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Solar Energy Storage Researchers Information User Study

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A Division of Midwest Research Institute

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SOLAR ENERGY STORAGE RESEARCHERS INFORMATION USER STUDY

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MARCH 1981

PREPARED UNDER TASK NOS. 8420.11 AND 1023.11

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FOREWORD

This document reports the results of a series of studies of users of solar energy storage information. It identifies specific energy storage 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

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SOLAR ENERGY STORAGE RESEARCHERS INFORMATION USER STUDY MANAGEMENT SUMMARY

This report describes the results of a series of telephone studies of solar researchers who were potential, near-term (2-3 years) users of information on storage of energy from solar sources. These studies, part of a larger study covering many different solar technologies, identified:

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

This energy storage report is one of the ten discussing the results of these studies. In most of these studies, a variety of groups were interviewed regarding each solar technology. The need for information on energy storage pervades all of the solar technologies. To a limited extent this need is addressed in the other reports in this series which dealt specifically with individual solar energy technologies. In this report, only researchers were interviewed. In the case of storage of energy from solar sources, the only group for which specific and primary involvement in energy storage could be separately identified were those involved in energy storage research.

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 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).

SOLAR ENERGY STORAGE GROUPS STUDIED

The results of an earlier study identified the groups of information users constituting the solar energy storage 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 solar energy storage. However, sufficient names could only be obtained for researchers.

Respondents in the following two groups were asked about their need for information on storage of energy from solar sources:

- DOE-Funded Solar Energy Storage Researchers, and
- Non-DOE-Funded Solar Energy Storage Researchers.

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

RESULTS

Only two groups (both Researchers) were interviewed in this study. For purposes of comparison, the following tables also list results for All Researchers who were interviewed in the various solar technologies.

Usefulness of General Types of Information

The most important result obtained from the study of Solar Energy Storage Researchers was the identification of the energy storage information categories ranked the most useful by each group (see Table S-1). Solar energy storage respondents in both groups gave high ratings to information on:

- Cost/performance,
- Research in progress,
- The state of the art,
- Expected developments, and
- Systems design.

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. Probably, the most interesting results for Solar Energy Storage Researchers (Table S-2) were:

- The high level of interest in manual analytical tools,
- The greater usefulness of manual analytical tools than of computer models for storage system design, and
- The relative lack of interest in bibliographies and nontechnical descriptions which was typical of Researchers.

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.

The information sources most familiar to the Energy Storage groups were:

- Periodicals, newspapers, or magazines;
- Workshops, conferences, or training sessions;
- A solar installer, builder, designer, or manufacturer; and
- Directly from the U. S. Department of Energy (DOE).

Table S-1. COMPARATIVE USEFULNESS OF GENERAL TYPES OF INFORMATION ON SOLAR ENERGY STORAGE

General Information Types	Storage DOE-Funded Researchers	Storage Non-DOE-Funded Researchers	Total Storage Researchers	All Researchers[c]
	Ranking[a]	Ranking	Ranking	Ranking[c]
State of the Art in Solar Energy Storage Research	6	1	3	2
Solar Energy Storage Research in Progress	4	1	2	1
Solar Energy Storage Systems Cost/Performance	1	3	1	3
Educational Institutions Offering Solar Energy Storage-Related Courses	11	11	12	20
Expected Developments in Solar Energy Storage ("Next 10 Years")	3	4	4	5
International Solar Energy Storage Markets, Research, Programs, Industry	9	11	10	17
Coming Events in Solar Energy Storage	6	8	8	9
Solar Energy Storage Information Sources	4	4	6	6
Technical Experts on Solar Energy Storage Systems	9	8	9	11
Technical Descriptions of Solar Energy Storage Systems	6	7	7	8
Nontechnical Descriptions of Solar Energy Storage Systems	12	10	10	(21)[d]
Solar Energy Storage Systems Design[b]	2	6	4	10
Sample Size	10	8	18	181

[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]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).

[c]All Researchers were asked general information types which applied to their specific technology. They were asked about more types of information (21) than were Storage Researchers. Rankings by All Researchers are over 21 items, not just the 12 shown here.

[d]"( )" means the question was not asked of all of the groups in this particular set of respondents. For example, "(21)" means that this item was ranked 21st by those who were asked about this source. In no case were fewer than nine respondents asked.

Table S-2. **VALUE ASSESSMENT OF SPECIFIC SOLAR ENERGY STORAGE INFORMATION PRODUCTS**

Specific Information Products	Storage DOE-Funded Researchers	Storage Non-DOE-Funded Researchers	Total Storage Researchers	All Researchers[b]
	Percent[a]	Percent	Percent	Percent
Bibliography of General Readings on Solar Energy Storage Systems	40	25	33	39
Calendar of Solar Energy Storage Conferences and Programs	50	25	39	49
Solar Energy Storage System Diagrams or Schematics	44	50	47	42
Solar Energy Storage System Design/Installation Handbooks, Reference Tables	60	50	56	46
Manual Analytical Tools for Solar Energy Storage System Design	90	75	83	52
Computer Analytical Tools (Models) for Solar Energy Storage System Design	60	25	44	44
Lists of Solar Energy Storage Technical Experts	40	38	39	45
Technical Descriptions of Solar Energy Storage Systems	50	38	44	56
Nontechnical Descriptions of Solar Energy Storage Systems	10	38	22	(14)[c]
List of Solar Energy Storage Information Sources	40	50	44	57
Sample Size	10	8	18	181

[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]All Researchers were asked about specific information products which applied to their specific technology.

[c]"( )" means the question was not asked of all of the groups in this 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-3. SOURCES USED TO OBTAIN SOLAR INFORMATION (Percent[a])

Information Sources	Storage DOE-Funded Researchers	Storage Non-DOE-Funded Researchers	Total Storage Researchers	All Researchers
Public Media				
Radio or TV	30	38	33	(28)[b]
Periodicals, newspapers, or magazines	90	100	94	(94)
Private Solar-Involved Organizations				
Private solar energy or environmental organizations	20	63	39	53
International Solar Energy Society (ISES) (including publications)	60	88	72	48
Solar Energy Industries Association (SEIA) (including publications)	30	25	28	33
Contacts With Professionals				
Solar installer, builder, designer, or manufacturer	70	50	61	65
Workshops, conferences, or training sessions	90	100	94	88
Information Services				
Respondent's organizational library or local library	90	75	83	84
Commercial data base	40	0	22	38
Smithsonian Science Information Exchange (SSIE)	20	38	28	17
Federal library or information center	50	63	56	54
Government Printing Office (GPO)	40	63	50	74
National Technical Information Service (NTIS)	60	50	56	64
Technical Information Center (TIC)	20	63	39	40
Government Solar-Involved Organizations				
Directly from the U.S. Department of Energy (DOE)	90	75	83	80
National Solar Heating & Cooling Information Center (NSHCIC)	20	25	22	29
Regional Solar Energy Centers (RSECs)	30	25	28	23
State energy or solar offices	50	88	67	48
Other				
Some other state or local government office or publication	20	50	33	28
Public utility company	40	50	44	51
Association of Energy Engineers (AEE)	0	0	0	NA[b]
Institute of Electrical and Electronics Engineers (IEEE)	0	0	0	NA
Sample Size	10	8	18	181

[a]Percent is the percentage of respondents who used the source to obtain any solar information in the past few years.
[b]"( )" means the question was not asked of all of the groups in this particular set of respondents. For example, "(44)" means that 44% of those who were asked had used that source. In no case were less than nine respondents asked.
[c]"NA" means the question was not asked of this particular set of respondents.

Technical Areas of Interest

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

- Fairly high levels of interest in only thermal and thermochemical systems, and
- Low levels of interest in magnetic and electrical storage technologies.

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 for Solar Energy Storage Researchers:

- Storage respondents were more accustomed than most Researchers to using microforms, and
- Computer terminals were used less widely than microforms.

Additional Findings

- There was substantial difference in the ranks which the two groups assigned to "computer models." While it ranked 3rd with the DOE-Funded group, it fell to 13th for the Non-DOE-Funded Researchers.

Table S-4. INTEREST IN INFORMATION ON SOLAR ENERGY STORAGE TOPICS

Topics	Storage DOE-Funded Researchers	Storage Non-DOE-Funded Researchers	Total Storage Researchers
	Percent[a]	Percent	Percent
Electrochemical	20	50	33
Thermochemical	60	88	72
Chemical	50	25	39
Mechanical	40	38	39
Magnetic	10	13	11
Thermal	90	75	83
Electrical	10	13	11
Sample Size	10	8	18

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

Table S-5. ADVANCED INFORMATION ACQUISITION METHODS USED

Acquisition Methods	Storage DOE-Funded Researchers	Storage Non-DOE-Funded Researchers	Total Storage Researchers	All Researchers
	Percent[a]	Percent	Percent	Percent
Computer Terminal Access to Data Banks	30	25	28	34
Microform (microfiche, microfilm sheets or rolls, COM, etc.)	40	63	50	40
Sample Size	10	8	18	181

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

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SECTION 1.0

INTRODUCTION

This report describes the results of a series of telephone interviews with researchers who were potential near-term (2-3 years) users of information on storage of energy from solar sources. These studies, part of a larger study covering nine different solar technologies, identified:

- the type of information each group of researchers 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 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 10 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 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 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 solar energy storage report is 1 of 10 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 another report from this study also indicated an interest in information in storage of energy from solar sources. These groups are listed in Section 2.2.4. Section 3.0 describes the results of studies of:

- DOE-Funded Solar Energy Storage Researchers, and
- Non-DOE-Funded Solar Energy Storage Researchers.

These respondents were asked specifically about their needs for information on storage of energy from solar sources. 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 solar energy storage). 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 two solar energy storage groups.

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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 solar energy storage community were selected as those to be sampled and gives a few comments on interpretation of study results. The study findings are reported in Section 3.0.

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 two of those 86 studies which dealt specifically with solar energy storage.

Studies of 86 groups, each interested either in one of nine specific solar technologies or 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 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 solar energy storage 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 the 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 development through political influence, pro or con.

Based upon this scheme, the solar energy storage information user community has been defined. Table 2-1 enumerates the user groups comprising the solar energy storage 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 solar energy storage. The problem was, thus, to select those groups to be included 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 to interview 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 energy storage 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 storage of energy from solar sources would be sampled. It was felt that these were the people who would be primary users of the Solar Energy Information Data Bank (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.)

