SERI/PR-401-524

UC CATEGORY: [REDACTED]

EDUCATION DATA BASE:
ANNUAL REPORT

OCTOBER 1, 1978 - SEPTEMBER 30, 1979

GEORGE CORCOLEOTES
KEVIN O'CONNOR

FEBRUARY 1980

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PREPARED UNDER TASK NO. 4231.02

Solar Energy Research Institute

1536 Cole Boulevard
Golden, Colorado 80401

A Division of Midwest Research Institute

Prepared for the
U.S. Department of Energy
Contract No. EG-77-C-01-4042

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

eb

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

FOREWORD

This progress report represents the annual effort of progress in the Education Data Base, Task 4231.02, Academic Programs Branch. George Corcoleotes provided a major contribution in the performance of this task. The Data Base Systems Branch, especially Katherine Kramer, provided the main effort as liaison in the technical work of getting the information from coded forms to a searchable data base. Steve Cronin of the Computer Systems Branch gave a tireless effort in support and development of data base software.

Kevin O'Connor
Academic Programs Branch

Approved for:

SOLAR ENERGY RESEARCH INSTITUTE

George Warfield, Director
Technology Dissemination

TABLE OF CONTENTS

	<u>Page</u>
1.0 Introduction	1
1.1 Scope.....	1
1.2 Purpose.....	1
1.3 Report Contents	1
2.0 Summary of Progress and Achievements.....	3
2.1 Data Base Establishments	3
2.2 Summary of Achievements	3
2.3 Major FY80 Activities	6
3.0 Survey Coding Procedures	7
3.1 Categorization of Returned Surveys	7
3.1.1 Organizations Without Solar Classes	7
3.1.2 Organizations With Solar Classes	7
3.1.3 Problem Survey Returns.....	8
3.2 Additional Information.....	8
4.0 Information Dissemination.....	9
Appendix A: First National Solar Energy Education Survey Package	11
Appendix B: Second National Solar Energy Education Information Update Package	19
Appendix C: Solar Energy Education Data Base: General System Operational Flowchart.....	29
Appendix D: Solar Energy Course Text List	33
Appendix E: Statistical Distribution of Schools Responding to Education Survey.....	35

LIST OF FIGURES

	<u>Page</u>
2-1 Task/Milestone Chart for Education Data Base	4

LIST OF TABLES

	<u>Page</u>
4-1 Solar Energy Education Data Base Publications Summary	10

SECTION 1.0

INTRODUCTION

1.1 SCOPE

The Solar Energy Education Data Base (SEEDB) task was established as a high priority in the Academic Programs Branch to serve as an information dissemination tool and to identify the active people and organizations in the educational arena.

SERI's Information Systems Division is responsible for the development of the Solar Energy Information Data Bank (SEIDB), a national repository of solar information. The education data base is part of SEIDB. Justification of SEIDB stems from the fact that no centralized collection effort exists for educational institutions offering solar energy courses, programs, and curricula.

Work on this project began in April 1978. From then through September 1978 (FY78), several major tasks were accomplished. A data collection effort was coordinated with the cooperation of the Office of U.S. Congressman George E. Brown, Jr. the Congressional Solar Coalition and the Solar Energy Research Institute (SERI). The SEEDB file definitions and structures were identified; the data base at Stanford University was developed using the SPIRES software system. Finally, a large effort was devoted to editing, coding, and verifying the data from the survey instruments. The original survey package is found in Appendix A.

1.2 PURPOSE

SEEDB was established to respond to the needs of a full range of users: academicians, industry, government agencies, research organizations, students, the general public, etc. The data base, which will be updated periodically, contains information that is accessible to the public in a variety of published materials and has the flexibility to respond quickly to special requests.

SEEDB is designed to facilitate information flow to the user community on technological developments in solar energy. In this manner, the education community can plan new programs that can be targeted to supply projected manpower skills for emerging solar technologies.

1.3 REPORT CONTENTS

This annual report represents a summary of work progress during FY79. A semiannual report was written covering work performed from the period 1 October 1978 to 31 March 1979 (O'Connor 1979).^{*} The report should be consulted for more details relative to this time period.

^{*}O'Connor, Kevin. Education Data Base Semiannual Report 1 October 1978 - 31 March 1979. SERI/PR-42-319. Golden, CO: Solar Energy Research Institute; July 1979.

This report summarizes the achievements and progress during FY79 and looks forward to the activities of FY80. It also discusses the operation of SEEDB and problems associated with day-to-day operations; systems hardware and software switchover; and other general concerns of the data base. A statistical summary of schools participating in the data base is included in Appendix E.

SECTION 2.0

SUMMARY OF PROGRESS AND ACHIEVEMENTS

2.1 DATA BASE ESTABLISHMENT

Figure 2-1 summarizes the operations leading to the data base creation and, ultimately, the production of reports from the system. The development of SEEDB was a complex process of coordinating many people and attending to minute details. Other branches within SERI involved in data base operations and the production of reports are Data Base Systems (DBS), Computer Systems, and Information Dissemination Branches.

The DBS Branch is responsible for system design and data entry and verification and acts as a liaison with Computer Systems and Information Dissemination. The Computer Systems Branch is responsible for the development of appropriate software; especially for the creation of a magnetic tape that is directly translatable to camera ready copy used for printing data base information. The Information Dissemination Branch works closely with Academic Programs in publication, advertising, and distribution efforts.

During the second half of FY79, the efforts to update the education data base were complicated by a switchover of computer systems from Stanford University's SPIRES system to a commercially available system called INQUIRE. In addition to both hardware and software system changes, the survey update form was substantially changed, compounding the difficulty of update efforts. In spite of these complications, the project remained on schedule with the eventual establishment of a second version of SEEDB.

