SERI/TR-743-396
Volume I

September 1980

Training for Solar Jobs: A Follow-Up of California CETA Programs and Their Graduates

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SERI

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A Division of Midwest Research Institute

1617 Cole Boulevard
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Operated for the
U.S. Department of Energy
under Contract No. EG-77-C-01-4042

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Available from:
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
Price:
Microfiche ~~$3.00~~ 6.50
Printed Copy ~~$4.50~~ 3.50

NOTICE

Dr. 2102

SERI/TR-743-396
VOLUME I
UC CATEGORY: UC-58

MASTER

TRAINING FOR SOLAR JOBS: A FOLLOW-UP OF CALIFORNIA CETA PROGRAMS AND THEIR GRADUATES

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SEPTEMBER 1980

PREPARED UNDER TASK NO. 5635.30

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PREFACE

Several recent studies have indicated that commercialization of solar energy will create expanded job opportunities requiring skills different from those in the conventional energy industry (Rodberg 1979; U.S. Congress 1978). Although there is significant disagreement among researchers about the net job creation potential of solar energy, it is probably safe to say that if the President's stated goal that 20% of total U.S. energy needs will be met by solar energy technologies in the year 2000 is to be achieved, the solar industry will provide substantial employment opportunities. In fact, a well-trained work force to design, manufacture, and install solar equipment will be necessary to attain that goal. A key concern in developing solar training efforts to meet this expanding demand is whether jobs in the solar industry can be targeted toward the unemployed or underemployed. Major premises supporting the assertion that solar energy will ultimately offer employment possibilities to CETA-eligible (Comprehensive Employment and Training Act) individuals are: (1) a substantially new job market will be created that cannot be met by existing labor market participants; and (2) individuals who do not have appropriate skills to compete in the current job market can be trained readily to manufacture, install, and maintain solar systems.

This study, prepared as part of Task No. 5635.30 for the Solar Energy Research Institute (SERI), was undertaken as an initial effort to provide needed information by identifying the types of solar training being offered by CETA-funded programs and the labor market experiences of graduates from these programs. To reduce the effect of differences in climate, state incentives for solar energy, and a number of other factors, the initial research was restricted to programs within one state. California was chosen as the site for the initial project because the state is currently involved in a large variety of solar-related activities, including development of jobs and job training programs in solar energy. California has had a relatively large number (12) of CETA solar training programs, which provided a range of designs and characteristics. There had been more than 500 graduates from these programs by December 1979, a sufficient sample for collecting data on the labor market experiences of persons trained for solar jobs. This project is part of a larger employment and training research effort being conducted by SERI that includes the review and development of data on solar energy labor requirements, a survey and data base of training and education programs, and regional and national solar energy employment projections. Volume II of this report on California CETA solar training programs and graduates provides further data. Because of its size and extensive data, it is available in limited supply. Contact the Document Distribution Service, Solar Energy Research Institute, 1617 Cole Blvd., Golden, Colo. 80401.

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SUMMARY

OBJECTIVES

This project had three major objectives: to develop and test procedures that could be used to assess a type of solar training effort (CETA-sponsored programs) included in the DOE/DOL/CSA SUEDE program, funded by state CETA offices and prime sponsors; to provide in-depth descriptions of the California CETA solar training programs for persons planning or managing solar training programs, including such issues as union response and institutional arrangements for providing the training; and to describe and analyze employment experiences of graduates of the California CETA solar training programs.

DISCUSSION

The project was an empirical study of the graduates of 12 CETA solar training programs in California. Interviews with program staff and graduates were conducted in the summer of 1979, in cooperation with the State of California's SolarCal Office. The data were analyzed to answer three major questions: (1) How many and which of the graduates of CETA solar training programs are working now in solar energy-related jobs? (2) Do those graduates working in solar jobs think their training was adequate for the jobs? (3) What particular factors are related to the placement of graduates in solar jobs? Specific information on the graduates includes data about demographics, prior educational and work experience, satisfaction with the solar training, types of jobs found, wage levels, and job tenure. Program information, including lengths of programs, types of training provided, and the number and kinds of solar systems actually installed, is presented in table form.

CONCLUSION AND RECOMMENDATIONS

The results of this study show that major program problems were limited funding, shortages of trained instructors, insufficient staff support, a need for local employment information, the need for a better defined role for unions, and pressures for high placement rates.

All of the curricula involved a mixture of general skills, skills specific to solar technologies, and basic job behavior and job skills. The training involved both classroom and hands-on experience and was, in most cases, tailored to the participants and the local job market.

Successful placement of the program participants was relatively high; over half of the initial job placements after training involved solar energy. Solar jobs appeared to pay more than nonsolar jobs. The participants were generally satisfied with their training and felt that it had prepared them adequately for their current work.

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TABLE OF CONTENTS

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LIST OF TABLES

SECTION 1.0

THE RESEARCH APPROACH

1.1 OBJECTIVES

This project had three major objectives:

(1) To develop and test procedures that could be used to assess a generic type of solar training effort (CETA-sponsored programs) included in the DOE/DOL/CSA SUEDE program and funded by state CETA offices and prime sponsors;

(2) To provide in-depth descriptions of the California CETA solar training programs for persons planning or managing solar training programs, including issues such as union response and institutional arrangements for providing the training; and

(3) To describe and analyze the employment experiences of the graduates of the California CETA solar training programs.