Table 2-1. SOLAR ENERGY STORAGE INFORMATION USERS

Target Audiences
- User Classes
  - User Groups

1.0 <u>Researchers</u>

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)
- National Science Foundation (NSF)
- U.S. Department of Defense (DOD)

1.3 Nonfederally Funded Researchers or Developers
- Universities
- Solar Manufacturers or Potential Manufacturers
- Independent Research Organizations
  - Institute of Gas Technology
- Trade Research Associations
  - Gas Research Institute
  - Electric Power Research Institute (EPRI)
- Ammonia Producers
- Chemical Industry
- Fuel Industry

2.0 <u>Applications Technologists</u>

2.1 Storage-Related Manufacturers
- Photovoltaics System Manufacturers
- Solar Heating and Cooling (SHAC) Manufacturers
- Heating, Ventilating and Air Conditioning (HVAC) Manufacturers
- Wind System Manufacturers
- Battery Manufacturers

2.2 Storage System Designers
- System Designers/Engineers
- Architectural/Engineering Design Firms
- Mechanical Engineers
- Electrical Engineers
- Chemical Engineers

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

Table 2-1. SOLAR ENERGY STORAGE INFORMATION USERS (Continued)

2.4 Storage System Installers and Maintainers

2.5 Storage Equipment Distributors

2.6 Technical Specialists for Utility, Government, Commercial, or Industrial Organization Using a Solar Storage System

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
- U.S. Department of Energy (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)
- National Center for Appropriate Technology (NCAT)
- International Energy Agency
- State Energy Offices
- State Solar Energy Offices
- Municipal Energy Offices
- United States Department of Agriculture (USDA)—Cooperative Extension Service
- U.S. Department of Commerce (DOC)

3.4 Government Solar-Concerned Organizations
- General Services Administration (GSA)
- DOD
- U.S. Department of Housing and Urban Development (HUD)
- USDA-Rural Electrification Administration (REA)
- USDA-Other
- Council on Environmental Quality (CEQ)
- General Accounting Office (GAO)
- State Governors' Offices
- State Agricultural Offices
- State Forestry Offices

Table 2-1. SOLAR ENERGY STORAGE INFORMATION USERS (Continued)

3.5	Nongovernment Solar-Active Organizations Solar Trade Associations Solar Professional Societies Solar Public Interest Groups Solar Lobbyists
3.6	Nongovernment Solar-Concerned Organizations Public Interest Organizations Environmental Organizations Chambers of Commerce Nonsolar Professional Societies Nonsolar Trade Associations
3.7	Regulatory, Codes, or Standards Community Environmental Protection Agency (EPA) Occupational Safety and Health Administration (OSHA) American National Standards Institute (ANSI) Building Officials and Code Administrators (BOCA), Council of American Building Officials (CABO), International Conference of Building Officials (ICBO), Southern Building Code Congress (SBCC) American Society of Mechnical 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 Federal Power Marketing Agencies DOE-Bonneville Power Administration Tennessee Valley Authority (TVA)
3.9	Financial Community
3.10	Legal Community
3.11	Real Estate Community
3.12	Insurance Community
3.13	Educational Community High School Science Teachers University Faculty Vocational Instructors Career Counselors Seminar Organizers and Instructors

Table 2-1. SOLAR ENERGY STORAGE INFORMATION USERS (Concluded)

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

3.16 Labor Organizations

4.0 Users or Prospective Users

4.1 Government, Commercial, or Industrial Users
- Federal/State/Local Agencies Owning or Holding Titles to Buildings
- Electric Utilities
- Users of Industrial Process Heat
- Owners of Large Buildings or Complexes
- Owners of Small Buildings
- Owners of Photovoltaic Systems
- Owners of Wind Energy Conversion Machines

4.2 Residential or Farming Users
- Homeowners
- Farmers, Ranchers

5.0 General Public
- Secondary School Students
- College Students
- Adults

2.2.3 Groups Included in the Solar Energy Storage Study

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

- DOE-Funded Solar Energy Storage Researchers, and
- Non-DOE-Funded Solar Energy Storage Researchers.

The results for these studies are reported in Section 3.0.

2.2.4 Solar Energy Storage-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 solar energy storage. 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 solar energy storage the following seven groups were especially relevant because for each group at least seven of the nine respondents indicated solar energy storage was one of the areas in which they were "particularly interested in obtaining information:"

- Real Estate Appraisers,
- Agricultural engineering specialists at state Cooperative Extension Service (CES) Offices,
- Information specialists at state CES Offices,
- Public Interest Groups,
- Tax Assessors,
- Insurers, and
- Lawyers.

The General Solar Energy report [2] also discusses the results of studies in which state solar/energy offices representatives were asked about their general, rather than technology-specific, solar information needs. Ninety-six percent of these representatives were interested in solar energy storage 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 up-to-date, 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 ocean energy and for another in solar thermal electric power, 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. 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 section 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," 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 "a bibliography" 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 the 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 both energy storage groups interviewed will not provide unbiased estimates of the total energy storage community. First, the proportions of respondents from one group interviewed in this study may not correspond to the proportion of such persons in each entire community, as only researchers were interviewed in the storage technology. 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 solar energy storage community were not studied (see Section 2.2).

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 solar energy storage systems" a low rating may have done so either because of the level and content of the subject matter (i.e., general readings on solar energy storage) 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.

SERI

SECTION 3.0

INFORMATION NEEDS OF RESEARCHERS IN SOLAR ENERGY STORAGE

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 the storage of energy from solar sources. In one study 10 DOE-Funded Solar Energy Storage Researchers were interviewed; in the other 8 Non-DOE-Funded Solar Energy Storage Researchers were interviewed.

The sample frame for DOE-Funded Solar Energy Storage Researchers was constructed from the Research in Progress (RIP) [3], the Smithsonian Science Information Exchange (SSIE) [4], and the Current Research Information System (CRIS) [5] 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 receiving at least some funding from the U.S. Department of Energy (DOE) and involving solar energy and storage were selected. Entries without contact names (i.e., principal investigator) were eliminated. In addition, this sample frame was compared to other Researcher sample frames (for active and passive solar heating and cooling, photovoltaics, wind, solar thermal electric power, industrial process heat, agricultural process heat, and ocean) and duplicate principal investigator names were deleted. After all adjustments were made, the 9 interview candidates were randomly selected from a sample frame of 38 names. Another respondent was added from the Non-DOE-Funded sample frame when it was later discovered that he had received DOE funding.

The sample frame for Non-DOE-Funded Solar Energy Storage Researchers was constructed by reviewing searches of RIP, SSIE, and CRIS files, then selecting those projects which had not received <u>any</u> 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 Storage Researchers, except that principal investigators who had received any DOE-funding during FY 1978 or FY 1979 were eliminated from the Non-DOE-Funded Storage Researchers. After all adjustments were made, the 8 interview candidates were randomly selected from a sample frame of 60 names.

<u>Respondents.</u> 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 solar energy storage research (and had or had not received funding from DOE, as appropriate for the specific group), and that they would be needing information on solar energy storage within the next year. If they were not both involved <u>and</u> 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: SOLAR ENERGY STORAGE RESEARCHERS

Event	Number of Candidates	
	DOE-Funded	Non-DOE-Funded
Interview completed with sample frame candidate	9	5
Interview completed with referral candidate	1	3
Refusal or candidate termination	0	0
Contact attempted: could not reach candidate within three attempts, or before interviews were completed	3	3
Subtotal	13	11
Contact attempted: invalid candidate (e.g.; inappropriate field of interest, no telephone)	3	1
TOTAL	16	12
Sample frame error rate[a] (Percent)	19	8
Completion rate[b] (Percent)	77	73

[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 two groups of Solar Energy Storage 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 the totals for Storage Researchers (one or both groups as appropriate) have been subtracted from the totals for All Researchers. The data for DOE-Funded Storage Researchers, Non-DOE-Funded Storage Researchers, and All Researchers can be found in Appendix F.

3.1.2 Current Status of Respondents

Role. Three of the DOE-Funded Storage Researchers were employed by universities; 3 were working for the Federal Government (U.S. Army or DOE national laboratories); and 1 each for an engineering firm, an aerospace firm, and a hotel chain. Five of the Non-DOE-Funded Storage Researchers were employed by universities (3 at Agricultural Experiment Stations), 2 by the U.S. Department of Agriculture, and 1 by the Federal Government (U.S. Navy).

Current activities of the DOE-Funded respondents involved: investigation of thermostratification, chemical heat pumps, identification of new methods to store solar energy, manufacture of a solar heating unit, promotion of storage of cold water for air conditioning, "processing systems," development of solar collectors for agricultural applications, and storage of hot water for space heat and chicken brooding.

Current activities of the Non-DOE-Funded respondents involved: greehnouse heat storage (3), rock and water heat storage for residential use (2), "infra-red energy storage for use on plants" in a solar heated and cooled greenhouse, use of batteries and other commercially available equipment, research on chemical storage materials, and "size stabilization."

Involvement. Four of the 10 (40%) DOE-Funded Storage Researchers and 3 of the 8 (38%) Non-DOE-Funded Storage Researchers said that they were "very involved" with solar energy storage systems. This compares with the 107 of the 181 (59%) of All Researchers who said they were very involved with their respective solar technologies.

Informedness. Similarly, 4 of the 10 (40%) DOE-Funded Solar Energy Storage Researchers considered themselves "very informed," compared to 3 of the 8 (38%) Non-DOE-Funded Storage Researchers and 117 of the 181 (65%) of All Researchers.

3.1.3 Background of Respondents

Five of the 10 (50%) DOE-Funded Storage Researchers and 6 of the 8 (75%) Non-DOE-Funded Storage Researchers held a doctoral degree. This compares to 52% (95 of the 181) of All Researchers who held doctorates. The remainder (2) of the Non-DOE-Funded Storage Researchers held master's degrees, as did 3 of the DOE-Funded Storage Researchers. The other 2 DOE-Funded Storage Researchers held bachelor's degrees.

Three of the DOE-Funded Storage Researchers had received their most recent degree from 5-10 years ago, 4 from 10-20 years ago, and 3 over 20 years ago. Similarly, 2 of the Non-DOE-Funded Storage Researchers received their degrees from 5-10 years ago, 3 from 10-20 years ago, and 3 over 20 years ago. Sixty-seven percent (122 of the 181) of All Researchers had received degrees within the past 20 years, compared to 70% (7 of the 10) of DOE-Funded Storage Researchers and 63% (5 of the 8) of Non-DOE-Funded Storage Researchers.

Nine of the DOE-Funded group had their most recent degrees in engineering (including general, civil, agricultural, mechanical, aero-physics, or chemical). The other degree was in chemistry. Professions mentioned included company vice-president, manager or director (research, project), engineer (research, chemical, mechanical, agricultural), researcher or research scientist, solar and gas turbine heating designer, and "experimenter in space environment." Five had been in their present profession for over 10 years, 1 for 6-10 years, and 4 for 3-5 years.

Most (5) of the Non-DOE-Funded Storage Researchers also held degrees in engineering (mechanical, civil, agricultural). The remainder (3) held degrees in soil physics, physical chemistry, and chemistry. Two respondents were currently teaching. Others described their professions as agricultural engineers (2), biophysicist, soil physicist, mechanical engineer, structural engineer, researcher in energy engineering, and materials applications expert. Six had been in their present profession for more than 10 years, 1 for 6-10 years, and 1 for 3-5 years.

3.2 INFORMATION NEEDS OF RESPONDENTS

3.2.1 Technical Areas

Solar Energy Storage Researchers were asked to choose those areas in which they were "particularly interested in obtaining information" from a list of selected technical areas in solar energy storage. At least half of the respondents in each group were interested in thermal storage and thermochemical storage. In both groups magnetic and electrical storage were of the least interest (see Table 3-2).

Table 3-2. AREAS OF INTEREST: SOLAR ENERGY STORAGE RESEARCHERS

Technical Area of Interest	DOE Funded		Non-DOE Funded		Total Storage Researchers	
	No.	Percent	No.	Percent	No.	Percent
Thermal	9	90	6	75	15	83
Thermochemical	6	60	7	88	13	72
Chemical	5	50	2	25	7	39
Mechanical	4	40	3	38	7	39
Electrochemical	2	20	4	50	6	33
Magnetic	1	10	1	13	2	11
Electrical	1	10	1	13	2	11
Total Respondents	10	100	8	100	18	100

One of the DOE-Funded Storage Researchers also expressed interest in phase-change materials, greenhouses, and photosynthesis in conjunction with energy storage systems. One of the Non-DOE-Funded Researchers was also interested in liquid storage systems; another was interested in metal hydrides.

3.2.2 Types of Information

Storage Researchers were asked to name the information about solar energy storage that was important for them to obtain. All of the 10 respondents in the DOE-Funded group volunteered one or more items of information which they considered important. They were interested in information on storage media other than water, including other liquid systems, chemical-bond storage, and seasonal and long-term storage. Also mentioned were: collector test data, performance records, demonstrations, and costs of various storage systems. The impact of the storage system on total solar system performance, ways to minimize heat loss, and new types of solar heating units were also mentioned—as were computer simulation programs and research in progress.

Seven of the 8 Non-DOE-Funded group responded to the question regarding important information. Two respondents mentioned information on phase-change materials and 2 mentioned costs. Other topics mentiones as being important were: heat storage capacity of materials, storage capacity per unit weight of materials, air flow characteristics in rock storage, infra-red storage, information on salt-crystals, cost-benefit analyses of various types of storage for water heating systems, storage research in progress, theoretical information, and reports on government funding of solar energy.

Information that 3 of the DOE-Funded Storage Researchers volunteered that they needed but were unable to get included: properties of storage materials, performance data on various collector systems, simulation programs for collector and storage systems, demonstrations of thermal storage, and descriptions and calendars of upcoming conferences on solar energy storage.

Only 1 Non-DOE-Funded Storage Researcher reported that he needed but was unable to get information. This information was on phase-change materials.