2.2 SUMMARY OF ACHIEVEMENTS

Many tasks were involved in the creation of SEEDB and the production of materials utilizing it. Summarized, these tasks were:

- survey form development, revision, printing, and distribution;
- preparation of returned forms for data entry, which included editing, coding, checking for response consistency and accuracy, and solving a myriad of associated problems;
- data base creation, which included data element and file definitions, creation of update mechanisms, computer system software design, and redesign of all software for application on new system hardware in the switchover from SPIRES to INQUIRE; and
- report definition and generation, which included a coordinated effort of several branches on all aspects of producing a publication.

A chronological summary of major accomplishments related to these tasks follows:

October 1978:

SEEDB created from Office of Education tape. Initial data entry coded, verification of surveys begun.

2,200 surveys returned from the 3,200 educational institutions contacted.

Symbol Meaning

- ▲ Milestone Beginning
- Intermediate Task/Report Complete
- Milestone Complete

Footnotes

- 1 - Preliminary Flowchart Complete
- 2 - Coding Schemes Gathered, Reviewed
- 3 - Initial System Creation - Small Sample
- 4 - Special Reports Produced

Figure 2-1. Task/Milestone Chart for Education Data Base

November 1978:

All initial response data entered and verified.

National Solar Energy Education Directory (NSEED) report rules agreement reached.

December 1978:

First draft of NSEED produced. Contained 679 institutions.

New survey update initiated for second iteration of data base update.

January 1979:

Final version of NSEED sent to regional Government Printing Office for reproduction.

SEEDB demonstrated at National Energy Education, Business, and Labor Conference in Washington, D.C.

February 1979:

Received 1,175 copies of NSEED. Questions about cover wording were noted. Report was returned to printer for recovering.

Initial draft of state solar energy education directories prepared.

Many more iterations of survey update form occurred. Staff review and Survey Review Committee interactions took place. This was a complex, time-consuming procedure.

March 1979:

NSEED printed. Superintendent of Documents ordered 9,600 for public sale. Congressman Brown's Office sent press release to 160,000 people using National Solar Heating and Cooling Information Center mailing lists. (Copies can be obtained from Superintendent of Documents, U.S. GPO, Washington, D.C. 20402. Price: \$5.50. Stock #061-000-00368-1.)

Camera-ready copies of state solar energy education directories sent to printers.

Survey update form finalized and sent to printer. (See Appendix B for new survey package.)

Rough draft of Solar Energy Technical Training Directory prepared.

April 1979:

SEEDB update forms (over 5,000) mailed by Office of Congressman Brown to post-secondary institutions across the United States.

Rough draft of Solar Energy Technical Training Directory completed.

State Solar Energy Educational Directories returned from printer and made available for distribution.

May 1979:

Solar Energy Technical Training Directory sent to printer.

Major effort spent on reviewing, editing, and coding 1,700 survey update forms.

Procedures for switching SEEDB from SPIRES to INQUIRE established.

June 1979:

All organization information entered into new INQUIRE system.

Initial definition of second edition of National Solar Energy Education Directory (NSEED-2) created.

Total surveys received topped the 2,000 mark; one-half were edited and coded.

July 1979:

Postcard reminders mailed requesting institutions to return survey update forms.

New course and program information entered into SEEDB.

SEEDB semiannual report produced.

August 1979:

Coding and editing of all survey forms except special problems completed.

Substantial portion of all data entered into data base.

A listing "National Solar Energy Degree Programs in Educational Institutions" produced.

September 1979:

First series of SEEDB printouts produced for review and verification.

Review of photocomposition printout for NSEED-2 formats begun.

2.3 MAJOR FY80 ACTIVITIES

The tasks scheduled to be completed in FY80 are as follows:

- print second edition of National Solar Energy Education Directory;
- print updated State Solar Energy Education Directories;
- print updated Solar Energy Technical Training Directory;
- expand data base to include noneducational institution information;
- produce data base summary and other special reports as necessary; and
- as part of the SEEDB task, produce a directory of research activities in the nation's colleges and universities using the Smithsonian Science Information Exchange Service.

SECTION 3.0

SURVEY CODING PROCEDURES

This section describes survey coding procedures and is important for understanding the complexity involved in receiving a survey response and verifying that the data are correctly entered.

3.1 CATEGORIZATION OF RETURNED SURVEYS

Returned surveys fall into three categories: organizations without solar courses, organizations with solar courses, and organizations whose return presents a problem. The coding procedures for these survey types follow.

3.1.1 Organizations Without Solar Courses

For organizations without solar courses, procedures dictate that codes be entered in the right hand column of the survey and that organization's responses are logged on a master return list and arranged in numerical order according to the organization's ID. Returned surveys that do not have an ID preprinted on the return must be assigned an ID from the National Center of Education Statistics' Education Directory: Colleges and Universities. Organizations not found in this directory are assigned a number in a series higher than all the numbers in the directory; i.e., the 80000 series will be used for organizations without solar classes; the 90000 series for those with solar classes.

The ID is entered on survey transfer sheets and delivered in packets to Data Base Systems (DBS) for data entry. The editor keeps a copy of the survey transfer sheet to verify that all surveys are accounted for following data entry.

3.1.2 Organizations With Solar Courses

The coding procedure is more lengthy for organizations with solar courses. Once the organization's ID is validated, the forms are perused for legible responses. A check is made for duplication of information in each response; i.e., information on returned computer printouts must be cross-checked against the information filled out on new survey forms.

Schools currently offering solar activities write updated information directly on the printouts. After data verification, responses are coded and placed in the right hand column of the survey or, in the case of computer printouts, coded on the sheets. The responses to the question concerning texts used in each course are coded numerically using the "Text Code List," which is continuously updated.

In addition to coding data responses, each program and course is given an ID number (P00001 . . . , C00001 . . .). All courses are linked via ID number to the appropriate program and/or organization. This step is extremely critical because the education data base is actually composed of three data bases: organizations, programs and curricula, and courses. All files are linked through the use of organization, course, and program IDs.

When each survey is completely coded, the procedure for logging the forms, delivering them to DBS, and verifying the data entry process is essentially the same as for organizations without solar courses.