1.2 TECHNICAL APPROACH

The technical approach involved: (1) a review of the literature on evaluation of manpower and training programs, (2) the design and monitoring of an empirical study of the California CETA solar training programs and their graduates, and (3) analysis of the data.

Information on the 12 CETA programs was collected by SERI project staff in June and July of 1979. The interview guide was reviewed by the programs in an earlier visit. In June, SERI staff met with personnel from the CETA solar training programs to obtain background information on each program. From this information, program descriptions were drafted and returned to the program directors for comment and modification.

SERI staff constructed a participant questionnaire to collect information on the labor market experiences of the CETA program graduates. Under contract with SERI, the State of California's SolarCal Office identified and located program participants through program records and conducted personal interviews with them between June and September of 1979. The number of interviews and total participants (by June 1979) for each program are shown in Table 1-1. Interviews were conducted with 151 of the 450 participants.* The range of interviews per program as a percentage of total program graduates is 16-100%. Differences in sampling are the result of pragmatic factors such as ease of locating graduates and their distance from Sacramento, rather than a purposeful emphasis on particular programs.

*Seven of the interviews could not be used because of missing answers, or because the student had either not been in the solar program or was currently in the program. The remaining 144 interviews were used for the analysis. Of these 144, 126 participants (88%) completed the CETA training program, and the remaining 18 (12%) dropped out before graduation.

Participants' questionnaire responses were computer-coded by SERI staff and analyzed using the Statistical Package for Social Sciences (SPSS). Frequency distributions and summary statistics for the major variables were calculated for each program and for the total sample, and standard statistical analysis (cross tabulations, correlations) was performed to identify major causal relationships (e.g., factors affecting post-program wage rates).

Table 1-1. GRADUATES AND INTERVIEWS BY PROGRAM

Program	Number of Graduates[a]	Number of Interviews	Interviews as % of Graduates	% of Total Interviews
Net Energy	4	3	75.0	2.1
Proteus	20	13	65.0	9.0
Lakeview	70	11	15.7	7.6
Westside CDC	250	61	24.4	42.4
Sky Ray	45	16	35.5	11.1
Santa Clara Adv. Training Center	1	1	100.0	0.7
Sonoma	44	30	68.2	20.8
Sacramento/Yolo	20	9	45.0	6.3
Total	454	144[b]	31.7	

[a]Approximate number of program graduates, June 1979.

[b]Of the 144 interviewees, 126 graduated. The remaining 18 left the program before completing it.

The program and graduate interviews were aimed at answering three main research questions:*

(1) How many and which of the graduates of CETA solar training programs are working in solar energy-related jobs?

  (a) What types of solar jobs are they filling?

  (b) What factors have restricted their ability to find solar jobs?

  (c) What, if any, interaction with unions have they had?

(2) Are there particular components of the training programs that are related to the placement of graduates in solar jobs?

(3) Have those graduates working in solar jobs found their CETA training adequate for job-required skills?

*A detailed list of the types of information collected from program managers and participants is attached (see the Appendix).

SECTION 2.0

DESCRIPTION OF THE CETA PROGRAMS

The use of California CETA funds to provide solar training began in 1976. At the time the field work for this study was conducted (May-August 1979), 12 programs were (or had been) operating and had graduated about 450 individuals. These students were trained for a variety of jobs in the solar industry—manufacturing, installation, maintenance, design, and sizing.

The programs vary widely in their design. Some have grown out of earlier weatherization programs, while other programs are the first and only offering of a training organization. Some programs offer up to a year of college credit; other programs offer only on-the-job (OJT) experiences. Some programs include specialized staff and well-equipped workshops; others use unpaid volunteers and minimum shop equipment.

The California CETA solar training programs are spread throughout the state. Specific characteristics of the programs vary, since in all cases they were designed to meet the needs of the local environment and the program participants. Summaries of the programs are provided in Table 2-1, which reviews the history and current status of the programs, and Table 2-2, which reviews the characteristics of the training. Detailed, narrative descriptions of the programs are found in Volume II of this project (Burns, Mason, and Mikasa 1980).