Choice Between Specific Needs. A list of 10 types of solar energy storage information products and 6 types of solar energy storage 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. 3-1 (DOE-Funded Storage Researchers) and 3-2 (Non-DOE Funded Storage Researchers). For the purpose of comparison, Fig. 3-3 shows results for All Researchers.

DOE-Funded Storage Researchers gave both items in the research category high ratings. Their four top-rated information categories/products were:

- Manual methods for sizing and predicting performance or costs;
- Costs and performance of systems;
- Computer models for sizing and predicting performance or costs; and
- Design handbooks, installation handbooks, or reference tables.

Only two of these items were highly rated by the Non-DOE-Funded Storage Researchers. Their four top-rated information categories/products included:

- Research in progress,
- The state of the art,
- Costs and performance of systems, and
- Manual methods for sizing and predicting performance or costs.

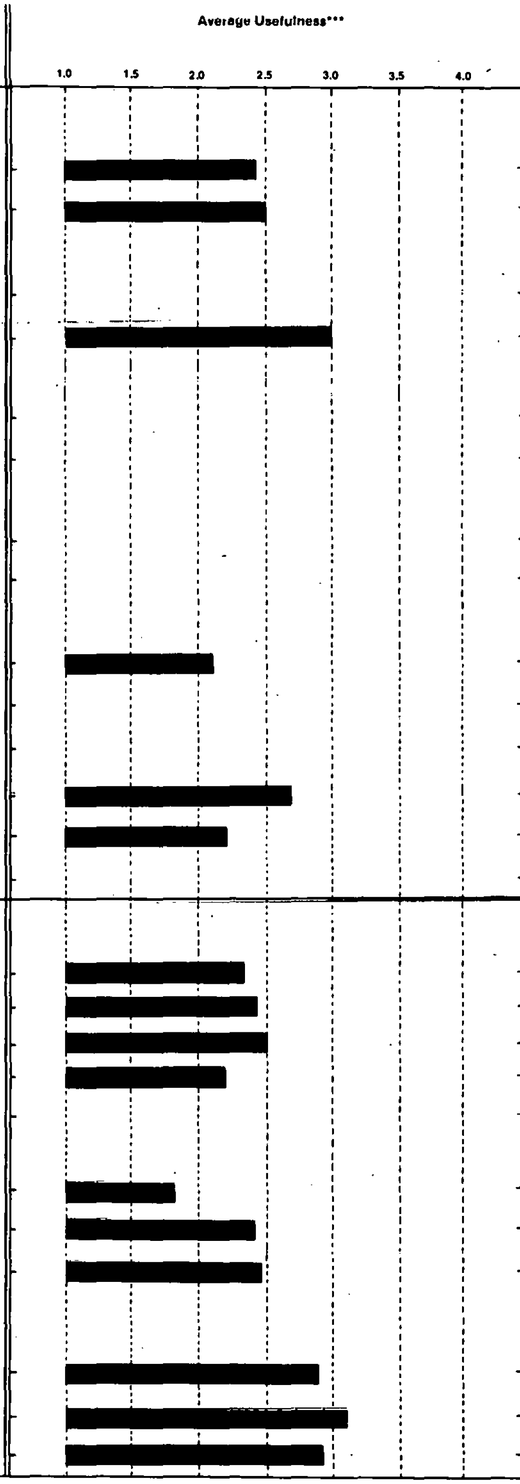
Among Researcher groups generally, high ratings were always given to the two research items, so that the relatively low rating given these two items by DOE-Funded Storage Researchers was surprising, as was the relatively high rating this group gave to the two prediction methods. However, the high rating given to the cost item was typical of Researchers.

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

- A nontechnical description of how a particular system works;
- Educational institutions and other organizations offering courses;
- Solar energy programs, research, industries, and markets outside the United States; and
- List of technical experts.

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	9	0	5	4	1
Research in progress	6	0	6	3	1
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	NA	NA	NA	NA	NA
Costs and performance of – systems	2	2	6	2	0
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	NA	NA	NA	NA	NA
Climatological data such as wind, weather, or amount of sunshine	NA	NA	NA	NA	NA
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	15	0	4	3	3
Standards, specifications, or certification programs for equipment	NA	NA	NA	NA	NA
Institutional, social, environmental, and legal aspects of system applications	NA	NA	NA	NA	NA
Expected major developments during the next 10 years	5	0	7	1	1
Solar system programs, research, industries, and markets outside the United States	13	0	5	2	3
Tax credits, grants, or other economic incentives	NA	NA	NA	NA	NA
Information Products:					
Reference Information Products:					
A bibliography of general readings	12	0	4	5	1
A calendar of conferences and programs	9	0	5	4	1
A list of sources for information	6	2	2	5	1
A list of technical experts	13	0	4	4	2
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	NA	NA	NA	NA	NA
Descriptive Information Products:					
A non-technical description of how a particular system works	16	1	0	5	4
A technical description of how a particular system works	9	0	5	4	1
System diagrams or schematics	8	1	3	4	1
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	4	3	3	2	1
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	1	2	7	1	0
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	3	3	3	4	0



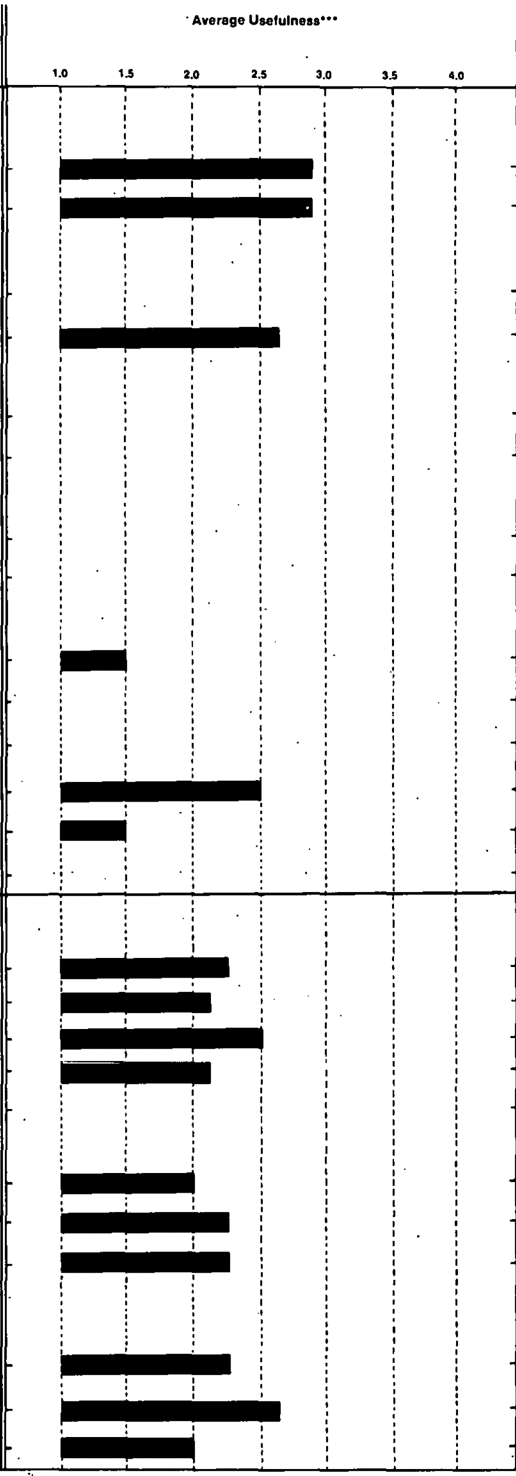
* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** 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 3-1. Usefulness of Selected Information Items: DOE-Funded Solar Energy Storage 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**	Essential (4)	Very useful (3)	Somewhat useful (2)	Not at all useful (1)
Information Categories:					
Research Information Categories:					
The state of the art	1	1	5	2	0
Research in progress	1	1	5	2	0
Cost Information Categories:					
Costs of installing and operating a solar system compared to a conventional system	NA	NA	NA	NA	NA
Costs and performance of systems	3	0	6	1	1
Site-Specific Information Categories:					
Local building codes or other regulations affecting siting or installation of systems	NA	NA	NA	NA	NA
Climatological data such as wind, weather, or amount of sunshine	NA	NA	NA	NA	NA
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	15	0	0	4	4
Standards, specifications, or certification programs for equipment	NA	NA	NA	NA	NA
Institutional, social, environmental, and legal aspects of system applications	NA	NA	NA	NA	NA
Expected major developments during the next 10 years	5	0	4	4	0
Solar system programs, research, industries, and markets outside the United States	15	0	1	2	5
Tax credits, grants, or other economic incentives	NA	NA	NA	NA	NA
Information Products:					
Reference Information Products:					
A bibliography of general readings	7	1	1	5	1
A calendar of conferences and programs	11	1	1	4	2
A list of sources for information	5	1	3	3	1
A list of technical experts	11	0	3	3	2
Lists of local lenders, insurers, builders, engineers, installers, manufacturers, or distributors	NA	NA	NA	NA	NA
Descriptive Information Products:					
A non-technical description of how a particular system works	13	0	3	2	3
A technical description of how a particular system works	7	0	3	4	1
System diagrams or schematics	7	0	4	2	2
Design Information Products:					
System design handbooks, installation handbooks, or reference tables	7	0	4	2	2
Manual methods for sizing and predicting the engineering performance or life cycle costs of systems	3	1	5	0	2
Computer models for sizing and predicting the engineering performance or life cycle costs of systems	13	0	2	4	2

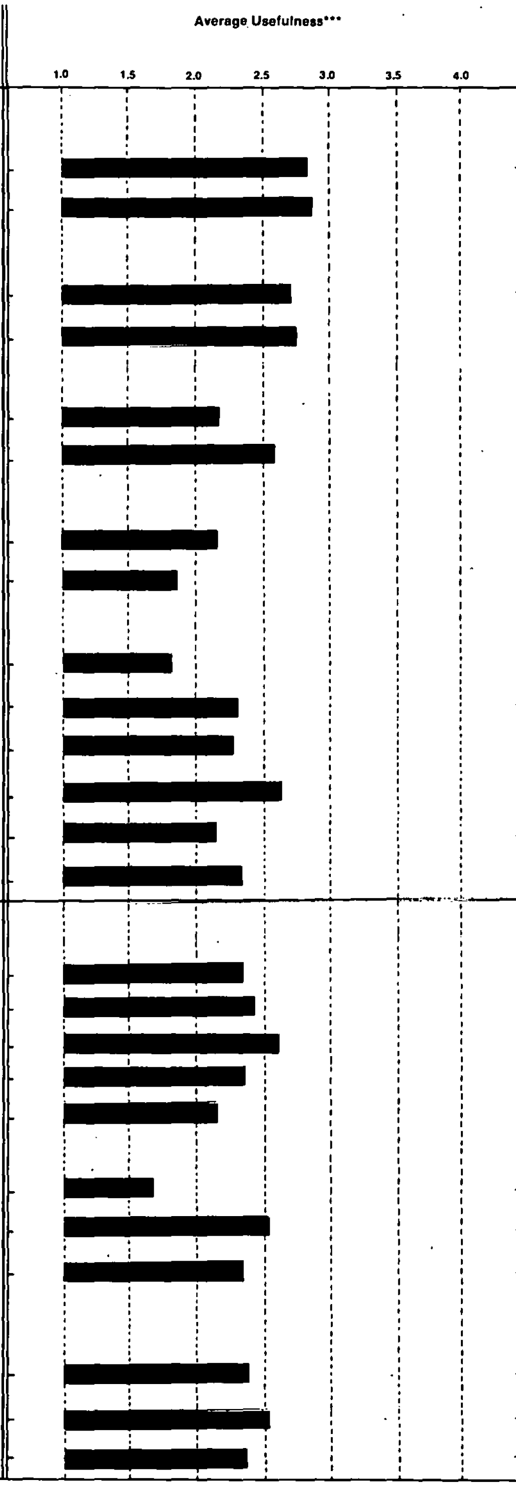
* Each sample frame of users was questioned on information and information products in the context of their specific technology. For example, biomass sample frames were asked about "a bibliography of general readings on biomass", "a calendar of upcoming biomass conferences and programs", etc.