3.1.3 Problem Survey Returns

The surveys that present special problems are set aside until the bulk of the surveys have been added to the data base. The major problem categories were: uncertainty of school ID, illegible or mismarked responses, insufficient information, and confusing or contradictory returns. Some problems were resolved internally while others involved a phone call to the contact person at the organization in question.

3.2 ADDITIONAL INFORMATION

A copy of the second national survey is found in Appendix B. Appendix C contains a general system operational flowchart that conveys the major procedural steps in the DBS operation. A list of the major texts used in the identified courses and curricula are found in Appendix D. A statistical distribution of schools responding to the first national survey (by state) is contained in Appendix E.

Of the 3,181 schools in the data base (from the National Center of Education Statistics) 1,780 (or 56%) responded. Schools with solar or solar-related offerings numbered 679, or slightly more than one-fifth.

SECTION 4.0**INFORMATION DISSEMINATION**

Computer stored information is of little use except in responding to specific inquiries and producing specialized reports. Consequently, several general use documents were created for distribution to the public by SERI, the regional solar energy centers, and the National Solar Heating and Cooling Information Center (NSHCIC). NSEED is available through the Superintendent of Documents, U.S. GPO.

Table 4.1 presents the number of publications printed by SERI and distributed to NSHCIC and the regional solar energy centers during FY79.

Table 4-1. SOLAR ENERGY EDUCATION DATA BASE PUBLICATIONS SUMMARY

Publications	Number Printed by SERI	Number Distributed/Sold	Distributor
National Solar Energy Education Directory	1,000	1,000	SERI
National Solar Energy Education Directory	9,600	3,000	Sup't of Documents
State Solar Energy Education Directories	43,500 ^a	14,500 (29) ^b	SERI
	-	14,500 (29)	NSHCIC
	-	3,000 (6)	NESEC ^c
	-	4,000 (8)	MASEC ^c
	-	4,000 (8)	Western SUN ^c
	-	3,500 (7)	SSEC ^c
Solar Energy Technical Training Directory	5,000	1,000	SERI
	-	2,000	NSHCIC
	-	500	NESEC
	-	500	MASEC
	-	500	SSEC
	-	500	Western SUN
TOTAL	59,100	52,500 ^d	

^a1500 copies of each of 29 directories were printed. There are only 29 directories because combination directories were created using contiguous states to reduce the number of directories printed.

^bThe number in parentheses indicates the number of individual state directories appropriate for distribution by each organization.

^cNESEC - Northeast Solar Energy Center
MASEC - Mid-American Solar Energy Complex
SSEC - Southern Solar Energy Center
Western SUN - Western Solar Utilization Network

^dAlthough many of the individual state directories have been depleted, it is not known exactly how many of the state directories have been distributed to individuals requesting them. It is known that 3,000 copies of the National Directory were sold by the Superintendent of Documents. Copies of the Technical Training Directory have all been distributed to requestors and it is currently in a second printing.

APPENDIX A

FIRST NATIONAL SOLAR ENERGY EDUCATION SURVEY PACKAGE

SERIO

GEORGE E. BROWN, JR.
2342 HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6161

COMMITTEES:
AGRICULTURE
SCIENCE AND TECHNOLOGY
CHAIRMAN, SUBCOMMITTEE ON
ENVIRONMENT AND THE ATMOSPHERE
TECHNOLOGY ASSESSMENT
BOARD

Congress of the United States
House of Representatives
Washington, D.C. 20515

36TH DISTRICT OF
CALIFORNIA

PLEASE
REPLY
TO

☐ DISTRICT OFFICES:
VANIR TOWER
290 NORTH D STREET
SUITE 717
SAN BERNARDINO, CALIFORNIA 92402
(714) 825-2472

☐ MISSION INN ROTUNDA
3616 MAIN STREET, SUITE 200
P.O. Box 71
RIVERSIDE, CALIFORNIA 92502
(714) 686-8863

☐ WASHINGTON OFFICE

FIRST NATIONAL SOLAR ENERGY EDUCATION SURVEY

July, 1978

TO: Presidents of Educational Institutions, Institute Heads, Deans and Department Directors offering Educational Programs in Solar Energy

FROM: U.S. Rep. George E. Brown, Jr. U.S. Senator Charles H. Percy
U.S. Rep. James M. Jeffords U.S. Senator Thomas J. McIntyre
U.S. Rep. James J. Blanchard

The Congressional Solar Coalition is interested in your participation in a cooperative effort to create a data base of all solar energy-related programs and courses currently being offered by our nation's post-secondary educational institutions.

Two organizations have agreed to work with the collected information. The Solar Energy Research Institute (SERI) in Golden, Colorado will have responsibility for the creation of a computerized data base which will become part of the legislatively mandated Solar Energy Information Data Bank (SEIDB). SERI's Information Systems Branch will receive the survey returns, edit and process the data into a computerized data base, and create the appropriate retrieval, reporting, updating, and analysis mechanisms. The compilation of collected material will be made available in a published Solar Energy Educational Directory. As an interim measure, before the computerized data base at SERI is fully operational, the National Solar Heating and Cooling Information Center (NSHCIC) will have the capability of providing a listing of solar educational offerings on a state-by-state basis free of charge to anyone by calling their toll-free number: (800) 523-2929.

The suggested deadline for returning the survey is September 15, 1978. For the purpose of this survey, wind, biomass conversion, and ocean thermal energy conversion should also be considered as solar technologies. New courses, curricula, and updates will be accepted any time following the September 15th date. However, this is not preferred. Even if you do not offer solar courses, please complete and return the first page of the form.

We appreciate your participation and, for your help, the Solar Energy Research Institute will be sending you a listing of the programs in your state. We hope you will be able to use the compiled information for your own course and/or curriculum development.

We would also like to use this opportunity to make sure that you are aware of the Higher Education Act Amendments of 1976. Of particular importance is an amendment introduced by Sen. Thomas J. McIntyre, (N.H.), that allows Federal Funds to be used for solar education programs in post-secondary vocational education schools. You might want to investigate your own possible uses of federal funds for the development of new or additional solar energy curricula.