Table 2-1. SUMMARY OF CALIFORNIA CETA SOLAR TRAINING PROGRAMS

Name and Location of Program[a]	Funding Source	Sponsoring Organization	Date Program Started	Length of Training Program[b]	Number of Graduates as of 12/1/79	Current Status
The Firebox Solar Water Heating Program Fir-Tower House Weitchpec Route Hoopa Post Office Hoopa, CA 95546	CETA and BIA	Klamath River Citizen Council	December 1978	18 months	0	Active
Solar Technician Training Net Energy Program 854 Ninth Street Arcata, CA 95521	CETA DOL/DOE (SUEDE)	Humboldt County	March 1979	9 months	14	Terminated December 1979
Solar Demonstration Project Lakeview Educational Association 833 W. Fir Street San Diego, CA 92101	CETA	San Diego Regional Employment Training Consortium	January 1979	15 weeks	41	Terminated September 1979
Solar/Energy Technician Training Program Sonoma State University 1801 E. Cotati Rohnert Park, CA 94928	1st year Gov. discretionary 2nd year CETA	Sonoma County	September 1976	9 months	47	Terminated September 1979
Solar Training Program Proteus Adult Training P.O. Box 727 Visalia, CA 93279	Gov. discretionary CSA CETA (Title III)	Self	February 1978	5 months	20	Active

[a]This list does not include the Sacramento-Yolo Pilot Program or the Santa Clara OJT Program.
[b]Includes on-the-job training (OJT).

Table 2-1. SUMMARY OF CALIFORNIA CETA SOLAR TRAINING PROGRAMS (concluded)

Name and Location of Program[a]	Funding Source	Sponsoring Organization	Date Program Started	Length of Training Program[b]	Number of Graduates as of 12/1/79	Current Status
Solar Energy Technician Training Program Manpower Services City of Richmond 330 25th Street Richmond, CA 94804	DOL competitive demonstration grant (STIP)	City of Richmond	June 1979	24 months	0	Active
Solar Technician Training Program Sky Ray 390 Ocie Way Hayward, CA 94541	CETA	Alameda County Training Employment Board	August 1978	15 weeks	45	Active
Solar Energy Project Economic Opportunity Commission Tap Route House 1105 Garden Street E. Palo Alto, CA 94033	CETA NCAT	County of San Mateo	January 1979	6 months	5[c]	Active
Solar Training and Utilization Community Resource Project 3317 S Street Sacramento, CA 95816	CETA	Sacramento Employment and Training Agency (City and County)	April 1979	9 months	9	Active
San Bernardino West Side Community Development Corporation 1736 W. Highland Ave. San Bernardino, CA 92411	Multi (15 sources)	Inland Manpower Association	1976	6 months	300	Active

[a]This list does not include the Sacramento-Yolo Pilot Program or the Santa Clara OJT Program.
[b]Includes on-the-job training (OJT).
[c]As of July 1979.

Table 2-2. CHARACTERISTICS OF TRAINING

Program[a]	Length	Hours/Week	Classroom	Hands-on Training	On-the-Job Training	Number and Types of Systems Installed During the Program
Firebox	18 months	20	none	18 months 20 hrs/week		35 installations: wood stove water heating systems and solar water heating systems on Native American homes
Net Energy	9 months	30	3 months	3 months of workshops included with class sessions and 6 months actual installations		5 bread-box water heaters, 1 thermosyphon water heater, 4 flat-plate active water heaters, and 4 attached greenhouse/solariums
Lakeview Educational Association	15 weeks	36	7 weeks	Actual installations during first 7 weeks and 8 weeks OJT	40 hrs a week; students are paid the normal wage rate. LEA reimburses the employer half of the wage rate as compensation for training the students	1 flat-plate domestic hot water heater, 1 bread-box water heater, 2 greenhouses at the community level, and 1 jacuzzi

[a]This list does not include the Sacramento-Yolo and Santa Clara programs.

Table 2-2. CHARACTERISTICS OF TRAINING (continued)

Program	Length	Hours/Week	Classroom	Hands-on Training	On-the-Job Training	Number and Types of Systems Installed During the Program
Sonoma	9 months	39	11 hrs/week	Actual installations on Alternative Energy Center building and individual projects 8 hrs/week	5 hrs/week	Constructed 600-sq.-ft. Alternative Energy Center demonstrating active and passive solar system; 2 domestic hot water systems (one active and one breadbox); 3 space heating systems, which included 1 air system and 2 water systems; and a direct-gain space heating system. Also constructed non-attached greenhouse, and numerous student projects
Proteus	5 months	35	10/hrs/week	Workshops and actual installations	Optional 2 months OJT. Proteus compensates the company 50% of trainee's salary	28 active domestic hot water systems, 37 breadboxes, solar heating system for swimming pool, a hot water system for use in the dairy at the local community college, and a greenhouse
City of Richmond	18 months	30	12 months	In-class workshop and OJT	6 months w/ local private employees; company is compensated by the program	Solar heating system for swimming pool at community college. Will solarize a lighthouse off the coast of the Port of Richmond

Table 2-2. CHARACTERISTICS OF TRAINING (concluded)

Program	Length	Hours/Week	Classroom	Hands-on Training	On-the-Job Training	Number and Types of System Installed During the Program
Sky Ray	15 weeks	30	6 weeks	9 weeks of workshops and actual installations	Work w/private companies on weekends	7 domestic hot water systems (open and closed loop active systems and glazed panels) and active systems (glazed and unglazed panels) for swimming pools
Economic Opportunity Commission	6 months	40	15 hrs/week; 8 hrs of support classes and 2 hrs on solar energy	25 hrs/week actual installation and OJT	Work 10-12 hrs/week, including weekends, with private companies primarily installing hot tubs and swimming pool applications	Built a solar house, which includes a domestic hot water system and a greenhouse
Community Resource Project	9 months	40	6 months	Workshops and skills development work experience, retrofit low income housing	3 months	Built and installed 4 domestic hot water systems, 2 greenhouses, and 1 active flat-plate system
Westside CDC	6 months	40	33% of total hours	33% of total hours in laboratory work and 33% in actual installations		Manufactured own solar systems. Contracted installations and retrofits with public housing projects 100 bread-boxes and flat-plate collectors, 10 fan coil space-heating systems, 1 greenhouse