** 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 3-2. Usefulness of Selected Information Items: Non-DOE-Funded Solar Energy Storage 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**	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	56	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

Non-DOE-Funded Storage Researchers were in agreement in assigning their lowest relative ratings to the same first three items. Also among their lowest four was:

- Computer models for sizing and predicting performance or costs,

which the DOE-Funded group had rated among their highest.

Statistical tests indicated that for both groups of Storage Researchers, differences between the ratings for the four highest-rated and four lowest-rated items were significant ($P < 0.05$).

It should be noted that these lower-rated items were not necessarily of no worth to the Storage Researchers. For example, 1 of the 10 (10%) DOE-Funded Storage Researchers and 3 of the 8 (38%) Non-DOE-Funded Storage Researchers thought "a nontechnical description" was either "essential" or "very useful." Thus, these information categories/products could be useful to some Storage Researchers, but were of a lower relative priority to the entire group.

Statistical tests were also used to determine whether the DOE-Funded Storage Researchers rated any of these information items significantly higher (or lower) than they were rated by the Non-DOE-Funded Storage Researchers, or whether either of these groups differed significantly from 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 Storage Researchers gave to all items was 2.48; for Non-DOE-Funded Storage Researchers it was 2.27; for All Researchers, 2.41.

In comparing the results for DOE-Funded Storage Researchers with Non-DOE-Funded Storage Researchers, the former group rated "computer models" significantly ($P < 0.05$) higher. Conversely, the DOE-Funded Storage Researchers rated "research in progress" and "the state of the art" significantly lower than did Non-DOE-Funded Storage Researchers.

In comparing the results of each of these two groups of Storage Researchers to All Researchers, DOE-Funded Storage Researchers were found to rate "manual methods" significantly ($P < 0.05$) higher and "the state of the art" and "research in progress" significantly lower than did All Researchers. They also appeared to be more interested in "system design handbooks" and in "computer models."

The Non-DOE-Funded Storage Researchers differed from All Researchers in giving significantly ($P < 0.05$) higher ratings to "a nontechnical description," and significantly lower ratings to "solar energy programs . . . outside the United States." They also appeared to be more interested in "manual methods."

3.3 ACQUISITION OF INFORMATION BY RESPONDENTS

3.3.1 Use of Selected Information Sources

Storage Researchers 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 solar energy storage 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 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.

The information sources mentioned most often by DOE-Funded Storage Researchers were:

- Periodicals, newspapers, or magazines;
- Workshops, conferences, or training sessions;
- An organizational library or a local library;
- Directly from DOE; and
- An installer, builder, designer, or manufacturer of solar systems.

Those mentioned most often by Non-DOE-Funded Storage Researchers were:

- Periodicals, newspapers, or magazines;
- Workshops, conferences, or training sessions;
- The International Solar Energy Society (ISES);
- State energy or solar offices;
- An organizational library or a local library; and
- Directly from DOE.

All of these sources except ISES and state energy or solar offices had also been used by at least 50% of All Researchers.

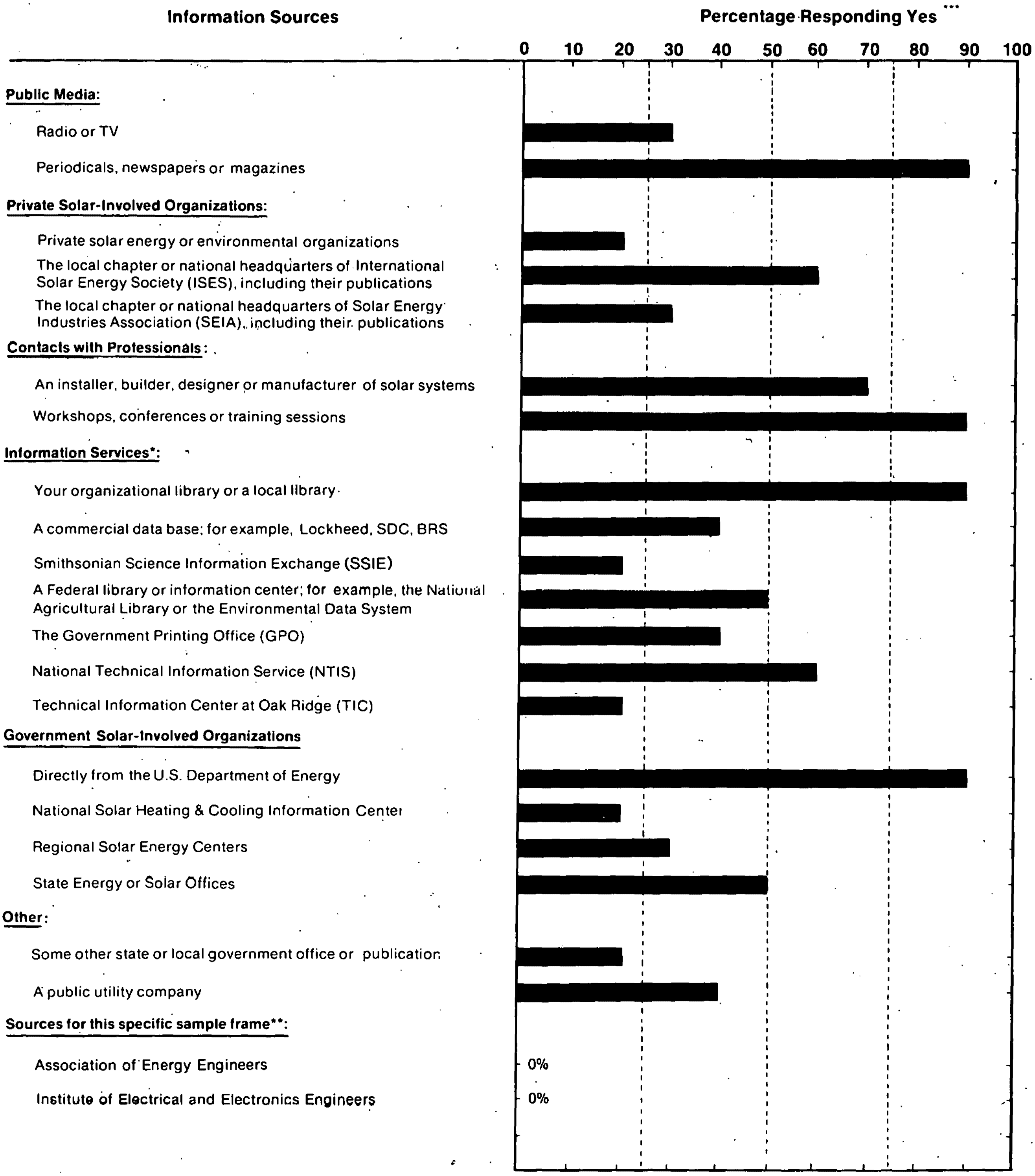
The information sources used least often by DOE-Funded Storage Researchers (only 2 of the 10 had used them) were:

- Private solar energy or environmental organizations,
- SSIE,
- Technical Information Center (TIC),
- National Solar Heating and Cooling Information Center (NSHCIC), and
- Some other state or local government office or publication.

The information sources mentioned least often by Non-DOE-Funded Storage Researchers were:

- A commercial data base,
- Solar Energy Industries Association (SEIA),
- NSHCIC, and
- Regional Solar Energy Centers (RSECs).

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



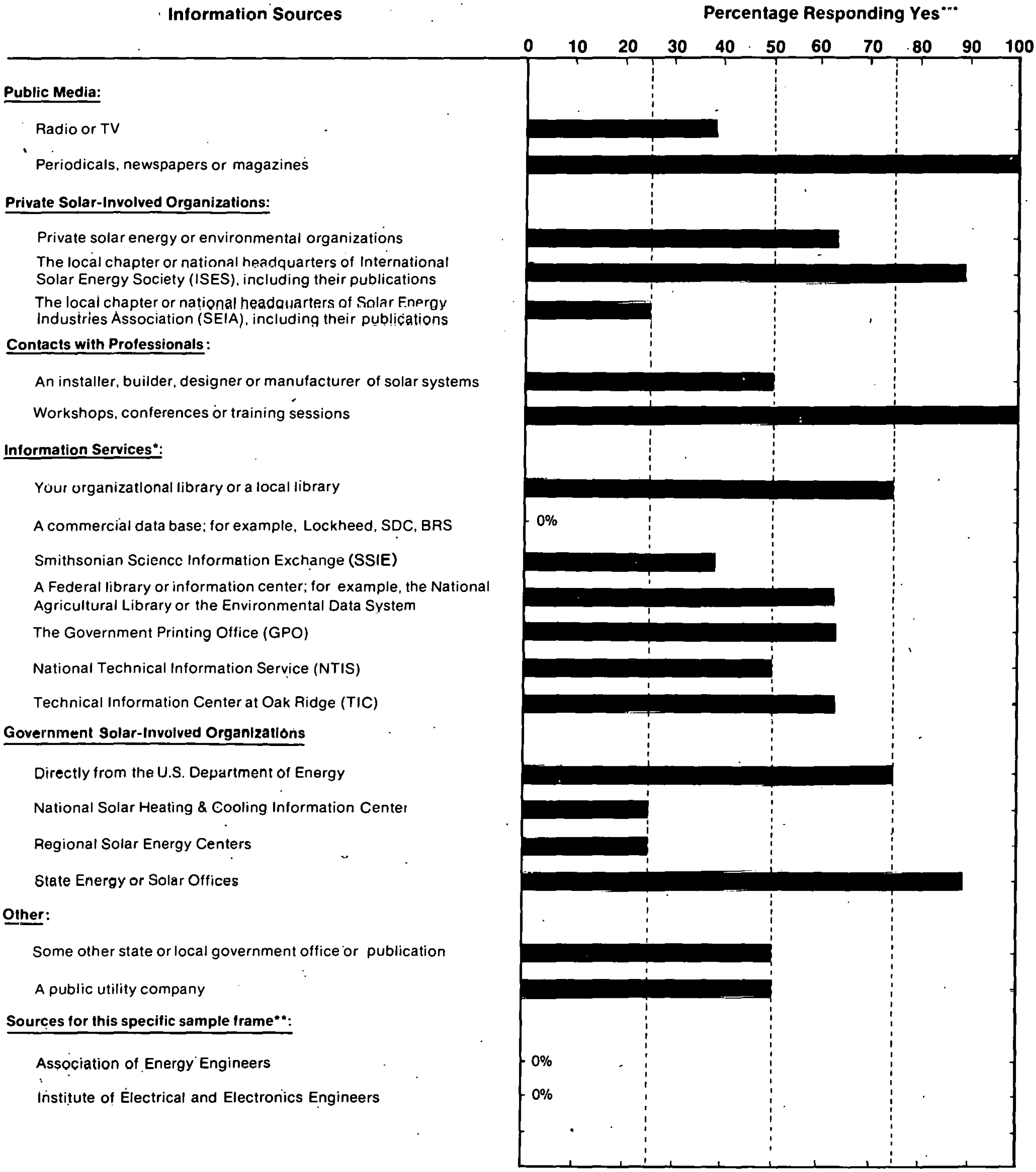
* Services and centers whose primary purpose is to disseminate information.