Solar Energy Educational Survey Instructions

If your institution is not offering any solar related programs, please complete only the first page of the survey, so indicating. If solar offerings are made by your institution, we would be happy to receive any additional information which you feel would be helpful.

The three-page survey form is designed to elicit information on solar-related programs, courses, and/or curricula currently being offered or planned to be offered by educational institutions. Your assistance in making the form entries as complete as possible will be greatly appreciated. There are two sections to be completed: (1) Educational Institutions and (2) Course Information (2 pages). Some detailed instructions may help in answering certain questions. Note that for the purpose of this survey wind, biomass conversion, and ocean thermal energy conversion should also be considered as solar technologies.

I. Educational Institutions

- Q. 4. If your institution offers or plans to offer a solar curriculum or program, answer "yes" to question 4 and complete questions 5 through 12 for each curriculum or program offered or planned. Duplicate the form if necessary.
- Q. 5-12. In questions 5 through 12, information relative to solar curricula and programs is requested, as distinguished from single course offerings. A curriculum is a set of integrated courses leading toward a degree or certificate. A program is loosely defined as a formal academic experience usually combining course-work and research in applied solar technology, but not necessarily leading to a degree in solar expertise. Specialized summer programs and research institutes are examples. The answer to Q. 8, Head of Prog./Curr., should be the main contact person for someone desiring more information about the program or curriculum. Question 12 estimates the proportion of students successfully placed in solar-related jobs.
- Q. 13-14. Please answer question 14, regardless of the answer given in question 13. If your institution is presently offering solar courses ("Yes" to question 13), it may also be developing additional courses.

II. Course Information

Please complete the Course Information Section (2 pages) for each separate, solar-related course, either presently offered or planned to be offered. Duplicate the Course Information Section if necessary to cover all solar courses offered. Any questions you may have concerning the survey form may be answered by Kevin O'Connor at SERI: (303) 234-7235.

Using the envelope provided, please return all completed surveys by September 15, 1978. A further update or correction may be returned at any time to:

Solar Energy Research Institute
Attn: Educational Data Base
1536 Cole Boulevard
Golden, Colorado 80401

Thank you very much for your participation.

I. Educational Data Base — Educational Institutions

1. Institution Name: _____

2. Address: _____
Street City State Zip

3. Institution Type:

- ☐ 4 Yr. Coll./Univ./Grad. School
☐ Community/Junior College

- ☐ Vocational/Technical School
☐ Other (describe) _____

4. Does your institution offer/plan a Solar Curriculum or Program? Yes ☐ No ☐
If "No", go to Question 13.

Please complete Questions 5-12 for each solar energy Curriculum or Program offered or planned. If more than one Program/Curriculum is offered/planned please make copies of this section and attach.

5. Is the offering a Program? ☐ Currently Offered? ☐ or Planned? ☐
or Curriculum? ☐ Currently Offered? ☐ or Planned? ☐

6. Program/Curriculum Name: _____

7. College/Dept. offering Program/Curriculum: _____

8. Head of Prog./Curr.: _____ Phone: () _____

9. What Degree/Title/Certificate, if any, does graduating student receive?

- ☐ Ph.D. ☐ MA ☐ MS ☐ BA ☐ BS ☐ Associate Degree ☐ None
☐ Other (specify) _____

10. Name of Degree/Title/Certificate: _____

11. Students completing Program/Curriculum would generally be classified as (check as many as apply):

☐ Architect	☐ Solar System Installer:
☐ Educator	☐ Residential
☐ Researcher	☐ Industrial/Commercial
☐ Solar Engineer	☐ Solar Technician — one trained in instrumentation, controls, design, maintenance, etc.
☐ Mech./Elec. Contractor	☐ Person specializing in solar from one of the following trades/skills:
☐ General Contractor —
Specializing in solar
design/installation	☐ Electrical ☐ Plumbing ☐ Sheet Metal
☐ Do-it-yourselfer/Homeowner	☐ Other (specify) _____
☐ Other (specify) _____	

12. Estimate what percentage of graduates of the above Prog./Curr. enters the job market in the field for which they are specifically trained: _____%

13. Is your institution presently offering solar courses? Yes ☐ No ☐

14. Are any (additional) solar courses being developed? Yes ☐ No ☐

For all courses, existing or planned, please complete the 2-page Course Information Section. Make extra copies of the section if needed. If no solar-related courses are offered or planned, complete this page only and return.

Thank you very much.

II. Educational Data Base — Course Information

1. Name of Institution: _____
2. Course Title: _____
3. Course Number: _____ 4. Is Course Currently Offered? ☐ Or Planned? ☐
5. Course Instructor/Contact: _____ Phone: (____) _____
6. College/Dept. Offering Course: _____
7. Is Course also taught in conjunction with other Colleges/Depts.? Yes ☐ No ☐
8. Most of the students in course are from what Colleges/Depts.? (Please List)
 - a. _____ b. _____ c. _____
 - d. _____ e. _____ f. Don't Know ☐
9. Number of Times Course Taught to Date: _____ 10. Average Enrollment _____
11. Number of Students Completing Course:

1973 or earlier _____	1974 _____	1975 _____	1976 _____
1977 _____	1978 (est.) _____	1979 (est.) _____	
12. Is Course Offered for Academic Credit? Yes ☐ No ☐ 13. # Credit Hours _____
14. Typical Academic Level of Student Taking Course:

All Levels ☐	High School Grad. ☐	Fresh/Soph ☐	Jr/Sr ☐
College Grad. ☐	Postdoctoral ☐		
15. Duration of Course: (# of Weeks _____ Hrs./Week _____) OR (# of Days _____ Hrs./Day _____)
16. Contract Hours: Total _____ Classroom/Lecture _____ Laboratory _____
On-the-job-training _____ Other _____ (Specify) _____
17. To what extent are the following topics covered in your course? Check only those that apply. Please specify topics not listed, but included in the course.

