONTHS TO 1 YEAR	2	
	7.	
1-3 YEARS	17	2
	63.	22.
OVER 3 YEARS	7	7
	26.	78.
DON'T KNOW/NO ANSWER		

Figure F-1. Wind Energy Data Tables (concluded)

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15. Supplementary Notes

16. Abstract (Limit: 200 words) This report describes the results of a series of telephone interview with groups of users of information on wind energy systems. These results, part of a larger study on many different solar technologies, identify types of information each group needed and the best ways to get information to each group. The report is 1 of 10 discussing study results. The overall study provides baseline data about information needs in the solar community. It covers these technological areas: photovoltaics, passive solar heating and cooling, active solar heating and cooling, biomass energy, solar thermal electric power, solar industrial and agricultural process heat, wind energy, ocean energy, and advanced energy storage. An earlier study identified the information user groups in the solar community and the priority (to accelerate solar energy commercialization) of getting information to each group. In the current study only high-priority groups were examined. Results from 10 wind energy groups respondents are analyzed in this report: DOE-Funded Researchers, Non-DOE-Funded Researchers, Representatives of Manufacturers, Distributors, Engineers (2 groups), Representatives of Utilities, Educators, Cooperative Extension Service County Agents, Small System Users. The data will be used as input to the determination of information products and services the Solar Energy Research Institute, the Solar Energy Information Data Bank Network, and the entire information outreach community should be preparing and disseminating.

17. Document Analysis

a. Descriptors
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