** 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 Solar Energy Storage Researchers

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



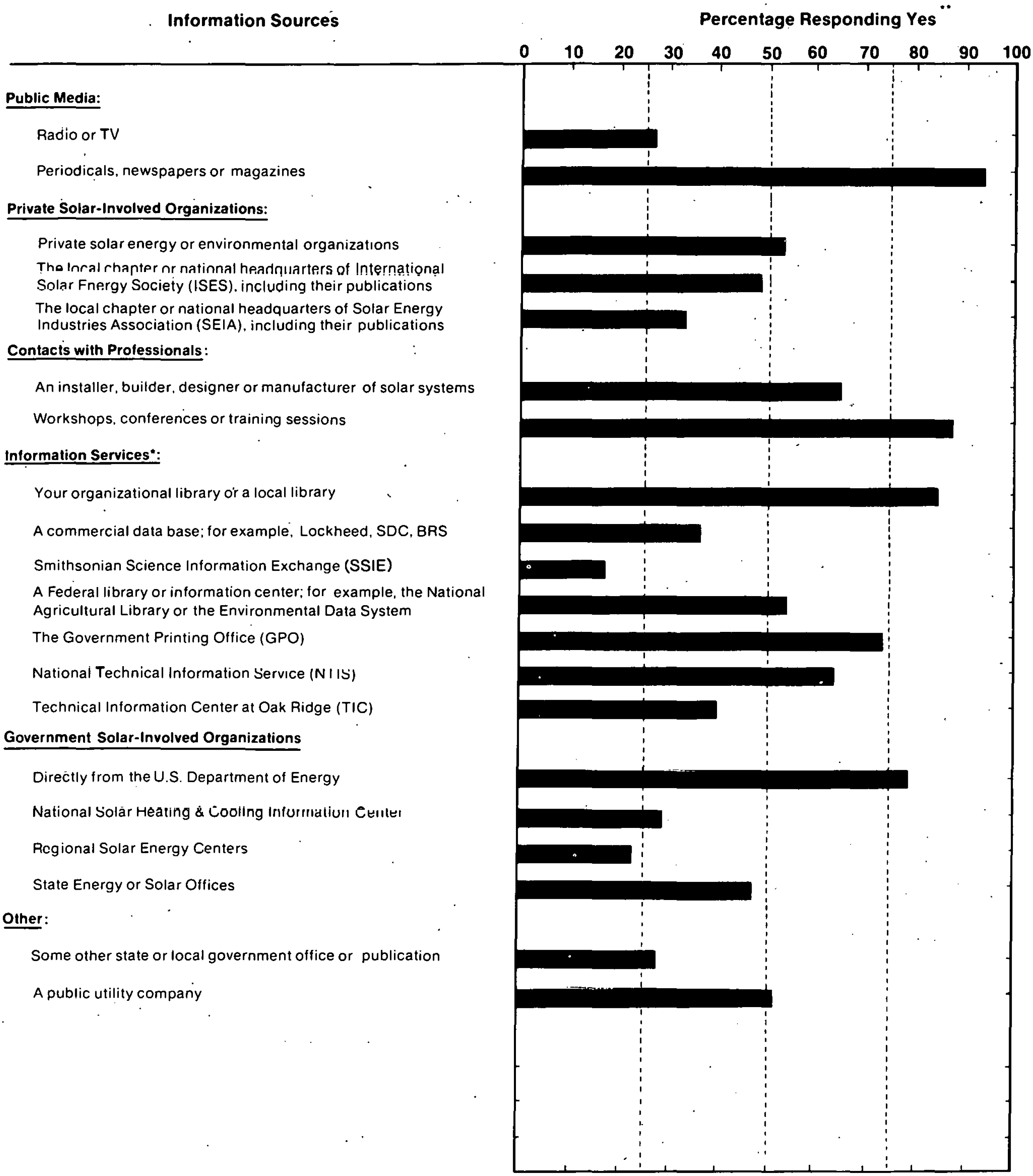
* Services and centers whose primary purpose is to disseminate information.

** 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 Solar Energy Storage 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

No statistically significant differences were found between DOE-Funded and Non-DOE-Funded Storage Researchers in the information sources they had used. DOE-Funded Storage Researchers were significantly ($P < 0.05$) less likely than All Researchers to have used the Government Printing Office (GPO) or "private solar. . .organizations." Non-DOE-Funded Storage Researchers were significantly ($P < 0.05$) less likely than All Researchers to have used "a commercial data base," but significantly more likely to have used both state energy/solar offices and ISES.

3.3.2 Membership in Solar-Interested Organizations

Seven of the 10 DOE-Funded Storage Researchers and all of the 8 Non-DOE-Funded Storage Researchers studied were members of a professional, technical, or other organization with an interest in solar energy. The organizations mentioned and the number belonging to each are displayed in Table 3-3. One DOE-Funded Storage Researcher also mentioned belonging to an organization which the authors could not verify. This was "IES" (Institute of Environmental Sciences or Institute for Earth Sciences?). Organizations which the Non-DOE-Funded Storage Researchers mentioned which the authors could not verify included "AMAE" and "AAAE."

Table 3-3. MEMBERSHIP IN SOLAR-INTERESTED ORGANIZATIONS: SOLAR ENERGY STORAGE RESEARCHERS

Organization	Storage Researcher Group[a]		
	DOE Funded	Non-DOE Funded	Total
American Chemical Society	2	1	3
American Institute of Aeronautics and Astronautics	1	—	1
American Institute of Chemical Engineers	1	—	1
American Society of Agricultural Engineers	2	4	6
American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)	1	1	2
American Society of Mechanical Engineers	1	2	3
American Society of Professional Biologists	—	1	1
Energy Consortium of the California State University	—	1	1
International Solar Energy Society	1	1	2
National Society of Professional Engineers	—	1	1
Solar Engineers of America	—	1	1
Texas Solar Energy Society	1	—	1
None	3	0	3
Total Respondents	10	8	18

[a]Number belonging to each organization.

3.3.3 Exposure to Publications on Solar Energy

During the past 6 months, all 10 DOE-Funded Researchers and all 7 Non-DOE Funded Researchers had read publications which included information on solar energy storage. The publications they could specify and the number mentioning each are shown in Table 3-4. Non-DOE-Funded Storage Researchers also mentioned some publications which the authors could not verify. These included "Sea World Magazine" and "Animal Heating." Many respondents in both groups responded that they had read too many to name, and (unidentified) "journal articles" and "technical journals" were commonly added to the list.

3.3.4 Use of Special Acquisition Methods

The respondents were asked whether they had obtained any information (not just solar energy or energy storage) in the past year by computer terminal, by Computer Output Microform (COM), or by other microform (e.g., mirofiche, microfilm sheets or rolls). The results are shown in Table 3-5.

Table 3-4. PUBLICATIONS READ WHICH INCLUDED INFORMATION ON SOLAR ENERGY: SOLAR ENERGY STORAGE RESEARCHERS

Publication	Storage Researcher Group[a]		
	DOE Funded	Non-DOE Funded	Total
Agricultural Engineering	—	1	1
ASHRAE publications	—	2	2
Chemical and Engineering News	—	1	1
DOE publications	3	1	4
International Journal of Heat and Mass Transfer	1	—	1
International Solar Energy Society publications	1	—	1
Journal of the American Chemical Society	—	2	2
Journal of Energy	1	—	1
Mechanical Engineering	—	1	1
Photochemistry and Photobiology	—	1	1
Popular Science	—	1	1
Solar Age	1	1	2
Solar Energy	2	4	6
Solar Engineering	1	1	2
Transactions of the American Society of Agricultural Engineers	—	1	1

[a]Number mentioning each publication.

Table 3-5. ACQUISITION METHODS USED: SOLAR ENERGY STORAGE RESEARCHERS

Acquisition Method	Storage Researcher Group					
	DOE Funded		Non-DOE Funded		All Researchers	
	No.	Percent	No.	Percent	No.	Percent
Computer Terminal	3	30	2	25	62	34
Computer Output Microform (COM)	0	0	1	13	16	9
Other Microform	4	40	5	63	72	40
Total Respondents	10	100	8	100	181	100

3.4 SUMMARY AND COMMENTS

Two types of solar energy storage researchers were interviewed: those who were funded by DOE and those who received funding only from non-DOE sources. The DOE-Funded Researchers had a variety of employers: Federal Government, national laboratories, universities, private engineering or aerospace firms, and a hotel chain. Non-DOE-Funded Researchers were employed by universities or by the Federal Government. Both groups had a substantial proportion of researchers working in agricultural applications for solar energy storage (e.g.; greenhouses, livestock shelters). Most of the storage techniques in which these researchers were involved were in the area of low-temperature thermal storage. The only exception was one researcher working with electrical storage. Both their levels of involvement in and informedness about the solar technology about which they were queried was somewhat lower than that exhibited by other researchers interviewed in this study.

Both groups attributed the greatest utility to information on:

- Manual methods for sizing and predicting the engineering performance or life-cycle costs of solar energy storage systems,
- Costs and performance of solar energy storage installations, and
- Solar energy storage research in progress.

High ratings for "manual methods" were unusual for other researchers interviewed in this study. DOE-Funded Storage Researchers also gave high ratings to "computer models for sizing and predicting the engineering performance or life-cycle costs of solar energy storage systems" and to "solar energy storage system design handbooks, installation handbooks, or reference tables." Non-DOE-Funded Storage Researchers also gave high ratings to "state of the art in solar energy storage."

Storage Researchers were not very interested in "educational institutions," "programs, research . . . outside the United States," "a nontechnical description," or "a list of solar energy storage technical experts." They appear to find any type of reference information source less useful than research and design information or hard data.

Storage Researchers obtained much of their solar information from "periodicals (etc.)," "workshops, conferences, or training sessions," "an organizational or a local library," and directly from DOE. For the Non-DOE-Funded groups, ISES and state energy or solar offices were also valuable sources. Most respondents also received solar information from professional societies of which they were members and to a lesser extent, solar organizations and their publications.

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SECTION 4.0

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4. Smithsonian Science Information Exchange (Data Base). Lockheed: File 65. Washington, DC: The Smithsonian Institute; 75-79/MAR.

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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

Table A-1. GROUPS STUDIED (Continued)

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
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

Table A-1. GROUPS STUDIED (Continued)

D. BIOMASS ENERGY (Continued)

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
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)

TABLE A-1. GROUPS STUDIES (Continued)

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

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
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

Table A-1. GROUPS STUDIED (Concluded)

J. GENERAL SOLAR (Continued)

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)

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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 different 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/she needed a calendar of solar events to be updated monthly or updated quarterly, when no one knew whether he/she 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 9 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/her 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 Solar Energy Storage 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 Solar Energy Storage Researchers wanted "state-of-the-art" information significantly more than they wanted "climatological data." Several tests could be made comparing one group to another. Thus, one could test whether Passive Architects wanted "cost data" significantly more than did Active Solar Heating and Cooling Architects. This type of comparison usually highlighted basic differences between technologies. One could also test whether Solar Energy Storage 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 Solar Energy Storage 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 Solar Energy Storage 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; authors of solar articles; technical staff at SERI; federal offices; publishers; solar groups; at least 30 state solar and state energy offices, etc.

Both the Mid-American Solar Energy Complex (MASEC) and the Northeast Solar Energy Center (NESEC) were subcontracted to provide additional names and addresses. Western SUN also provided many names on a voluntary basis. The Southern Solar Energy Center (SSEC) 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 specified field or employment sector, etc. Averaging over all groups, approximately 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 the 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., "a DOE-Funded Researcher doing work on solar energy storage") 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 nine candidates for interviewing: the total number of potential candidates was divided by nine to obtain "i," the "skip interval." Starting from a random point (R), every i^{th} name then became one of the first nine 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.

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 a DOE-Funded Researcher doing research on solar energy storage 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 doing DOE-Funded research related to solar energy storage systems. Is that correct?

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 organization who was doing DOE-funded research related to solar energy storage systems. 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, solar energy storage respondents were asked the following two questions:

- In the next year do you expect to need information on solar energy storage systems for your job?
- In the next year do you expect to need information on solar energy storage systems outside your job?

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/she was receiving DOE funds for his/her 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

SERI

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 were 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, that respondent had not necessarily received this letter.

There were numerous telephone calls to the Solar Energy Research Institute (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.

The questionnaires used in the solar energy storage study were very similar to those used for the other studies. The instrument which follows (see Fig. D-1) contains references to solar energy storage in Questions 1 through 9. Questionnaires that were used for respondents from other technologies substituted references to their appropriate technologies instead of to solar energy storage.

Question 5. This question asked, "What is the most important information that could be provided to you about solar energy storage?" 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 each of 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. Therefore, 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 solar energy storage technologies was read to the respondent, and the respondent was asked for which application he/she was particularly interested in obtaining information. After this was completed, respondents were asked "Are there any other areas of solar energy storage for which you are particularly interested in obtaining information?" Responses to this question fell into one of two areas: additional solar energy storage 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 solar energy storage 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 16 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.

1. In the next year, do you expect to need information on solar energy storage. . . . . .

(a) For your job? Yes. . . . . 1 → (IF "YES" CONTINUE. OTHERWISE TERMINATE)
No. 2
Don't know. 8
NA. 9

(b) NOT ASKED. 0 31
32

---

2. To what extent are you <u>currently</u> involved with solar energy storage? 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 solar energy storage? (ASK AS AN OPEN END)

Verb.