Extensively	Somewhat	<u>Course Topics</u>
☐	☐	1. Alternate Energy Sources
☐	☐	2. Appropriate Technology
☐	☐	3. Biomass Conversion
☐	☐	4. Energy Conservation
☐	☐	5. Energy Conversion
☐	☐	6. Energy Storage
☐	☐	7. Heat and Energy Transfer
☐	☐	8. Intro. to Solar Energy
☐	☐	9. Marketing/Market Analysis
☐	☐	10. Materials Research
☐	☐	11. Passive Solar Technology
☐	☐	12. Photovoltaics
☐	☐	13. Plumbing Techniques
☐	☐	14. Solar Energy Policy Development
☐	☐	15. Sheet Metal Techniques
☐	☐	16. Solar System Components
☐	☐	17. Solar Economics
☐	☐	18. Solar Home Construction
☐	☐	19. Solar Law/Legislation
☐	☐	20. Solar Collector Evaluation/Design

Extensively	Somewhat	<u>Course Topics</u>
☐	☐	21. Solar Systems Design
☐	☐	22. Solar Systems Installation
☐	☐	23. Solar Systems Maintenance
☐	☐	24. Solar Systems Testing and Evaluation
		<u>Solar Applications</u>
☐	☐	25. Domestic Hot Water
☐	☐	26. Swimming Pool Heating
☐	☐	27. Elec'l Generation, Central
☐	☐	28. Elec'l Generation, Small Scale
☐	☐	29. Process Heat, Agricultural
☐	☐	30. Process Heat, Industrial
☐	☐	31. Space Heating
☐	☐	32. Space Cooling
☐	☐	33. Wind Power, Central Systems
☐	☐	34. Wind Power, Small Systems
		Other (specify)
☐	☐	35. _____
☐	☐	36. _____

Please complete back of form for this course. Thank you.

II. Educational Data Base — Course Information (Continued)

Materials Used or Proposed for Use in this Course

18. Is a text used in this course? Yes ☐ No ☐

19. Name of text _____ 20. Author _____

The following are used in this course:

21. Slides: Yes ☐ No ☐ 22. Films: Yes ☐ No ☐ 23. Demonstrations: Yes ☐ No ☐

24. List sources of above materials or describe demonstrations.

25. Course Prerequisites (May be copied from catalog, etc.):

26. Course Description (May be copied from catalog, etc.):

Thank you very much for your participation.

SERIO

APPENDIX B
SECOND NATIONAL SOLAR ENERGY EDUCATION INFORMATION
UPDATE PACKAGE

SERIO

Congress of the United States

House of Representatives

Washington, D.C. 20515

NATIONAL SOLAR ENERGY EDUCATION INFORMATION UPDATE

April 1979

TO: Institutions Offering Educational Activities

FROM: U. S. Rep. George E. Brown, Jr. U. S. Sen. Charles H. Percy
U. S. Rep. James M. Jeffords U. S. Senator Paul E. Tsongas
U. S. Rep. James J. Blanchard U. S. Senator Gary Hart
U. S. Rep. Timothy E. Wirth

The Congressional Solar Coalition is interested in your continued participation in a cooperative effort to update the data base of all solar energy related programs and courses being offered by our nation's post-secondary educational institutions.

The Department of Energy's Solar Energy Research Institute (SERI) in Golden, Colorado has created a computerized data base as part of the Congressionally mandated Solar Energy Information Data Bank (SEIDB). SERI will receive returns, edit and process the data, and create the appropriate retrieval, reporting, updating and analysis mechanisms. The compilation of the material from the first data collection effort in the summer of 1978 was made available in the first edition of the National Solar Energy Education Directory (March 1979). In addition, the National Solar Heating and Cooling Information Center (NSHCIC) and the regional Solar Energy Centers provide listings of solar educational offerings on a state-by-state basis free of charge to anyone calling their toll-free number: (800) 523-2929; in Pennsylvania, (800) 462-4983; and in Hawaii and Alaska, (800) 523-4700.

The National Solar Energy Education Directory is a comprehensive, 300-page up-to-date listing of solar-related courses, programs and curricula offered at institutions nationwide. Copies of the first edition of the Directory may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington DC 20402, Stock Number 061-000-00210-3, Price \$4.75.

To insure that all new and updated information is included in the next Directory, the deadline for returning the form is June 15, 1979. New courses and other program updates will be accepted at any time following the June 15th date. Even if you do not offer solar courses, please complete the first page and return the form.

We appreciate your participation and hope you will be able to use the compiled information. Your institution will receive notices of all publications created from the solar energy education data base.

Available Now!

National Solar Energy Education Directory

First Edition
a cooperative effort of the
Solar Energy Research Institute*
the office of
U.S. Rep. George E. Brown, Jr.
and the
Congressional Solar Coalition

... a comprehensive, up-to-date list of solar-related courses, programs, and curricula offered at 700 post-secondary institutions nationwide. Information was derived from a national survey of all educational institutions of higher education. The Directory contains 279 pages, including indexes. Produced from the Solar Energy Information Data Bank.

1536 Cole Boulevard
Golden, Colorado 80401

For a copy, write:
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
Stock Number: 061-000-00210-3
Price: \$4.75

* Operated for the U.S. Department of Energy
under Contract Number EG-77-C-01-4042
by the Midwest Research Institute

Instructions
National Solar Energy Education Survey
a cooperative effort of
The Solar Energy Research Institute*
The Office of U.S. Congressman George E. Brown, Jr.
The Congressional Solar Coalition

The Solar Energy Research Institute, in cooperation with the office of U.S. Congressman George E. Brown, Jr. and the Congressional Solar Coalition, is requesting information about your institution's activities in solar energy. Our goal is to provide a comprehensive guide to education and training efforts related to solar energy throughout the world. Your participation in this task is appreciated.

The enclosed survey form is designed to obtain information about solar-related courses and programs offered by institutions during 1979 or 1980. Your assistance in making the entries as complete as possible is of great value. This information will be used to update the Educational Data Base which is part of the Solar Energy Information Data Bank (SEIDB).