SECTION 3.0

CHARACTERISTICS AND EXPERIENCES OF PROGRAM PARTICIPANTS

3.1 DEMOGRAPHIC AND EDUCATIONAL CHARACTERISTICS

Slightly more than two-thirds of the students interviewed were male (102 males; 42 females). About half the interviewees were white (75); 43 were black; 18, Hispanic; and 8, Oriental or Native American.

The graduates' ages ranged from 18 to 53. Most students were in the younger age groups. Table 3-1 shows demographic information for those interviewed. Three-quarters of the students (110) were not married, and about two-thirds (99) had no dependents. Only 9 had four or more dependents. About two-thirds of the students had been raised in urban or suburban areas (47 and 45 students, respectively); 41 had been raised in small towns; and only 10, in rural areas.

The graduates were generally well educated. Only 14 of the 144 had not completed high school.* Seventy-seven had college experience; 19 had received degrees. (This figure includes junior or community colleges as well as 4-year colleges and universities.) Of those with college degrees, 19 received bachelor's degrees and 2 had earned a master's degree. The total distribution of formal education is shown in Table 3-2.

About half the students had received training from former employers or the military. Sources of prior training are shown in Table 3-3. Only 32 (22%) of the participants interviewed had received previous training in one or more CETA or similar programs.

3.2 EMPLOYMENT BACKGROUNDS

Participants in the CETA solar training programs came from a variety of occupational backgrounds. Three job categories—structural work; service; and professional, technical, and managerial—account for more than half of the total responses. Perhaps most important is that most of the participants had held several different types of jobs. Of the 128 respondents, 76 (59%) listed at least three previous occupations. Prior jobs held by the graduates are shown in Table 3-4. The relatively high proportion of professional, technical, and managerial occupations (16.5%) is somewhat surprising for a sample of CETA-eligible individuals. Twenty-eight percent of the participants held jobs that involved construction skills (machine trades, benchwork, and structural work).

The mean number of employers since age 18 for the sample is about 7. Since the average age of participants is slightly less than 25 years, this means that the average participant has had about one employer per year since age 18. These data indicate that the participants in the solar training programs exhibit employment histories that are probably typical of CETA-eligibles—frequent job changes with relatively short tenure in each job. This generalization is supported by the variety of jobs participants had held since age 18; almost 50% of the participants responded that they had performed "several" or "many" different kinds of work.

*Some participants received their diplomas or GED as part of the CETA program.

Table 3-1. NUMBERS OF INTERVIEWEES BY AGE, SEX, AND ETHNIC BACKGROUND

Racial/ Ethnic Group	Sex	Age 18-19	20-24	25-29	30-34	35-39	40 or older	Total
White	Male	1	21	19	6	3	2	52
	Female		6	12	4		1	23
Black	Male	6	22	1				29
	Female	1	12				1	14
Hispanic	Male		10	2	3			15
	Female		3					3
Other (Oriental, Native Amer.)	Male		2	2	1	1		6
	Female		1	1				2
Totals		8	77	37	14	4	4	144
% of Participants		5.6	53.5	25.7	9.7	2.8	2.8	100

Table 3-2. EDUCATION LEVELS OF PROGRAM GRADUATES

Formal Education Levels	No. of Graduates
Eighth grade	1
Some high school	13
High school graduate	51
Post-high school, noncollege	2
Some college	58
College degree	19
Total	144

Table 3-3. EMPLOYMENT TRAINING PRIOR TO THE CETA PROGRAMS

Employment Training	No. of Graduates
Courses provided by employer	4[a]
On-the-job training	21
Trade or vocational-technical school	10
School	2
Military	15
Junior or community college	1
Apprenticeship	4
Other	16
None	67

[a]These numbers will not total 144 because multiple responses were permitted and because missing responses are not shown.

3.3 EXPERIENCE WITH THE SOLAR TRAINING PROGRAM

Participants learned about the solar programs from a variety of sources. Forty-five graduates found out about the program through relatives or friends; 22, through media sources (television, newspapers, posted bulletins); and 5, by word of mouth. Informal and formal CETA information channels were often used. Eighteen students were referred by other CETA programs, and 52 became informed through people involved in the program or through program information. Only one graduate claimed to have found out about the program through his/her own research on and interest in solar energy.