---

4. How well informed would you say you are about solar energy storage? Would you say you are:

Very informed. 4
Moderately informed, or. 3
Slightly informed. 2
Not at all informed. (VOLUNTEERED) . 1 34
Don't know. 8
NA. 9

---

5. What is the most important information that could be provided to <u>you</u> about solar energy storage? (INTERVIEWER: THIS INCLUDES INFORMATION WHICH <u>COULD</u> BE PROVIDED BY AN INFORMATION CENTER)

1st mention 35 C+V

2nd mention

Figure D-1. Questionnaire

Cd 2 1-10asl
11-50 Blk

6. For which of the following areas of solar energy storage are you particularly interested in obtaining information? (READ LIST. CIRCLE ONE RESPONSE PER ITEM.)

	Yes	No	Don't Know	NA	
(1) Electrochemical (BATTERIES, FOR EXAMPLE)	1	2	8	9	51
(2) Thermochemical (SUCH AS REVERSIBLE CHEMICAL REACTION PRODUCTS)	1	2	8	9	52
(3) Chemical (HYDROGEN, FOR EXAMPLE)	1	2	8	9	53
(4) Mechanical (SUCH AS FLYWHEELS, COMPRESSED AIR, PUMPED HYDROELECTRIC)	1	2	8	9	54
(5) Magnetic	1	2	8	9	55
(6) Thermal (FOR EXAMPLE, SENSIBLE HEAT, LATENT HEAT, CHEMICAL BOND)	1	2	8	9	56
(7) Electrical (SUPERCONDUCTING MAGNETS, FOR EXAMPLE)	1	2	8	9	57

58-75 Blk
76 Cd #
77-80 Job #

Cd 3

Are there any other areas of solar energy storage for which you are especially interested in obtaining information? (SPECIFY) 1-10 as 1
11-43 Blk

(1st Mention) ____________________ 44 C+V

(2nd Mention) ____________________ 45-51 Blk

7. What publications have you read in the past six months that include information on solar energy storage?

None. 001

Read, but can't remember titles . 002
(VOLUNTEERED)

Read too many to name 003 52-54
(VOLUNTEERED)
(ASK) Which are most important?
(RECORD TITLES)

Names publications (RECORD TITLES) 004

1st Mention ____________________

2nd Mention ____________________

3rd Mention ____________________ CL

Figure D-1. Questionnaire (continued)

8a. I will read a list of potential information products on solar energy storage. For each, please tell me how useful that information would be to you. Would the 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 solar energy storage. . .	4	3	2	1	8	9	43
(2) A list of sources for information on solar energy storage. . .	4	3	2	1	8	9	44
(3) A calendar of upcoming solar energy storage conferences and programs. .	4	3	2	1	8	9	45
(4) Diagrams or schematics of a solar energy storage system. . .	4	3	2	1	8	9	46
(5) A non-technical description of how a particular solar energy storage system works. . . .	4	3	2	1	8	9	47
(6) A technical description of how a particular solar energy storage system works. . .	4	3	2	1	8	9	48
(7) NOT ASKED.						0	49
(8) Solar energy storage system handbooks, installation handbooks, or reference tables. . . .	4	3	2	1	8	9	50
(9) A list of technical experts in solar energy storage. . .	4	3	2	1	8	9	51
(10) Manual methods for sizing and predicting the engineering performance or life cycle costs of solar energy storage 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)

SERI

8b. I will next read a list of types of information on solar energy storage. 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 solar energy storage. . . .	4	3	2	1	8	9	55
(2) Solar energy storage research currently in progress. . .	4	3	2	1	8	9	56
(3) The state-of-the-art in solar energy storage systems.	4	3	2	1	8	9	57
(4) Costs and performance of solar energy storage installations. . . .	4	3	2	1	8	9	58
(5) NOT ASKED.						0	59
(6) NOT ASKED.						0	60
(7) NOT ASKED.						0	61
(8) NOT ASKED.						0	62
(9) NOT ASKED.						0	63
(10) Solar energy storage programs, research, industries and markets outside the United States. . .	4	3	2	1	8	9	64
(11) NOT ASKED.						0	65
(12) NOT ASKED.						0	66
(13) Expected major developments in solar energy storage during the next ten years. . .	4	3	2	1	8	9	67
(14) NOT ASKED						0	68

Figure D-1. Questionnaire (continued)

9. Is there solar energy storage information which you need but are not able to get?

Yes	1	11
Yes (BUT CAN'T DESCRIBE)	2	
No	3	
Don't know	8	
NA	9	

(IF YES) What information do you need?

1st mention Verb.

2nd mention

10. In the past year have you obtained any information, not just 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

Figure D-1. Questionnaire (continued)

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 <u>any</u> 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 Infrmation 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? (25)

Good	3
Fair	2
Poor	1
Don't know	8
NA	9

What are some of the reasons you do not consider their service "good"? (Verb.)

1st Mention ____________________

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? (27)

Good	3
Fair	2
Poor	1
Don't know	8
NA	9

What are some of the reasons you do not consider their service "good"? (Verb.)

1st Mention ____________________

2nd Mention ____________________

Figure D-1. Questionnaire (continued)

(Cont'd)

	Yes	No	Don't know	NA	
(10) Technical Information Center at Oak Ridge (TIC) . . .	[1] ↓	2	8	9	28

How would you evaluate the service you received from TIC?

Good	3	
Fair	[2] ↓	
Poor	[1] ↓	29
Don't know	8	
NA	9	

What are some of the reasons you do not consider their service "good"?

1st Mention____________________

2nd Mention____________________ Verb.

	Yes	No	Don't know	NA	
(11) National Solar Heating and Cooling Information Center. .	[1] ↓	2	8	9	30

How would you evaluate the service you received from the Center?

Good	3	
Fair	[2] ↓	
Poor	[1] ↓	
Don't know	8	31
NA	9	

What are some of the reasons you do not consider their service "good"?

1st Mention____________________

2nd Mention____________________ Verb.

	Yes	No	Don't know	NA	
(12) Regional Solar Energy Centers. . . .	[1] ↓	2	8	9	32

How would you evaluate the service you received from your regional center?

Good	3	
Fair	[2] ↓	
Poor	[1] ↓	33
Don't know	8	
NA	9	

What are some of the reasons you do not consider their service "good"?

1st Mention____________________

2nd Mention____________________ Verb.

Figure D-1. Questionnaire (continued)

(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)	Association of Energy Engineers (AEE)	1	2	8	9	42
(22)	The Institute of Electrical and Electronics Engineers (IEEE, PRONOUNCED "I" TRIPLE "E") . . .	1	2	8	9	43
(23)	NOT ASKED				0	44
(24)	NOT ASKED				0	45

Figure D-1. Questionnaire (continued)

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	48-49
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	

D1b. In what field is your most recent degree? ______ (RECORD) — Verb.

D1c. In what year did you get that degree? ______ (YEAR) — 50-51

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	52
3-5	2	
6-10	3	
Over 10	4	
NA	9	

Figure D-1. Questionnaire (continued)

D3. Do you belong to any professional, technical, or other organizations which have an interest in solar?

Yes	1	53
Yes (BUT CAN'T NAME)	2	
No	3	
Don't know	8	
NA	9	

a. What organizations? CL

1st Mention ______________________

2nd Mention ______________________

3rd Mention ______________________

4th Mention ______________________

54-69 Blk

Thank you very much for your time.

Figure D-1. Questionnaire (concluded)

Question 11. In this question respondents were not asked if they had obtained solar information from the 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 Bank (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.

Table D-1. SELECTED ORGANIZATIONS ABOUT WHICH SOLAR ENERGY STORAGE RESPONDENTS WERE ASKED

Item[a]	Organization
21	Association of Energy Engineers (AEE)
22	Institute of Electrical and Electronics Engineers (IEEE)

[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

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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 DOE-Funded Solar Energy Storage Researchers using computer terminals was compared to the proportion of Non-DOE-Funded Solar Energy Storage Researchers 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 Solar Energy Storage 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 with 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 Solar Energy Storage 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 DOE-Funded Solar Energy Storage Researchers 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.

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APPENDIX F

SOLAR ENERGY STORAGE

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 respondents 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 shows 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	Report Section
Solar Energy Storage DOE-Funded Researchers (STOR DOE-FUND RES)	3.0
Solar Energy Storage Non-DOE-Funded Researchers (STOR NDOE-FUND RES)	3.0
Total Solar Energy Storage Researchers (TOTAL STOR RES)	3.0
All Researchers (ALL RES)	3.0

Table F-2. COMBINATION GROUPS

Total Solar Energy Storage Researchers (TOTAL STOR RES)

Solar Energy Storage DOE-Funded Researchers
Solar Energy Storage Non-DOE-Funded Researchers

All Researchers (ALL RES)

Photovoltaics (PV) DOE-Funded Researchers
PV Non-DOE-Funded Researchers
PV 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

Table F-3. LIST OF SOLAR ENERGY STORAGE DATA TABLES

[a]See Appendix D, Fig. D-1 for the wording of each question.

(OCTOBER, 1979)

NEED FOR INFORMATION ON THE JOB AND OUTSIDE THE JOB (QUESTION 1)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
YES FOR JOB	10 100.	8 100.	18 100.	178 98.
NO FOR JOB				2 1.
DON'T KNOW/NA				1 1.
Q1B TOTAL				117 100.
YES OUTSIDE JOB				48 41.
NO OUTSIDE JOB				60 51.
DON'T KNOW/NA				9 8.
YES, JOB + OUTSIDE				46 39.

Figure F-1. Solar Energy Storage Researchers Data Tables

(OCTOBER, 1979)

INVOLVEMENT (QUESTION 2)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 / 100.	8 / 100.	18 / 100.	181 / 100.
4. VERY INVOLVED	4 / 40.	3 / 38.	7 / 39.	107 / 59.
3. MODERATELY INVOLVED	4 / 40.	2 / 25.	6 / 33.	43 / 24.
2. SLIGHTLY INVOLVED	2 / 20.	3 / 38.	5 / 28.	29 / 16.
1. NOT AT ALL INVOLVED				1 / 1.
DON'T KNOW/NA				1 / 1.
AVERAGE	3.20	3.00	3.11	3.42
STANDARD DEVIATION	.74	.86	.81	.78

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)
INFORMEDNESS (QUESTION 3)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
4. VERY INFORMED	4 40.	3 38.	7 39.	117 65.
3. MODERATELY INFORMED	6 60.	5 63.	11 61.	59 33.
2. SLIGHTLY INFORMED				5 3.
1. NOT AT ALL INFORMED				
DON'T KNOW/NA				
AVERAGE	3.40	3.38	3.39	3.62
STANDARD DEVIATION	.49	.44	.47	.53

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

INTEREST IN SPECIFIED ENERGY STORAGE AREAS (QUESTION 6)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	18 100.
ELECTROCHEMICAL				
1. YES	2 20.	4 50.	6 33.	6 33.
2. NO	8 80.	4 50.	12 67.	12 67.
DON'T KNOW/NA				
THERMOCHEMICAL				
1. YES	6 60.	7 88.	13 72.	13 72.
2. NO	4 40.	1 13.	5 28.	5 28.
DON'T KNOW/NA				
CHEMCIAL				
1. YES	5 50.	2 25.	7 39.	7 39.
2. NO	5 50.	6 75.	11 61.	11 61.
DON'T KNOW/NA				
MECHANICAL				
1. YES	4 40.	3 38.	7 39.	7 39.
2. NO	6 60.	5 63.	11 61.	11 61.
DON'T KNOW/NA				

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

INTEREST IN SPECIFIED ENERGY STORAGE AREAS - CONTINUED (QUESTION 6)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 / 100.	8 / 100.	18 / 100.	18 / 100.
MAGNETIC				
1. YES	1 / 10.	1 / 13.	2 / 11.	2 / 11.
2. NO	9 / 90.	7 / 88.	16 / 89.	16 / 89.
DON'T KNOW/NA				
THERMAL				
1. YES	9 / 90.	6 / 75.	15 / 83.	15 / 83.
2. NO	1 / 10.	2 / 25.	3 / 17.	3 / 17.
DON'T KNOW/NA				
ELECTRICAL				
1. YES	1 / 10.	1 / 13.	2 / 11.	2 / 11.
2. NO	9 / 90.	7 / 88.	16 / 89.	16 / 89.
DON'T KNOW/NA				