If your institution responded to the 1978 survey and is included in the National Solar Energy Education Directory**, First Edition, we have enclosed a computerized printout of the information that was submitted. Please review the printout, make corrections where necessary, and supply information where none is present. Also, please complete the provided survey sections with information on your institution's solar energy education offerings which are not listed on the computer printout.

If your institution is not presently listed in the National Solar Energy Education Directory, or if the Directory listing is created from a secondary source of information, we request that you complete the survey form provided.

If you offer no solar-related courses or programs, please complete only Part I of the survey.

On all solar-related courses and programs, we would appreciate receiving any additional information which you feel would be helpful.

Please observe the following guidelines in completing the survey:

Solar Technologies

- In addition to the more commonly recognized applications of solar heating, cooling, and electrification, consider wind, biomass conversion, and ocean thermal energy conversion as solar technologies.

Program Definitions

- A Solar Curriculum is a program in which the student receives a degree or diploma in a solar field — doctorate, master's, bachelor's, associate; e.g., "Master's in Solar Engineering"; "Associate Degree in Solar Installation".
- A Curriculum with Solar Study is a program in which the student receives solar education while working on a related degree or diploma — doctorate, master's, bachelor's, associate; e.g., "Doctorate in Physics" with solar emphasis; "Bachelor's in Architecture" with solar design experience.
- Solar Technical Training (Non-Academic Degree) is a program in which the student receives a certificate for study in solar energy or a solar-related field; e.g., solar technician.

Solar Course Definition

- A Solar Course or Solar-Related Course is a lecture, workshop, seminar, research project, laboratory, on-the-job training experience, or other educational experience where the solar content is equal to one-third (1/3) or more of the total course contact hours.

To insure accurate information in future publications, please return all surveys in the envelope provided by June 15, 1979. A further update or correction may be returned at any time to:

SERI, Academic Programs
Attn: George Corcoleotes
1536 Cole Boulevard
Golden, Colorado 80401

Call SERI, Academic Programs Branch, at (303) 231-1831 if you have any questions about this survey.

THANK YOU VERY MUCH FOR YOUR PARTICIPATION

* SERI (Solar Energy Research Institute) is a Division of Midwest Research Institute.

** Copies of the National Solar Energy Education Directory may be obtained from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. SN 061-000-00210-3. Price: \$4.75

Part I — Institution Information
(1979-1980)

Please type or print legibly.

FOR OFFICE USE ON

Institution Name _____
Address _____
City _____ State _____ Zip _____

IMPORTANT

We request the following information of the person filling out or coordinating the response to this survey.

Name _____ Position _____
Department _____ Phone () _____ Ext. _____

1. Institution Type (Circle single most appropriate response):

☐ University/College/Graduate School	☐ Industrial Organization
☐ Junior/Community College	☐ Government Organization
☐ Vocational/Technical School	☐ Adult/Community Education
☐ Research Institute/Laboratory	☐ Political Action Group
☐ Trade Association	☐ Professional Association
☐ Labor Organization	☐ Other _____

2. What is your institution's total educational enrollment? _____

3. Control or affiliation of your institution (Circle one):

- ☐ Public ☐ Private ☐ Combination—Public/Private

4. What is the minimum admission level for students attending your institution? (Circle one)

☐ Only the ability to profit from attendance	☐ Four-year college graduate
☐ High school graduate or equivalent	☐ Other (Specify) _____
☐ High school graduate and superior academic aptitude	_____
☐ Two-year college graduate	_____

5. How is your school year divided? (Circle one)

- ☐ Semester ☐ Quarter ☐ Trimester ☐ Not Applicable ☐ Other (Specify) _____

6. If you have no solar-related programs or courses, circle the response, stop here, and return this part of the survey. Thank you. ☐ No solar programs or courses.

If you have solar-related programs or courses, please go to Part II.

FOR OFFICE USE ONLY

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Part II — Solar Energy Program Information (1979-1980)

NOTE: If more than one solar program is offered during 1979 or 1980, please make copies of this part for each.

1. Which of the following programs does your institution offer or plan to offer during 1979 or 1980? NOTE: Please see Program Definitions on instruction page.

- ☐ **SC** Solar Curriculum, Awarding a Degree or Diploma in a Solar Field
- ☐ **SS** Curriculum with Solar Study, Awarding a Degree or Diploma in a Solar-Related Field
- ☐ **ST** Solar Technical Training, Awarding a Certificate for Study in Solar Energy or a Solar-Related Field

If you have not circled one of the above program types, go to Part III.

2. Program Name: _____
3. Department Offering Program: _____
4. Head of Program: _____
5. Phone: () _____ Ext. _____

6. What degree does the student receive? (Circle appropriate responses)

- ☐ **D** Doctorate ☐ **B** Bachelor's ☐ **C** Certificate
- ☐ **M** Master's ☐ **A** Associate ☐ **O** Other (Specify) _____

7. What is the discipline or subject area of the above degree type? _____

8. Estimate the number of students completing the above program for the years indicated:

1973: _____ 1974: _____ 1975: _____ 1976: _____

1977: _____ 1978: _____ 1979: _____ 1980: _____ 1981: _____

9. As a result of having completed the above program, students will be trained in the following area(s) (Circle as many as apply):

☐ ARC Architecture—Solar Specialization	☐ INR Solar System Installation—Residential
☐ EDU Solar Energy Education	☐ INI Solar System Installation—Industrial/Commercial
☐ ADM Solar Energy Administration/Policy	☐ SOT Solar Technology—Training in Instrumentation, Controls, Design Maintenance, Etc.
☐ RES Scientific Research and Development in Solar Energy	☐ ELE Electricity—Solar Specialization
☐ ENG Engineering—Solar Specialization	☐ PLB Plumbing—Solar Specialization
☐ MEC Mechanical/Electrical Contracting Solar Specialization	☐ SHM Sheet Metal—Solar Specialization
☐ CON General Contracting—Specialization in Solar Design/Installation	☐ HOM Do-It-Yourself/Home Installation
☐ HVC Heating, Ventilation, Air Conditioning—Solar Specialization	☐ OTH Other Solar Specialization (Specify) _____

10. Does your institution offer a job placement service? ☐ **Yes** ☐ **No**

11. Does your institution have any procedures for following student employment after program completion? ☐ **Yes** ☐ **No**

12. If yes, what is the estimate of the percentage of students who find employment in the field for which they are specifically trained as a result of having completed the above program: _____ %

FOR OFFICE USE ONLY

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. '73 _____
- '74 _____
- '75 _____
- '76 _____
- '77 _____
- '78 _____
- '79 _____
- '80 _____
- '81 _____
9. _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
10. _____
11. _____
12. _____ %

FOR OFFICE USE ONLY

Part III — Solar Energy Course Information (1979-1980)

NOTE: If more than one solar course is offered during 1979 or 1980, please make copies of this part for each.

