**PROJECT STATUS REPORT
ON
FIELD RESEARCH TASKS AND TECHNICAL SERVICES
Period from June 1 through August 31, 1982**

ENERGY SYSTEMS GROUP
ESG, INC.
ATLANTA, GEORGIA

MASTER

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COVER**

September 1982

PREPARED FOR
U.S. DEPARTMENT OF ENERGY
CHICAGO OPERATIONS OFFICE
UNDER CONTRACT DE-AC02-82CH10122

ESG ENERGY
SYSTEMS
GROUP

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ABSTRACT

This status report covers progress by ESG, Inc. under Contract DE-AC02-82CH10122 during the period from June 1 through August 31, 1982. The work is considered in two primary areas as discussed below.

1. Field Measurements, Analyses, and Reporting Related to Building Energy Systems and Biomass Projects.

Sound progress was made in all areas, although the buildup of effort was delayed somewhat because of work under other contracts, and a less rapid transition of personnel than had been originally anticipated. Emphasis was placed on analysis efforts for passive design tools, industry review of the initial performance monitoring data on the 160 hot water systems that are under test, and the work concerned with residential PV systems.

Of particular importance was the completion of a report covering analysis of residential PV systems integrated with on-site thermal storage. This work shows that some advantage may result in hot, humid climates where there is more of a load balance throughout the year because of the relatively constant cooling load.

2. Technical Services in Support of Appropriate Technology Program.

Effort was started on the evaluation of completed Midwest AT projects, analysis from a management viewpoint, and preparation for more detailed monitoring and technical assistance to grantees.

This report includes a listing of documents produced during the reporting period and provides materials defining the work which was accomplished.

1.0 INTRODUCTION

This status report covers work being undertaken on certain tasks which were initiated at the Southern Solar Energy Center, and also includes technical services in support of the Appropriate Technology Small Grants Program at the DOE Chicago Operations Office. The effort is under contract DE-AC02-82CH10122 and covers the reporting period from June 1 through August 31, 1982.

In general, sound progress is being made; however, the level of effort initially made during the reporting period was somewhat less than had been originally planned because of the impact of other work related to close out of SSEC by the personnel involved.

It should be noted that the format of this status report follows the format of the contract work statement with a final section to discuss the overall situation and highlight special problems. Also, Appendix A provides a listing of reports or other publications issued during the reporting period.

2.0 TASK STATUS

A. FIELD ACTIVITIES IN BUILDING ENERGY SYSTEMS AND BIOMASS

1. Residential Building Energy Systems

The work being conducted under this task was initiated by SSEC and is being completed in order to make critical data available to industry and the research community. This task includes work in the refinement of design methods for accommodating cooling loads; analysis of data on passive residences and related support of the passive monitoring program; an investigation of integrated PV-thermal storage concepts; and work on improved passive system selection criteria. A summary of activities during the reporting period follows:

Cooling Loads Impact Study - An improved method has been developed for calculating the cooling load impact in the design of passive solar buildings. Basically, the method adds the solar gain to the house cooling load if the gain occurs when the outside temperature is above the cooling balance point temperature of the house. The delay effects of high mass areas such as Trombe and water wall systems is accounted for by assuming that the related radiation is spread out over the entire twenty-four hour period. In this way the method accounts for energy stored in the mass wall during the day but lost at night. A cooling degree-hour calculation determines the conductive load on the passive wall.

This approach has been compared to results obtained from thermal node analyses using the TNODE program. Figures 1 and 2 in Appendix B show typical results for mass wall systems using both a cooling degree-hour and a cooling degree-day conductive load approach. Both agree quite well. It is well known that thermal node analyses of sensible cooling loads can be misleading, often

over-predicting the cooling impacts in residences. This is principally due to the thermal flywheel effect and varying occupancy and internal gains. Because of this, further analysis is required before confidence can be placed in the method.

A report on the method, as presently developed, is in draft form and has received an initial review. Revisions to the first draft and further examination of the calculation methodology is forthcoming.