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q8A(1) BIBLIOGRAPHY	10 100.	8 100.	18 100.	181 100.
ESSENTIAL		1 13.	1 6.	15 8.
VERY USEFUL	4 40.	1 13.	5 28.	55 30.
SOMEWHAT USEFUL	5 50.	5 63.	10 56.	89 49.
NOT AT ALL USEFUL	1 10.	1 13.	2 11.	22 12.
ESSENTIAL + VERY USEFUL	4 40.	2 25.	6 33.	70 39.
DON'T KNOW				
AVERAGE	2.30	2.25	2.28	2.35
STANDARD DEVIATION	.64	.82	.72	.79
Q8A(2) LIST OF SOURCES	10 100.	8 100.	18 100.	180 100.
ESSENTIAL	2 20.	1 13.	3 17.	23 13.
VERY USEFUL	2 20.	3 38.	5 28.	79 44.
SOMEWHAT USEFUL	5 50.	3 38.	8 44.	67 37.
NOT AT ALL USEFUL	1 10.	1 13.	2 11.	11 6.
ESSENTIAL + VERY USEFUL	4 40.	4 50.	8 44.	102 57.
DON'T KNOW				
AVERAGE	2.50	2.50	2.50	2.63
STANDARD DEVIATION	.92	.86	.89	.79

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q8A(3) CALENDAR-CONFERENCES/ PROGRAMS	10 100.	8 100.	18 100.	181 100.
ESSENTIAL	.	1 13.	1 6.	19 10.
VERY USEFUL	5 50.	1 13.	6 33.	69 38.
SOMEWHAT USEFUL	4 40.	4 50.	8 44.	71 39.
NOT AT ALL USEFUL	1 10.	2 25.	3 17.	22 12.
ESSENTIAL + VERY USEFUL	5 50.	2 25.	7 39.	88 49.
DON'T KNOW	.	.	.	.
AVERAGE	2.40	2.13	2.28	2.47
STANDARD DEVIATION	.66	.91	.79	.83
Q8A(4) DIAGRAMS/SCHEMATICS	9 100.	8 100.	17 100.	179 100.
ESSENTIAL	1 11.		1 6.	14 8.
VERY USEFUL	3 33.	4 50.	7 41.	62 35.
SOMEWHAT USEFUL	4 44.	2 25.	6 35.	78 44.
NOT AT ALL USEFUL	1 11.	2 25.	3 18.	25 14.
ESSENTIAL + VERY USEFUL	4 44.	4 50.	8 47.	76 42.
DON'T KNOW			.	.
AVERAGE	2.44	2.25	2.35	2.36
STANDARD DEVIATION	.84	.82	.84	.82

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 6)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q8A(5) NON-TECHNICAL DESCRIPTION	10 100.	8 100.	18 100.	153 100.
ESSENTIAL	1 10.		1 6.	3 2.
VERY USEFUL		3 38.	3 17.	18 12.
SOMEWHAT USEFUL	5 50.	2 25.	7 39.	62 41.
NOT AT ALL USEFUL	4 40.	3 38.	7 39.	70 46.
ESSENTIAL + VERY USEFUL	1 10.	3 38.	4 22.	21 14.
DON'T KNOW				
AVERAGE	1.80	2.00	1.89	1.70
STANDARD DEVIATION	.87	.86	.87	.74
Q8A(6) TECHNICAL DESCRIPTION	10 100.	8 100.	18 100.	181 100.
ESSENTIAL				18 10.
VERY USEFUL	5 50.	3 38.	8 44.	84 46.
SOMEWHAT USEFUL	4 40.	4 50.	8 44.	63 35.
NOT AT ALL USEFUL	1 10.	1 13.	2 11.	16 9.
ESSENTIAL + VERY USEFUL	5 50.	3 38.	8 44.	102 56.
DON'T KNOW				
AVERAGE	2.40	2.25	2.33	2.57
STANDARD DEVIATION	.66	.66	.67	.80

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q8A(7) LISTS OF SUPPLIERS				146 100.
ESSENTIAL				12 8.
VERY USEFUL				39 27.
SOMEWHAT USEFUL				56 38.
NOT AT ALL USEFUL				39 27.
ESSENTIAL + VERY USEFUL				51 35.
DON'T KNOW				
AVERAGE				2.16
STANDARD DEVIATION				.92
Q8A(8) HANDBOOKS/TABLES	10 100.	8 100.	18 100.	181 100.
ESSENTIAL	3 30.		3 17.	17 9.
VERY USEFUL	3 30.	4 50.	7 39.	67 37.
SOMEWHAT USEFUL	2 20.	2 25.	4 22.	65 36.
NOT AT ALL USEFUL	1 10.	2 25.	3 17.	31 17.
ESSENTIAL + VERY USEFUL	6 60.	4 50.	10 56.	84 46.
DON'T KNOW	1 10.		1 6.	1 1.
AVERAGE	2.89	2.25	2.59	2.39
STANDARD DEVIATION	.99	.82	.96	.87

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE		STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
		10 100.	8 100.	18 100.	181 100.
Q8A(9)	TECHNICAL EXPERTS LIST	10 100.	8 100.	18 100.	181 100.
	ESSENTIAL				16 9.
	VERY USEFUL	4 40.	3 38.	7 39.	66 36.
	SOMEWHAT USEFUL	4 40.	3 38.	7 39.	72 40.
	NOT AT ALL USEFUL	2 20.	2 25.	4 22.	27 15.
	ESSENTIAL + VERY USEFUL	4 40.	3 38.	7 39.	82 45.
	DON'T KNOW				
	AVERAGE	2.20	2.13	2.17	2.39
	STANDARD DEVIATION	.74	.76	.75	.85
Q8A(10)	MANUAL METHODS	10 100.	8 100.	18 100.	181 100.
	ESSENTIAL	2 20.	1 13.	3 17.	30 17.
	VERY USEFUL	7 70.	5 63.	12 67.	65 36.
	SOMEWHAT USEFUL	1 10.		1 6.	53 29.
	NOT AT ALL USEFUL		2 25.	2 11.	33 18.
	ESSENTIAL + VERY USEFUL	9 90.	6 75.	15 83.	95 52.
	DON'T KNOW				
	AVERAGE	3.10	2.63	2.89	2.51
	STANDARD DEVIATION	.53	.97	.80	.96

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1 .

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

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(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 / 100.	8 / 100.	18 / 100.	181 / 100.
COMPUTER MODELS	10 / 100.	8 / 100.	18 / 100.	181 / 100.
ESSENTIAL	3 / 30.		3 / 17.	28 / 15.
VERY USEFUL	3 / 30.	2 / 25.	5 / 28.	51 / 28.
SOMEWHAT USEFUL	4 / 40.	4 / 50.	8 / 44.	62 / 34.
NOT AT ALL USEFUL		2 / 25.	2 / 11.	40 / 22.
ESSENTIAL/VERY USEFUL	6 / 60.	2 / 25.	8 / 44.	79 / 44.
DON'T KNOW				
AVERAGE	2.90	2.00	2.50	2.37
STANDARD DEVIATION	.83	.70	.89	.99

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q8B(1) EDUCATIONAL INSTITUTIONS	10 100.	8 100.	18 100.	181 100.
ESSENTIAL				1 1.
VERY USEFUL	4 40.		4 22.	26 14.
SOMEWHAT USEFUL	3 30.	4 50.	7 39.	99 55.
NOT AT ALL USEFUL	3 30.	4 50.	7 39.	54 30.
ESSENTIAL + VERY USEFUL	4 40.		4 22.	27 15.
DON'T KNOW				1 1.
AVERAGE	2.10	1.50	1.83	1.86
STANDARD DEVIATION	.83	.50	.77	.65
Q8B(2) RESEARCH IN PROGRESS	10 100.	8 100.	18 100.	181 100.
ESSENTIAL		1 13.	1 6.	33 18.
VERY USEFUL	6 60.	5 63.	11 61.	102 56.
SOMEWHAT USEFUL	3 30.	2 25.	5 28.	39 22.
NOT AT ALL USEFUL	1 10.		1 6.	7 4.
ESSENTIAL + VERY USEFUL	6 60.	6 75.	12 67.	135 75.
DON'T KNOW				
AVERAGE	2.50	2.88	2.67	2.89
STANDARD DEVIATION	.67	.57	.65	.73

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 / 100.	8 / 100.	18 / 100.	181 / 100.
Q8B(3) STATE OF ART	10 / 100.	8 / 100.	18 / 100.	181 / 100.
ESSENTIAL		1 / 13.	1 / 6.	34 / 19.
VERY USEFUL	5 / 50.	5 / 63.	10 / 56.	93 / 51.
SOMEWHAT USEFUL	4 / 40.	2 / 25.	6 / 33.	44 / 24.
NOT AT ALL USEFUL	1 / 10.		1 / 6.	9 / 5.
ESSENTIAL + VERY USEFUL	5 / 50.	6 / 75.	11 / 61.	127 / 70.
DON'T KNOW				1 / 1.
AVERAGE	2.40	2.88	2.61	2.84
STANDARD DEVIATION	.66	.57	.68	.79
Q8B(4) COSTS/PERFORMANCE	10 / 100.	8 / 100.	18 / 100.	180 / 100.
ESSENTIAL	2 / 20.		2 / 11.	39 / 22.
VERY USEFUL	6 / 60.	6 / 75.	12 / 67.	78 / 43.
SOMEWHAT USEFUL	2 / 20.	1 / 13.	3 / 17.	49 / 27.
NOT AT ALL USEFUL		1 / 13.	1 / 6.	14 / 8.
ESSENTIAL + VERY USEFUL	8 / 80.	6 / 75.	14 / 78.	117 / 65.
DON'T KNOW				
AVERAGE	3.00	2.63	2.83	2.79
STANDARD DEVIATION	.63	.67	.70	.86

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q8B(5) COSTS INSTALL/OPERATE				163 100.
ESSENTIAL				32 20.
VERY USEFUL				70 43.
SOMEWHAT USEFUL				45 28.
NOT AT ALL USEFUL				16 10.
ESSENTIAL + VERY USEFUL				102 63.
DON'T KNOW				
AVERAGE				2.72
STANDARD DEVIATION				.90
Q8B(6) BUILDING CODES/REGS				165 100.
ESSENTIAL				19 12.
VERY USEFUL				38 23.
SOMEWHAT USEFUL				50 36.
NOT AT ALL USEFUL				40 29.
ESSENTIAL + VERY USEFUL				37 35.
DON'T KNOW				
AVERAGE				2.17
STANDARD DEVIATION				.9[illegible]

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	0 100.	10 100.	163 100.
8B(7) TAX/ECONOMIC INCENTIVE				163 100.
ESSENTIAL				27 17.
VERY USEFUL				44 27.
SOMEWHAT USEFUL				52 32.
NOT AT ALL USEFUL				40 25.
ESSENTIAL + VERY USEFUL				71 44.
DON'T KNOW				
AVERAGE				2.36
STANDARD DEVIATION				1.03
8B(8) STANDARDS/SPECS				163 100.
ESSENTIAL				18 11.
VERY USEFUL				55 34.
SOMEWHAT USEFUL				53 33.
NOT AT ALL USEFUL				37 23.
ESSENTIAL + VERY USEFUL				73 45.
DON'T KNOW				
AVERAGE				2.33
STANDARD DEVIATION				

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

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(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	1[illegible]1 100.
Q8B(9) MARKETING/SALES DATA				146 100.
ESSENTIAL				14 10.
VERY USEFUL				38 26.
SOMEWHAT USEFUL				56 38.
NOT AT ALL USEFUL				38 26.
ESSENTIAL + VERY USEFUL				52 36.
DON'T KNOW				
AVERAGE				2.19
STANDARD DEVIATION				.93
Q8B(10) OUTSIDE US RESEARCH/ INDUSTRY	10 100.	8 100.	18 100.	180 100.
ESSENTIAL				13 7.
VERY USEFUL	5 50.	1 13.	6 33.	51 28.
SOMEWHAT USEFUL	2 20.	2 25.	4 22.	68 37.
NOT AT ALL USEFUL	3 30.	5 63.	8 44.	48 27.
ESSENTIAL + VERY USEFUL	5 50.	1 13.	6 33.	64 36.
DON'T KNOW				
AVERAGE	2.20	1.50	1.89	2.16
STANDARD DEVIATION	.[illegible]7	.78	.87	.[illegible]