1. Course Title: _____
2. Course No.: _____
3. Instructor or Contact Person: _____
4. Phone: (____) _____ Ext. _____
5. Department Offering Course: _____
6. Is course also taught in conjunction with other departments/schools? ☐ Yes ☐ No
7. Is course part of a program described in Part II of this survey? ☐ Yes ☐ No
8. If yes, give program name: _____
9. Number of times course taught to date: _____
10. Average enrollment per class: _____
11. Estimate the number of students completing the course for the years indicated:
 1973: _____ 1974: _____ 1975: _____ 1976: _____
 1977: _____ 1978: _____ 1979: _____ 1980: _____ 1981: _____
12. Is the course offered for academic credit? ☐ Yes ☐ No
13. If yes, how many credits? _____
14. Are continuing education units offered for this course? ☐ Yes ☐ No
15. If yes, how many units? _____
16. Level for which course is offered:

<u>Academic Level</u>	<u>Non-Academic Level</u>
☐ AL All Levels	☐ MA Managerial
☐ CG College Graduate	☐ PR Professional
☐ JS College Junior/Senior	☐ SK Skilled labor
☐ FS College Freshman/Sophomore	☐ LA Layperson
☐ OA Other (Specify) _____	☐ ON Other (Specify) _____
17. Duration of Course:

No. of weeks _____	No. of Days _____
Hours per week _____	Hours Per Day _____
OR	
Total Course _____	Total Course _____
Contact Hours _____	Contact Hours _____
18. Detailed Course Contact Hours for Duration of Course:

Lecture/Discussion _____ Hrs.	Seminar _____ Hrs.
Research/Independent Study _____ Hrs.	Workshop _____ Hrs.
On-the-Job Training _____ Hrs.	Laboratory _____ Hrs.
Other (Specify) _____ Hrs.	
19. When is this course offered? (Circle as may as apply):
☐ Day ☐ Evening ☐ Weekend

FOR OFFICE USE ONLY

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. '73 _____
 '74 _____
 '75 _____
 '76 _____
 '77 _____
 '78 _____
 '79 _____
 '80 _____
 '81 _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. W _____ D _____
 H _____ H _____
 T _____ T _____
18. D _____ S _____
 R _____ W _____
 J _____ L _____
 O _____
19. _____

FOR OFFICE USE ONLY

20. Tuition and fees for a full-time student for one term: \$ _____ Resident
\$ _____ Non-resident
21. Tuition and fees for a student taking just this course: \$ _____ Resident
\$ _____ Non-resident

22. What are the principal texts used in this course?

AUTHOR

TITLE

1. _____
2. _____

23. Are there any prerequisites for taking this course? ☐ Yes ☐ No

24. To what extent are the following topics covered in this course? Circle a 1 or 2 using the following code definitions:

1-Topic Covered Extensively (Major course topic or concept)

2-Topic Covered In Some Detail (Minor course topic or concept)

Do not code topics covered superficially.

☐ ☐ ALTE - Alternate Energy Sources

☐ ☐ APRT - Appropriate Technology

☐ ☐ BIOM - Bioconversion

☐ ☐ CENT - Centralized Solar Power Systems

☐ ☐ COMP - Components—Solar

☐ ☐ DIST - Distributed Solar Power Systems

☐ ☐ CNSV - Energy Conservation

☐ ☐ STOR - Energy Storage Systems

☐ ☐ GRHT - Greenhouse Techniques

☐ ☐ HETR - Heat and Energy Transfer

☐ ☐ HYBR - Hybrid Systems

☐ ☐ INTR - Introduction to Solar Energy

☐ ☐ MATR - Materials

☐ ☐ SEAS - Ocean Systems

☐ ☐ PASS - Passive Solar Systems

☐ ☐ PHOT - Photoconversion

☐ ☐ PHVC - Photovoltaics and Solar Cells

☐ ☐ PLMB - Plumbing Techniques

☐ ☐ PROC - Process Heat

☐ ☐ SSPS - Satellite Solar Power Systems

☐ ☐ SHMT - Sheet Metal Techniques

☐ ☐ SHAC - Solar Cooling

☐ ☐ HOTW - Solar Domestic Hot Water

☐ ☐ POLD - Solar Energy Policy Development

☐ ☐ SHAK - Solar Heating

☐ ☐ CNST - Solar Home Construction

☐ ☐ LAWL - Solar Law/Legislation

☐ ☐ MRKT - Solar Marketing/
Economic Analysis

☐ ☐ SWPL - Solar Swimming Pool Heating

☐ ☐ SSYD - Solar Systems Design

☐ ☐ INST - Solar Systems Install./
Maintenance

☐ ☐ TEST - Solar Systems Testing/
Evaluation

☐ ☐ CHEM - Thermochemical
Conversion

☐ ☐ WIND - Wind Energy Conversion
Systems

☐ ☐ OTHR - Other (Specify) _____

FOR OFFICE USE ONLY

20. R _____ NR _____

21. R _____ NR _____

22. _____

23. _____

24. _____

FOR OFFICE USE ONLY

SERI

APPENDIX C

**SOLAR ENERGY EDUCATION BASE: GENERAL SYSTEM
OPERATIONAL FLOWCHART**

SERIO

Solar Energy Education Data Base: General System Operational Flowchart

SERIO

APPENDIX D

SOLAR ENERGY COURSE TEXT LIST

This list of texts was compiled from data received from the first survey of colleges and universities (August 1978). In the responses received, 275 different books were noted, of which 102 were cited more than once, with 34 cited more than three times. This list represents those 34 books. It is believed that the value of these or any other books should not be based solely on the frequency (or lack) of their citing in the survey returns. This list is meant mainly as a summary of the books most often used (to date) in solar courses. An update will be available after each successive survey.