Design Tool Development - Major rework of the FChart-SLR analysis technique, which is identified as SLR-PLUS, is near completion and ready for initial verification tests. This includes:

- Use of the latest Los Alamos passive system performance data in a manner that allows straightforward interpolation and extrapolation of results.
- Addition of a set of shading coefficient schedules which can be used to simulate the effects of movable window screens, unusual glazing types, shading from sources other than fixed overhangs, or reflector augmentation of radiation.
- Incorporation of an advanced shading algorithm based on a method developed by Utzinger and Klein.
- Creation of an interactive help command which allows the user to review program commands at any point of program operation.

With this capability, the SLR-PLUS program can evaluate the heating and sensible cooling impacts of direct gain, water wall, vented and unvented Trombe wall, and sunspace passive solar systems.

Initial efforts have begun in verifying the results of the SLR-PLUS program. Where possible, checks have been performed on intermediate steps used by the program. Figures 1 through 5 in Appendix C are comparisons of the Solar Savings Fraction versus absorbed solar over degree days for Los Alamos passive system configurations, with the same configuration as calculated by the SLR-PLUS program.

As can be seen, the program reproduces the Los Alamos data rather well. Figures 6 and 7 in Appendix C compare the program calculated illumination fraction for beam radiation with that given by Utzinger and Klein. Again, the two methods agree quite well. Finally, limited comparisons between annual Solar Savings Fraction calculated by the program and those given by Los Alamos for the new system types have been made. These comparisons test many of the calculation steps used by the program. Figures 8 through 12 in Appendix C are examples of the comparisons that have been made up to this point.

Work has progressed on providing documentation for the program. A first draft has been completed of the User's Manual for SLR-PLUS and the review process has begun. The reference manual for the program is still in the preparation stage, but is close to first draft status.

Progress on the SLR-PLUS project for the next quarter should see the completion of the program documentation and further verification of program operation and accuracy. This should include comparison with measured data (Class B) and other design methodologies (University of Wisconsin).

Infiltration Analysis - Infiltration measurements on six residences in the southeast has been run during the past quarter. In all six cases both tracer gas measurements and blower door measurements were conducted. At the present time, reduction of the accumulated data is progressing, but preliminary observations are in order.

Tracer gas measurements (gas bag tests) present significant problems in the southeast during the summer months. During this period, the wind velocity and temperature differences (i.e. the infiltration driving potential) are very low. This results in extremely low measured infiltration rates. These rates are not representative of the thermal integrity of the house, as indicated by the blower door tests. The blower door tests, on the other hand, are relatively independent of climate impact and should be accurate year round. Analysis of the blower door data, however, indicate that it is only suitable for small to medium sized residences. In large houses, or leaky houses, the blower has insufficient capacity to provide a reasonable pressure difference. In addition, analysis of the blower door calibration data indicate the design is very poor, and flow instability may occur leading to incorrect results.

Over the next quarter, some additional tests may be conducted. Data analysis on the sites already tested will be completed. It is anticipated that some effort will be expended attempting to modify the field tests to eliminate some of the performance restrictions on the blower door.

Performance Monitoring - Efforts under this task during the reporting period consisted of collection of performance data on two passive solar residences in Dallas, Texas by Texas Power and Light Utility. Following receipt of this data, ESG will combine this information with available weather data and design information to generate data and report on the cooling load impact of passive heating systems.

During the reporting period progress has been made toward the analysis of data gathered by SSEC under the Class B program. A significant amount of work was done in organizing the data base in a systematic manner. ESG now has copies of all data, and has been brought up to date on the status of the various sites. A list of the available data has been compiled, including allowances and corrections for data gaps.

The data reduction and analysis methodology is being developed by concentrating on one site. The lack of availability of computer compatible data types from SERI is limiting this analysis to the data produced daily on paper tape. This data is being manually entered for further data reduction. At the present time total energy consumption, auxiliary energy consumption, and passive contribution are being analyzed as a function of several climatic variables (independently) by means of a least squares regression analysis both first and second order. Scatter plot diagrams with superimposed regression curves are being produced. The programming necessary to develop a multivariate linear regression analysis is well along in its development.