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE		STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
		10 100.	8 100.	18 100.	181 100.
Q8B(11)	INFO ON MARKETING				18 100.
	ESSENTIAL				3 17.
	VERY USEFUL				
	SOMEWHAT USEFUL				7 39.
	NOT AT ALL USEFUL				8 44.
	ESSENTIAL + VERY USEFUL				3 17.
	DON'T KNOW				
	AVERAGE				1.89
	STANDARD DEVIATION				1.04
Q8B(12) LEGAL	INST/SOCIAL/ENVIRON/				163 100.
	ESSENTIAL				13 8.
	VERY USEFUL				51 31.
	SOMEWHAT USEFUL				73 45.
	NOT AT ALL USEFUL				26 16.
	ESSENTIAL + VERY USEFUL				64 39.
	DON'T KNOW				
	AVERAGE				2.31
	STANDARD DEVIATION				.84

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USEFULNESS OF SPECIFIED INFORMATION ITEMS - CONTINUED (QUESTION 8)

ENERGY STORAGE		STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
		10 100.	8 100.	18 100.	181 100.
Q8B(13)	EXPECTED DEVELOPMENTS	10 100.	8 100.	18 100.	181 100.
	ESSENTIAL				24 13.
	VERY USEFUL	7 70.	4 50.	11 61.	88 49.
	SOMEWHAT USEFUL	1 10.	4 50.	5 28.	51 28.
	NOT AT ALL USEFUL	1 10.		1 6.	17 9.
	ESSENTIAL + VERY USEFUL	7 70.	4 50.	11 61.	112 62.
	DON'T KNOW	1 10.		1 6.	1 1.
	AVERAGE	2.67	2.50	2.59	2.66
	STANDARD DEVIATION	.65	.50	.59	.82
Q8B(14)	CLIMATOLOGICAL DATA				163 100.
	ESSENTIAL				34 21.
	VERY USEFUL				55 34.
	SOMEWHAT USEFUL				46 28.
	NOT AT ALL USEFUL				28 17.
	ESSENTIAL + VERY USEFUL				89 55.
	DON'T KNOW				
	AVERAGE				2.58
	STANDARD DEVIATION				1.00

SCALE: ESSENTIAL = 4, VERY USEFUL = 3, SOMEWHAT USEFUL = 2, NOT AT ALL USEFUL = 1

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USE OF SPECIAL ACQUISITION METHODS (QUESTION 10)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q10A COMPUTER TERMINAL				
1. YES	3 30.	2 25.	5 28.	62 34.
2. NO	5 50.	6 75.	11 61.	116 64.
8. DON'T KNOW/NA	2 20.		2 11.	3 2.
Q10B MICROFORM - COMPUTER				
1. YES		1 13.	1 6.	16 9.
2. NO	10 100.	7 88.	17 94.	155 86.
8. DON'T KNOW/NA				10 6.
Q10C OTHER MICROFORM				
1. YES	4 40.	5 63.	9 50.	72 40.
2. NO	6 60.	3 38.	9 50.	108 60.
8. DON'T KNOW/NA				1 1.

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES (QUESTION 11)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 / 100.	8 / 100.	18 / 100.	181 / 100.
Q11(1) LIBRARY (ORG/LOCAL)	10 / 100.	8 / 100.	18 / 100.	179 / 100.
1. YES	9 / 90.	6 / 75.	15 / 83.	150 / 84.
2. NO	1 / 10.	2 / 25.	3 / 17.	28 / 16.
8. DON'T KNOW				1 / 1.
Q11(2) PUBLIC UTILITY	10 / 100.	8 / 100.	18 / 100.	180 / 100.
1. YES	4 / 40.	4 / 50.	8 / 44.	91 / 51.
2. NO	6 / 60.	4 / 50.	10 / 56.	88 / 49.
8. DON'T KNOW				1 / 1.
Q11(3) INSTALLER/BUILDER/DESIGNER	10 / 100.	8 / 100.	18 / 100.	180 / 100.
1. YES	7 / 70.	4 / 50.	11 / 61.	117 / 65.
2. NO	3 / 30.	4 / 50.	7 / 39.	63 / 35.
8. DON'T KNOW				
Q11(4) WORKSHOPS/CONFERENCES	10 / 100.	8 / 100.	18 / 100.	180 / 100.
1. YES	9 / 90.	8 / 100.	17 / 94.	159 / 88.
2. NO	1 / 10.		1 / 6.	21 / 12.
8. DON'T KNOW				

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q11(5) COMMERCIAL DATA BASE	10 100.	8 100.	18 100.	181 100.
1. YES	4 40.		4 22.	68 38.
2. NO	6 60.	7 88.	13 72.	110 61.
8. DON'T KNOW		1 13.	1 6.	3 2.
Q11(6) FEDERAL LIBRARY/INFO CENTER	10 100.	8 100.	18 100.	180 100.
1. YES	5 50.	5 63.	10 56.	97 54.
2. NO	5 50.	2 25.	7 39.	78 43.
8. DON'T KNOW		1 13.	1 6.	5 3.
Q11(7) SSIE - SMITHSONIAN	10 100.	8 100.	18 100.	181 100.
1. YES	2 20.	3 38.	5 28.	30 17.
2. NO	8 80.	5 63.	13 72.	146 81.
8. DON'T KNOW				5 3.

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q11(8) GOV'T PRINTING OFFICE-GPO	10 100.	8 100.	18 100.	181 100.
1. YES	4 40.	5 63.	9 50.	134 74.
2. NO	6 60.	3 38.	9 50.	44 24.
8. DON'T KNOW				3 2.
	10 100.	8 100.	18 100.	181 100.
Q11(9) NATIONAL TECHNICAL INFORMATION SERVICE-NTIS	10 100.	8 100.	18 100.	181 100.
1. YES	6 60.	4 50.	10 56.	115 64.
2. NO	4 40.	2 25.	6 33.	59 33.
8. DON'T KNOW		2 25.	2 11.	7 4.
	10 100.	8 100.	18 100.	181 100.
Q11(10) TECHNICAL INFORMATION CENTER - TIC	10 100.	8 100.	18 100.	180 100.
1. YES	2 20.	5 63.	7 39.	72 40.
2. NO	7 70.	2 25.	9 50.	100 56.
8. DON'T KNOW	1 10.	1 13.	2 11.	8 4.

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q11(11) NATL SOLAR HEATING + COOLING INFO CTR	10 100.	8 100.	18 100.	181 100.
1. YES	2 20.	2 25.	4 22.	53 29.
2. NO	8 80.	5 63.	13 72.	120 66.
8. DON'T KNOW		1 13.	1 6.	8 4.
	10 100.	8 100.	18 100.	181 100.
Q11(12) REGIONAL SOLAR ENERGY CENTERS	10 100.	8 100.	18 100.	181 100.
1. YES	3 30.	2 25.	5 28.	41 23.
2. NO	7 70.	4 50.	11 61.	133 73.
8. DON'T KNOW		2 25.	2 11.	7 4.

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
Q11(13) US DEPT. OF ENERGY	10 100.	8 100.	18 100.	181 100.
1. YES	9 90.	6 75.	15 83.	144 80.
2. NO	1 10.	2 25.	3 17.	36 20.
8. DON'T KNOW				1 1.
Q11(14) RADIO/TV	10 100.	8 100.	18 100.	80 100.
1. YES	3 30.	3 38.	6 33.	22 28.
2. NO	6 60.	5 63.	11 61.	57 71.
8. DON'T KNOW	1 10.		1 6.	1 1.
Q11(15) PERIODICALS/ NEWSPAPERS	10 100.	8 100.	18 100.	109 100.
1. YES	9 90.	8 100.	17 94.	103 94.
2. NO	1 10.		1 6.	6 6.
8. DON'T KNOW				
Q11(16) PRIVATE SOLAR/ ENVIRONMENTAL ORG.	10 100.	8 100.	18 100.	181 100.
1. YES	2 20.	5 63.	7 39.	96 53.
2. NO	8 80.	3 38.	11 61.	82 45.
8. DON'T KNOW				3 2.

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

ENERGY STORAGE

	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	100. (10)	100. (8)	100. (18)	100. (181)
Q11(17) STATE ENERGY OR SOLAR OFFICES	100. (10)	100. (8)	100. (18)	100. (181)
1. YES	50. (5)	88. (7)	67. (12)	48. (86)
2. NO	50. (5)	13. (1)	33. (6)	52. (94)
8. DON'T KNOW				1. (1)
Q11(18) OTHER STATE/ LOCAL GOV'T. SOURCE	100. (10)	100. (8)	100. (18)	100. (178)
1. YES	20. (2)	50. (4)	33. (6)	28. (49)
2. NO	80. (8)	50. (4)	67. (12)	72. (128)
8. DON'T KNOW				1. (1)
Q11(19) INTL SOLAR ENERGY SOCIETY-ISES	100. (10)	100. (8)	100. (18)	100. (181)
1. YES	60. (6)	88. (7)	72. (13)	48. (87)
2. NO	40. (4)	13. (1)	28. (5)	51. (92)
8. DON'T KNOW				1. (2)
Q11(20) SOLAR ENERGY INDUSTRIES ASSOC.-SEIA	100. (10)	100. (8)	100. (18)	100. (181)
1. YES	30. (3)	25. (2)	28. (5)	33. (60)
2. NO	70. (7)	63. (5)	67. (12)	65. (118)
8. DON'T KNOW		13. (1)	6. (1)	2. (3)

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

USE OF SELECTED SOLAR INFORMATION SOURCES - CONTINUED (QUESTION 11)

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES
	10 100.	8 100.	18 100.
Q11(21) QUESTIONNAIRE SOURCE (AEE) 21	10 100.	8 100.	18 100.
1. YES			
2. NO	10 100.	8 100.	18 100.
8. DON'T KNOW			
Q11(22) QUESTIONNAIRE SOURCE (IEEE) 22	10 100.	8 100.	18 100.
1. YES			
2. NO	10 100.	8 100.	18 100.
8. DON'T KNOW			
Q11(23) QUESTIONNAIRE SOURCE 23			
1. YES			
2. NO			
8. DON'T KNOW			
Q11(24) QUESTIONNAIRE SOURCE 24			
1. YES			
2. NO			
8. DON'T KNOW			

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)
YEARS IN CURRENT PROFESSION (QUESTION D2B)

ENERGY STORAGE

	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
1. 0-2 YEARS				10 6.
2. 3-5 YEARS	4 40.	1 13.	5 28.	35 19.
3. 6-10 YEARS	1 10.	1 13.	2 11.	33 18.
4. OVER 10	5 50.	6 75.	11 61.	103 57.
DON'T KNOW/NA				

Figure F-1. Solar Energy Storage Researchers Data Tables (continued)

(OCTOBER, 1979)

MEMBERSHIP IN SOLAR-INTERESTED ORGANIZATIONS (QUESTION D3)
MEMBERSHIPS WITH INTEREST IN SOLAR

ENERGY STORAGE	STOR DOE-FUND RES	STOR NDOE-FUND RES	TOTAL STOR RES	ALL RES
	10 100.	8 100.	18 100.	181 100.
1. YES BELONG, NAME	7 70.	8 100.	15 83.	136 75.
2. YES BELONG, CAN'T NAME				4 2.
3. NO, DON'T BELONG	3 30.		3 17.	40 22.
DON'T KNOW/NA				1 1.

Figure F-1. Solar Energy Storage Researchers Data Tables (concluded)

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16. Abstract (Limit: 200 words) This report describes the results of a series of telephone interviews with groups of users of information on solar energy storage. 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 solar 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 2 groups of researchers are analyzed in this report: DOE-Funded Researchers and Non-DOE-Funded Researchers. 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.

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