The reasons for signing up for the program were varied. Sixty-two of the students applied because of an interest in solar energy; 63 were more concerned with getting a job,

developing more marketable skills, or entering trades. Thirty-four students expressed general curiosity or thought the program looked like a good opportunity.*

The majority of the graduates were satisfied or very satisfied with the programs (see Table 3-5). They did, however, suggest a number of changes for future cycles of the course. These suggestions ranged from changes in the course content and equipment to interpersonal treatment of the graduates. The suggestions most often made were that the bureaucratic problems and amount of red tape be reduced (14 graduates); there be more hands-on experience (17) and more on-the-job or field experience (11); there be a longer training period (11); and better job placement should be provided (10).

Somewhat less frequently mentioned were a need for more in-depth or specific training (8), more individual attention (8), and better organization or administration (8).

Table 3-4. TYPES OF JOBS GRADUATES PREVIOUSLY HELD

Job Category[a]	Number	Percent
Professional, technical, and managerial	63	16.5
Clerical	25	6.5
Sales	20	5.2
Service occupations	63	16.5
Agricultural, fishing, forestry	29	7.6
Processing	11	2.9
Machine trades	20	5.2
Benchwork	9	2.4
Structural work	79	20.7
Miscellaneous	39	10.2
Unskilled (unspecified)	17	4.5
CETA or similar programs	3	0.8
Student	1	0.3
Occupations in solar (unspecified)	3	0.8
Total	382[b]	

[a]Job categories are defined in Appendix D of Volume II.

[b]Total responses (382) exceed number of interviews (144) because of multiple answers. Responses are summarized as follows: No response: 16; one previous job: 21; two previous jobs: 31; three previous jobs: 32; four previous jobs: 23; five previous jobs: 10; and six previous jobs: 11.

3.4 GRADUATE PLACEMENTS

To obtain information on the types of jobs that graduates from the CETA programs have obtained, several questions were asked about post-program labor market experiences.

*Multiple answers were allowed.

Table 3-5. PARTICIPANTS' SATISFACTION WITH PROGRAM[a]

	Very Dissatisfied	Dissatisfied	Can't decide, did not have, or no response	Satisfied	Very Satisfied
Feedback from trainers about performance	0.7%	6.3%	9.7%	59.0%	24.3%
Work assignments for workshop sessions	4.2	14.6	9.7	56.3	15.3
Time with instructors	2.8	12.5	4.7	62.5	17.4
Handling of job placements	9.0	16.0	13.2	36.1	25.7
Tools provided	1.4	8.3	6.3	59.7	24.3
Manuals provided	0.7	7.6	19.4	50.0	22.2
Way tools and manuals were provided	0.7	4.2	5.6	74.3	15.3
Program administration in general	9.0	16.0	13.9	40.3	20.8

[a]In cases where two responses were marked, they were averaged and then rounded toward the center point.

The types of jobs—in terms of occupational category—found by participants after leaving the CETA programs are presented in Table 3-6. Professional, technical, and managerial (33 of 123) and structural work occupations total about two-thirds of the first jobs found when the individuals left the programs. Virtually all of the jobs in the professional, technical, and managerial category and 69% of those in structural work involved solar energy.

Table 3-6. TYPE OF JOB HELD AFTER PROGRAM—SOLAR VS. NONSOLAR
(First Job)

Job Category	Yes		No	
	Number	% of Total "Yes"	Number	% of Total "No"
Professional, technical, and managerial	32	45.1	1	1.9
Clerical	3	4.2	3	5.8
Sales	1	1.4	1	1.9
Service occupations	0	0	9	17.3
Agricultural, fishing, forestry, and related occupations	0	0	4	7.7
Processing	0	0	3	5.8
Machine trades	0	0	5	9.6
Benchwork	0	0	4	7.7
Structural work	35	49.3	16	30.8
Miscellaneous	0	0	4	7.7
Unskilled (unspecified)	0	0	2	3.8
Total[b]	71	100.0	52	100.0

[a]Occupational categories are from the Dictionary of Occupational Titles, Fourth Edition, 1977. U.S. Department of Labor, Employment and Training Administration.

[b]These totals exclude 5 students; 12 unemployed; 1 person in the professional, technical, and managerial category who did not respond; 2 in the machine trades category who did not respond; and 1 one in the benchwork category who did not respond.

Eight percent of the participants (12 of 144) at first were unable to find jobs. At the time of the interviews, 23 of the 126 who had graduated were unemployed. Of the 18 who left the program before completion, 7 were unemployed.

For graduates' first jobs after leaving the program, the average starting wage was $4.33/hr. Wages at the end of these first jobs (either current wage at the time of the interview or wage when participant left the job) averaged $5.20/hr. There is also some indication that individuals who left their initial jobs were able to find better-paying jobs (at least for the second, third, and fourth jobs). For example, starting salaries for second jobs averaged $1.27/hr higher than those for the initial job ($5.60 versus $4.33/hr), and the starting salaries for second jobs were higher than the average top wage in first jobs ($5.60 versus $5.20). In terms of hourly wage rates, it therefore appears that graduates of CETA solar training programs have been able to advance, both by working at the same job and by finding new ones. It is also important to note that 103 of the participants

responding to the wage question were able to find employment paying more than the federal minimum wage rate (then $2.90/hr).