For the next quarter, the multivariate regression analysis method will be implemented. In addition, selected analysis methods developed from the first site will be applied to the other sites where data is adequate.

During the reporting period, data available from the SSEC Homeowner Monitoring Program has been reviewed and assessed, especially in light of new FmHA data. It appears that energy consumption is not well correlated. Therefore, the data analysis is being redirected toward the goal of generating information on the operating characteristics of passive residences, i.e. allowable temperature swings and extremes. In efforts to come, the computerized data base will be brought up to date, the final analysis completed, and a report prepared.

Analysis of Integrated PV Concepts - Results of work in this area are reported in "Analysis of Selected Photovoltaic Systems and Storage Options for Residential Applications in Hot Humid Climates," DOE/CH/10122-3. This document examines the relationship between photovoltaic generated power and its onsite use as a function of total array size for an energy-efficient house in the hot, humid climates of Miami and Houston. The study looks at five system options in an effort to identify applications which are less expensive and rely less on utility sellback. Conclusions and recommendations are presented.

In compliance with contract requirements, six copies of DOE/CH/10122-3 with appropriate forms have been supplied to the Acquisition and Assistance Unit, Chicago Operations Office of DOE. The document was also provided to certain DOE/CE personnel known to be concerned with the subject matter.

2. Domestic Solar Hot Water Performance Monitoring

This task relates to the completion of work begun by SSEC in the Domestic Solar Hot Water Program. ESG will continue and complete work which includes installation of monitoring instrumentation and gathering data under agreements previously made between SSEC and installers and homeowners. ESG will also coordinate with utilities and industry involved in similar programs. A summary of significant efforts during the reporting period follows.

Progress under this task is proceeding according to schedule. During the quarter, significant events took place allowing for continued operation toward overall program goals. Program participation increased with 165 homeowners and 38 installers now actively involved in the program. A 91% response rate continues to reinforce the program procedures for selecting program participants and mode of periodic interaction with the participants by ESG staff.

Technical staff completed the data analysis report during the reporting period. "Analysis of Field Test Data from Domestic Solar Water Heaters in the Southern United States - Period through May 1982", DOE/CH/10122-2, contained performance data and analysis from 103 solar water heaters. The average monitored period for the 103 sites was 6.7 months. Seventy-eight of the sites were located in Florida with the remaining sites located in Alabama, South Carolina, North Carolina, Virginia, Kentucky, and Texas. The data analysis

report consists of numerous data reduction methodologies developed by ESG as a part of the overall program. Using computer programs, data reduction was performed on the gathered data and presented in the report in a form appropriate for analysis.

The analysis was distributed to the installer participants during the third week of July. Positive and constructive responses to the report from the various installers were received soon thereafter reinforcing the methods utilized for data presentation. The report presented the first opportunity for ESG to present proper performance values from the solar water heaters being monitored under the program. This was due mainly to the need for a minimum number of months of gathered data for each site for meaningful analysis.

In compliance with contractual requirements, six copies of DOE/CH/10122-2, with appropriate forms, have been supplied to the Acquisitions and Assistance Unit, Chicago Operations Office of DOE. The document was also provided to certain DOE/CE personnel known to be concerned with the subject matter.

Data gathering continued which included the first site's accumulation of one year of performance data. The first monitored sites in the program began producing data in June, 1981.

As mentioned, computer analysis is being used for data reduction. The "Monthly Summary Report" is one output from the computer data base and is sent to program participants on a quarterly basis. During the first week of August, a "Monthly Summary Report" (MSR) was sent to installer participants for each of their monitored sites, while homeowners received a MSR for their individual site. This report displays to each homeowner their solar water heater performance during their respective reporting period. The MSR was sent to 138 homeowner participants and 38 installer participants.