<u>Author</u>	<u>Title</u>
Anderson, Bruce	<u>Solar Energy: Fundamentals in Building Design</u>
Anderson, Bruce	<u>The Solar Home Book</u>
Angrist, S.	<u>Direct Energy Conversion</u>
Clark, W.	<u>Energy for Survival</u>
Colorado State University	<u>Solar Heating and Cooling of Residential Buildings</u>
Cook, Earl	<u>Man, Energy and Society</u>
Crawley, G. M.	<u>Solar Energy</u>
Daniels, Farrington	<u>Direct Use of the Sun's Energy</u>
Doolittle, J. S.	<u>Energy</u>
Dorf, Richard C.	<u>Energy Sources and Policy</u>
Duffie and Beckman	<u>Solar Energy Thermal Processes</u>
Duffie and Beckman	<u>Solar Heating Design by the F-Chart Method</u>
Fowler	<u>Energy and the Environment</u>
ITT	<u>Solar Heating System Design Manual</u>
Kreider and Kreith	<u>Principles of Solar Engineering</u>
Kreider and Kreith	<u>Solar Heating and Cooling</u>
Krenz, Jerrold A.	<u>Energy Conversion and Utilization</u>
Leckie, Jim	<u>Other Homes and Garbage</u>
Lennox, Inc.	<u>Phase I (Solar)</u>
McGuinness and Stein	<u>Mechanical and Electrical Equipment in Buildings</u>
Meinel and Meinel	<u>Applied Solar Energy</u>
Montgomery, Richard and Jim Budnick	<u>The Solar Decision Book</u>
Priest, Joseph	<u>Energy for Technological Society</u>
Romer	<u>Energy: An Intro to Physics</u>
Ruedisiti and Firebaugh	<u>Perspectives on Energy</u>
SMACNA	<u>Fundamentals of Solar Heating</u>
Stoker, Senger, Capener	<u>Energy from Source to Use</u>
Threlkelb	<u>Thermal Environmental Engineering</u>
U.S. Department of HUD	<u>Solar Dwelling Design Concepts</u>
U.S. Government Printing Office	<u>Solar Heating and Cooling</u>
Watson, Don	<u>Building Your Solar Home</u>
Watson, Don	<u>Designing and Building a Solar House</u>
Williams, J. R.	<u>Solar Energy Technology and Applications</u>
Wright, David	<u>Natural Solar Architecture</u>

SERIO

APPENDIX E

**STATISTICAL DISTRIBUTION OF SCHOOLS RESPONDING TO
EDUCATION SURVEY**

SERIO

STATISTICAL DISTRIBUTION OF SCHOOLS RESPONDING TO
EDUCATION SURVEY

February 1979

State	Number of Schools in Data Base	Number of Schools Responding	% Response	Number of Schools With Solar	% Response
Alabama	57	37	64.9	6	10.5
Alaska	16	11	68.8	5	31.3
Arizona	24	19	79.2	9	37.5
Arkansas	31	18	58.1	3	9.7
California	264	138	52.3	94	35.6
Colorado	46	33	71.7	22	47.8
Connecticut	49	16	32.7	11	22.4
Delaware	11	5	45.5	2	18.2
District of Columbia	20	9	45.0	4	20.0
Florida	77	42	54.5	18	23.4
Georgia	66	35	53.0	6	9.1
Guam	1	1	100.0	1	100.0
Hawaii	12	10	83.3	3	25.0
Idaho	9	7	77.8	2	22.2
Illinois	157	86	54.8	34	21.7
Indiana	67	45	67.2	14	20.9
Iowa	61	35	57.4	11	18.0
Kansas	54	29	53.7	10	18.5
Kentucky	39	22	56.4	3	7.7
Louisiana	31	23	74.2	5	16.1
Maine	28	15	53.6	7	25.0
Maryland	51	33	64.7	8	15.7
Massachusetts	124	66	53.2	28	22.6
Michigan	99	56	56.6	30	30.3
Minnesota	65	37	56.9	13	20.0
Mississippi	46	22	47.8	4	8.7
Missouri	81	37	45.7	13	16.0
Montana	13	6	46.2	6	46.2
Nebraska	30	20	66.7	7	23.3
Nevada	7	3	42.9	3	42.9
New Hampshire	25	10	40.0	6	24.0
New Jersey	71	36	50.7	17	23.9
New Mexico	20	13	65.0	5	25.0
New York	299	132	44.1	52	17.4
North Carolina	120	64	53.3	25	20.8
North Dakota	15	7	46.7	5	33.3
Ohio	132	78	59.1	21	15.9
Oklahoma	44	23	52.3	3	6.8
Oregon	43	27	62.8	7	16.3
Pennsylvania	183	91	49.7	30	16.4
Puerto Rico	30	14	46.7	1	3.3
Rhode Island	14	9	64.3	3	21.4
South Carolina	56	32	57.1	16	28.6
South Dakota	17	10	58.8	3	17.6
Tennessee	72	39	54.2	9	12.5
Texas	151	110	72.8	29	19.2
Utah	13	10	76.9	5	38.5
Vermont	24	12	50.0	5	20.8
Virginia	71	44	62.0	14	19.7
Washington	49	31	63.3	8	16.3
West Virginia	23	18	64.3	3	16.7
Wisconsin	60	46	76.7	23	38.3
Wyoming	8	3	100.0	7	87.5
TOTAL:	3181	1780	56.0	679	21.3