To provide some insight into the steadiness of employment found by graduates, participants were asked how many hours of work per week they averaged in their first job. Most participants were able to find full-time work; 82 responded that they were working 40 hours per week. Only 16 said that they were working 30 or fewer hours per week.

The length of employment in jobs was also determined. For first jobs, the average length of employment was 6.5 months; 61 individuals were still at their first job at the time of the interview. Second jobs averaged 7 months, and 26 (54% of those who took second jobs) were still employed in that job.

A significant percentage of those interviewed left their initial jobs, and some have held four or more jobs. To determine reasons for these job changes, participants were asked why they left their previous jobs. The most frequent reasons given were that they found better jobs, the business or project was discontinued, or that they disliked particular aspects of the job.

Participants were asked two specific questions that were intended to relate their experiences in the labor market with the solar training program. The first was, "Did the training program help in finding your first (post-program) job?" Of the 125 who answered this question, 86 (68.8%) responded "yes," and 39 (31.2%) responded "no."

The second question was, "Do you feel that the training program adequately prepared you for the work you are doing?" The majority of the participants (57.1%) felt that the programs provided adequate training; about 23% believed the training was inadequate for the jobs they found.

One issue related to solar jobs is the role of union and nonunion labor. Trade unions are anxious to ensure solar employment for their members, while nonunion individuals view the solar industry as an opportunity to open fields of employment to people such as CETA-eligibles. As a result, trade unions have been less than enthusiastic about CETA-funded solar training efforts, except perhaps as pre-apprenticeship programs.

To provide some information on the experience of graduates of CETA solar training programs with trade unions, participants were asked about their contacts with unions. Of the 110 respondents, only 11 (10%) stated that they had worked with union members on a job site. Graduates were also asked, "Are you now in any way affiliated with a union?" Of the 143 responses, 21 (15.9%) indicated that they were.

3.5 SOLAR EMPLOYMENT AND EXPERIENCE

Seventy-one of the respondents indicated that the first job they obtained after leaving the program involved solar energy. As indicated in Table 3-6, most of the solar jobs were in the professional, technical, and managerial fields (32) and the structural work category (35). For those who left their initial jobs, the relative proportion of those who found solar jobs declined slightly. At the time of the interviews, 62 had solar-related jobs. Additionally, many respondents were very recent graduates from the solar training programs, and much career "sorting out" that will occur has not yet been observed. About 80% of those whose first job had a solar component spent more than three-quarters of their time on solar work.

Of the 144 participants interviewed, 66 (46.5%) indicated that they had worked on solar installations since leaving the program. Most graduates (39) who had installed solar systems had worked on 10 or fewer installations. Eighteen graduates had worked on from 11 to 100 installations. Seven individuals reported that they had worked on more than 100 systems.

In terms of types of solar systems the graduates installed, nearly all were some form of residential hot water system. Domestic hot water systems and pool and hot tub applications accounted for 86% of the solar installations. Although almost all of the interviewees (64 of the 66 who had installed solar systems) indicated that they worked primarily on single-family home installations, a significant number (45) had also installed solar systems on multifamily residences and commercial buildings.

SECTION 4.0

FACTORS AFFECTING PLACEMENT EXPERIENCE

To identify factors that may influence post-program job experiences of the participants, relationships between participant characteristics (demographics, prior education) and placement data (type of job, wage rate) were analyzed. Results should be interpreted as indicators of general relationships rather than as statements of causality and magnitude.

The ethnic group, sex, and previous education of the participant appeared to influence the type of job found upon leaving the CETA solar training program. Most (over 90%) of those who obtained jobs in the professional, technical, and managerial category had some college (35%) or a college degree (59%). In structural work, where 35% of the participants found jobs, the educational background apparently had little or no effect; 21 had a high school diploma and 27 had a college background. Women were disproportionately represented in the professional, technical, and managerial job category (40% of all females interviewed). In the structural work category, however, there was a comparatively low percentage of women (14% of the females interviewed). This seems to reinforce the expressed concerns of some of the program directors and participants that female students were having trouble breaking into traditionally male construction trades. The women, however, were less likely than the men to be unemployed. Only one of the 12 participants who said that they were unemployed immediately after the program was a woman. The relationship to ethnic background showed most clearly in the professional, technical, and managerial job category, which was dominated by whites (76%). Only 7% of blacks and 12.5% of Hispanics were in that category. However, the relative proportion of whites and of those in the "other" category was about the same (35% and 37.5%). The structural work category and the unemployed category showed a somewhat more even distribution by ethnic group.

Previous education and ethnic group appeared to be related to whether the first job involved solar energy. Sex did not appear to be a factor. Of those with college experience or degrees (68 students), 73% were placed in solar jobs. An equal percentage of men and women (58%) listed their first job as involving solar energy. Of all white respondents, 78.5% said their first job involved solar energy; for all nonwhite respondents, only 33% were employed in solar jobs.

Wage rates did not significantly vary with respect to sex. There did appear to be some ethnic group differences, however. Only 1 white (1.8% of whites) listed a top wage rate for the first job as less than $3.01/hr, while 11 nonwhites (22.4% of nonwhites) were in this category. Respondents listing their top wage rates above $5.00/hr included 44% of all white respondents (25 of 57) and 35% of all nonwhite respondents (17 of 49).