Activities concerning the screening and the validating of gathered data occurred throughout the reporting period on a scheduled basis. This process requires a daily handling and analysis of the incoming performance data received at ESG from the homeowner participants.

3. Industrial/Commercial Renewable Energy Systems

Under this task ESG will complete assessment of existing simulation models and their applicability to light commercial buildings. In addition, a design guide for commercial applications requiring moderate-temperature hot water systems will be developed based on earlier work at SSEC.

Thermal Mass Analyses - The computer parametric runs for the thermal mass analysis have been examined, and analysis work is well underway. The analysis work is proving more difficult than expected, for the reasons that follow.

Computer runs were made on two houses, using both BLAST 3.0 and DOE 2.1A for each. Initial review of the results indicated that both BLAST and DOE 2 gave the same answers. Upon further investigation, however, it was ascertained that while the gross effects were identical, the detailed effects

were significantly different. For example, while the yearly energy consumption numbers are the same, the zone temperatures and heat transfer rates at any given hour of the year are often different. In order to explain this, line by line comparisons of the two models are being conducted. This means not only what is explicitly in the model, but what is implicit due to program default values. These are being compared not only from parametric run to run, but also from program to program.

It is anticipated that this work will be completed next quarter. Once the analysis currently underway is completed, the thermal mass analysis will be relatively quick and straightforward. The results of this task should not only be a good analysis of the effects of thermal mass, but a comparison of the utility of DOE-2 and BLAST 3.0 for this sort of analysis work on residential buildings.

Design Guide - A design guide has been developed for use by commercial facilities with large hot water demands. The text has been written and a draft produced. Entitled "The Commercial Water Heating Handbook", it has eight chapters and ten appendices with 65 tables and figures. Final editing is 60% complete. This document will be submitted during the next quarter.

4. Industry Reviews and Technology Transfer

Efforts under this task relate to completion of ongoing industry coordination activities initiated by SSEC. These include: holding a technical review meeting to present data from SHW system field test programs; final reporting on the various programs conducted jointly with state and local agencies, and summarizing key technical information activities with professional groups; and technology transfer which includes the follow-up and close-out of industry activities in areas such as biomass fuel use, reliability and maintainability data collection, and technical assessment of selected solar installations. A summary of activities relating to these efforts follows.

Technical Review Meeting - ESG, Inc. convened the Technical Review Meeting on July 14-15, 1982 in Atlanta, Georgia (See Appendix D for agenda). The meeting served as a forum for organizations conducting large scale solar hot water field tests to exchange information on data acquisition, analysis procedures, and test results.

Workshop presentations included reports on field tests conducted by: Bonneville Power Administration; Carolina Power and Light Company; ESG, Inc.; Illinois Power Company; Kansas Power and Light Company; Northern Energy Corporation; Ontario Hydro Division; Oregon Department of Energy; Pacific Gas and Electric Company; Pennsylvania State University; Portland General Electric Company; Public Service of New Mexico; San Diego Gas and Electric Company; and Tennessee Valley Authority. Two organizations conducting field tests, Baltimore Gas and Electric Company and Long Island Lighting Company, were unable to send representatives; however, the data from these field tests were presented by ESG, Inc.

Since presentations covered nearly all the solar hot water field tests being conducted, the meeting achieved its primary purpose of bringing field test practitioners together to exchange experiences and test results. Another objective was to attempt to establish agreement on a methodology to be used in reducing field test data to meaningful parameters. The need for a uniform data reduction methodology was apparent from meeting presentations which highlighted the differences in data reduction methodologies and assumptions used in existing field tests. Prior to the meeting, participants were provided a report entitled "Two Methods for Reducing, Analyzing and Interpreting Solar Water Heater Field Test Data" by William E. Stoney of ESG to serve as a basis for discussing a uniform field test data reduction method. While there was no general consensus on any one methodology, the meeting presentations and discussions made it possible to develop more distinct reduction options.