For both initial and top wage rates, more participants whose jobs involved solar energy were in the higher wage-rate categories than those whose jobs did not. For their initial wage rate, 31% of those in solar jobs were earning over $5.00/hr, compared with 8% of those in nonsolar jobs. For their top wage rate, 80% of the respondents in solar jobs were earning over $5.00/hr, compared with 30% of those in nonsolar jobs.

SECTION 5.0

FINDINGS FROM PROGRAM EXPERIENCES

The program and participant interviews and a project review meeting in Sacramento suggested a number of general findings or implications from the program experiences. These are outlined briefly here; a more detailed discussion is presented in Volume II.

The findings can be grouped into four categories: (1) program components and characteristics, (2) curriculum design and implementation, (3) student selection and characteristics, and (4) placement experiences.

5.1 PROGRAM COMPONENTS AND CHARACTERISTICS

- Availability of funding for the programs and for solar installations is the major problem facing the programs. Delays in receiving promised funding have caused changes in the proposed efforts; some sponsors thought the solar programs were too expensive; and financial support for the actual installations has been hard to obtain. For example, CETA funds cannot be used for permanent installations. Other funding sources have included HUD, CSA, BIA, and the building owners.
- Conservation and weatherization efforts should be combined with solar training activities. This serves the dual function of adequately preparing installation sites for solar systems and of providing the students with a broader range of job skills and employment opportunities.
- An increase in solar training programs may further increase the shortage of qualified instructors. Because of the range of qualifications required and the present shortage of individuals meeting the requirements and willing to teach in CETA solar programs, many programs have already turned to consultants, visiting instructors, and faculty from local community colleges.
- The staff must handle teaching responsibilities and administrative paperwork for the CETA grant. An appropriate staff/student ratio should be determined and applied to program planning.
- It is critical that local employment opportunities be assessed carefully. One way in which the California programs are able to gain this information is by appointing and using an advisory board comprising members of the local solar industry. The advisory boards provide feedback to the programs on the types of training needed by local industry and facilitate placement of graduates.
- The unions' role in CETA solar training programs needs to be defined. At this stage, it appears that trade union participation in the California CETA solar programs has been limited to individual union members sitting on advisory boards and providing some part-time teaching assistance.
- Student job placement is perhaps the primary concern of the program, in part because it is a major factor used by prime sponsors in evaluating the programs. Some programs have felt pressured by prime sponsors for both a high placement rate and a high proportion of placements in solar jobs. Because of the current limited availability of solar jobs, program directors felt that "successful" placement of graduates should include employment in a variety of fields related to the training, including general construction, and not just to solar installations.

5.2 CURRICULUM DESIGN AND IMPLEMENTATION

- The scope and depth of instruction that can be covered in the CETA programs depend in large part on their length and on the number of training hours per week. Some of the programs have chosen to limit instruction to one or more of the basic trades skills, such as plumbing, with minor coverage of solar-specific skills. Others focus on specific solar skills and information, assuming that their trainees will be assisting journeymen on specific installations.
- While practical experience is important, program directors cautioned that it should not preclude classroom work. Some programs integrated OJT experience with the classroom sessions; other programs completed the classroom work before beginning field installations or OJT.
- All of the programs include a training mix of general skills, solar-specific skills, and basic job behavior and skills. Program directors felt that such a mix was necessary because of the job opportunities available to their graduates, the skills requirements for solar installations, and the lack of specific or related job skills and experiences of many of the participants.
- While program directors recognized the benefits of comparability and control across training programs, they also felt strongly that the program must be tailored to the local job market and to the particular program participant. One compromise between consistency and flexibility is a set of standardized curriculum modules that can be used in a variety of course combinations.

5.3 STUDENT SELECTION AND CHARACTERISTICS

- A controversy exists over the use of aptitude tests rather than interview judgments in the student selection process. Some programs, because of their curriculum content, screened for 9th-grade math ability; other programs gave aptitude tests to the students after they had been accepted, using the results for guidance and training.
- Both program directors and prime sponsors are concerned that the early cycles of the CETA solar programs may be "skimming" the best of the CETA-eligibles. Since some intake agencies see the solar programs as the top choice for solar training, and since there are pressures for high placement rates, highly qualified and motivated applicants may be more readily accepted than others. Yet, this may limit the program's ability to serve a large portion of the CETA-eligible population.
- Program directors differ as to whether all students should have the same skills or should be at different levels. The main arguments for homogeneity are (1) ease of planning and carrying out training and (2) more similar, evenly paced assignments during workshop sessions and OJT assignments. Arguments for a mix of skill levels in the courses are that a mixture does not "skim" the upper levels of CETA-eligibles, it is more similar to real-world job experiences, and it encourages the students to help each other.
- The program directors felt that student expectations for solar employment are, in many cases, a problem for the programs and for the students. Particular expectations included: that the level of pay in solar jobs will be high; that the solar jobs will be more glamorous or exciting than traditional jobs; and that

participants can be virtually assured of getting a solar job. Four of the programs meet with the students before or just after the selection process to discuss what to expect in solar jobs.

5.4 PLACEMENT EXPERIENCES

- Ninety-two percent of the participants interviewed found immediate employment upon leaving the program. At the time of the interviews, 78% of the participants were still employed.
- The participants' jobs were generally full-time, fairly high-wage jobs. Only 16% of the students reported that they were working 30 or fewer hours per week.
- Initial and final wages for first jobs averaged $4.33/hr and $5.20/hr, respectively. For those who moved into other jobs, the comparative averages in the third job were $6.34/hr and $6.64/hr.
- Four categories—professional, technical, and managerial; structural; service; and machine trades—accounted for more than 70% of the first jobs participants obtained.
- Seventy-one of the graduates indicated that their first jobs involved solar energy. Eighty percent of those with solar-related jobs spent more than three-fourths of their time on solar activities. At the time of the interviews, 62 of those interviewed were in solar jobs.
- Solar jobs appeared to pay more than nonsolar jobs. At the time of the interviews, 84% of those with solar jobs were earning more than $5.00/hr, while only 56% of those in nonsolar jobs were earning more than $5.00/hr.
- Overall, the graduates were generally satisfied with the training they received in the solar programs. The majority of them felt that their training adequately prepared them for their current work.

SECTION 6.0

REFERENCES

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APPENDIX

INTERVIEW QUESTIONS

1. Program Characteristics
   a. What are the objectives of the training program?
   b. What changes or modifications have occurred in the program and why?
   c. What types of persons are participating in the program and how are they selected?
   d. What are the characteristics of persons who do not complete the program?
   e. What is the content of the program (e.g., how much time is devoted to hands-on experience and in what setting)?
   f. What types of placement assistance are offered to the graduates?
   g. What are the local conditions that influence the job market for the program graduates?
   h. What types of instructors are used by the program?
   i. What are the programs' relations with other area organizations (industry, union, and training)?
   j. What general types of problems have the programs encountered, and how have they responded?

2. Graduate Characteristics and Labor Market Experiences
   a. What are the demographic characteristics of graduates from the California CETA solar training program?
   b. How did they get into the training program, and why?
   c. What were their employment skills and experiences prior to the solar training program?
   d. Have the graduates found jobs in the solar energy industry? If yes, what types of jobs are they filling and do they see their training as adequate; if no, what factors do they see as restricting their job opportunities?
   e. What types of solar systems have the graduates worked on since leaving the program?
   f. How satisfied are the graduates with the amount and type of training they received?
   g. What kinds of interaction with unions have the graduates had?

Document Control Page	1. SERI Report No. TR-743-396, Vol I	2. NTIS Accession No.	3. Recipient's Accession No.

4. Title and Subtitle

Training for Solar Jobs; A Follow-Up of California CETA Programs and Their Graduates

5. Publication Date: August 1980

6.

7. Author(s)

Burns, Barbara; Mason, Bert; Mikasa, Gail

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

Solar Energy Research Institute
1627 Cole Boulevard
Golden, Colorado 80401

10. Project/Task/Work Unit No. 5635.30

11. Contract (C) or Grant (G) No.

(C)

(G)

12. Sponsoring Organization Name and Address

13. Type of Report & Period Covered: Technical Report

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words) This study assessed solar training offered by CETA-funded programs and labor market experiences of program graduates. The initial research was restricted to programs within California, because the state is involved in a variety of solar-related activities, including development of jobs and training programs in solar energy. Interviews were conducted with 12 CETA solar training programs and graduates in 1979, in cooperation with California's SolarCal Office. Information on graduates includes demographics, educational and work experience, satisfaction with solar training, types of jobs found, wage levels, and job tenure. Program information includes length, types of training, and the number and kinds of solar systems installed. Results show that major program problems were: limited funding; shortages of trained instructors; insufficient staff; need for local employment information; need for a better defined role for unions; and pressures for high placement rates. The curricula involved general skills, skills specific to solar technologies, and basic job behavior and skills. The training involved both classroom and hands-on experience and was mainly tailored to participants and the local job market. Successful placement of program participants was relatively high; over half the initial job placements involved solar energy. Solar jobs appeared to pay more than nonsolar jobs. Participants generally felt that their training had prepared them adequately for their current work.

17. Document Analysis

a. Descriptors: California ; Data Compilation ; Education (Q_1,Q_2) ; Employment ; Federal Assistence Programs ; Labor ; Local Government ; Manpower (T_1) ; Occupations ; Social Services ; Solar Energy (T_2) ; Solar Industry ; Work ; Data ; Energy ; Energy Sources ; Industry ; Information ; North America ; Numerical Data ; Renewable Energy Sources ; USA ; Western Region ; Technology

b. Identifiers/Open-Ended Terms

c. UC Categories: UC-58

18. Availability Statement
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

19. No. of Pages: 35

20. Price: $4.50

Form No. 8200-13 (6-79)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980—677-175/337

MASTER