It should be noted that the level of attention and interest at the meeting indicated a growing interest in the need for a standard technique of hot water system performance field testing. The attendees were exposed to a wide variety of test methods and their pros and cons as seen by the people who had conducted them. By the end of the meeting the issues, while not resolved, were better defined.

A report of the proceedings of the Technical Review Meeting is now being prepared. The report will include papers submitted by the presenters as well as a summary of discussion issues. Also included will be a description of the four methodologies for reducing solar hot water field test data developed as a result of meeting discussions. This document will be submitted during the next quarter.

Programs with State Agencies/Summary of Information Activities - During this reporting period, two documents were readied for submittal as task deliverables. The "Final Report on SSEC Programs Conducted With State Agencies" describes SSEC's State Solar Support Project and documents selected accomplishments and activities. Included is a project overview, detailed review of SSEC project support, training and assistance, and materials provided to state participants. A final section presents a state by state summary of the impact of the project on participating jurisdictions and identifies accomplishments attributed, in part, to the project. A detailed appendix contains illustrative project materials.

The second document developed during this reporting period relating to this task was "Summary of SSEC Information Activities, October 1981-May 1982." This report summarizes technical information activities providing an overview of the inquiry and response process which includes an inquirer profile, procedures for receiving, processing, and recording inquiries; and materials used in responses. A brief analysis of inquiries by subject category is also provided. An appendix lists information products used in responding to technical inquiries.

5. Biomass Field Projects

This task relates to the completion of technical activities initiated by SSEC relating to biomass field projects. ESG will complete certain technical activities for the ethanol plant at Agri-Fuels, Inc. in Tupelo, Mississippi and prepare recommendations for field research and development work related to the gasification system at Starke, Florida.

The work underway related to the Agri-Fuels plant includes a final documentation package on the initial design of the ethanol subsystem which was conducted by the contractor originally hired by Agri-Fuels. This documentation package is intended to provide a record of this activity for future use but will not include all of the related design analysis. Also, documentation will be completed of the limited economic analysis which was made by SSEC. It should be noted that as a result of final assesment of both the initial design and various economic analyses, it was concluded that plans for the construction of the plant should be revised considerably.

This resulted in a scaled-down approach for the project and the submittal of a revised grant proposal by Agri-Fuels, Inc. In the revised project, a multi-fuel boiler may be used as part of the energy system rather than a methane generation system. This permits a more favorable economic situation and avoids problems with the supply of manure feedstock which had become apparent. ESG is not, at this time, responsible for further grant technical monitoring and is limiting its activities to information exchange and some minor assistance to Agri-Fuels, Inc.

Work on the wood gasification system originally intended for use at the City of Starke, Florida has been brought to a conclusion insofar as the City of Starke and Gulf Wood Energy are concerned. ESG is reviewing the test data accumulated in the May-June time period in an effort to prepare a report on the supporting test activity which took place at the Gulf Wood Energy plant in Dunnellon. Efforts were also made to provide available information to both the Project Manager for the City of Starke and his subcontractor, the University of Florida, to assure that an adequate final report is obtained from the grantee.

B. TECHNICAL SERVICES RELATED TO THE APPROPRIATE TECHNOLOGY SMALL GRANTS PROGRAM

This effort relates to supporting the conduct of the Midwest Appropriate Technology Small Grants Program as administered by the DOE Chicago Operations Office. This involves three tasks: (I) Management Analysis and Technical Evaluation of Completed Projects; (II) Monitoring and Technical Assistance for ongoing projects; and (III) Technical Information Dissemination.

Task I involves the technical evaluation and summarization of up to 80 completed projects. In addition, it provides for management analysis of the success and failure rates of these projects. During the reporting period, several activities took place in the accomplishment of this task.

Basic information files were developed which relate to the range of applications and technologies to be reviewed. These files are intended to support the technical review process. Technical staff were briefed on the review approach and guidelines developed for inputs to the one page summaries. Management controls were installed to insure timely and thorough review of assigned project reports.

Inquiries to DOE regarding the project files indicated some potential concerns over information labeled as proprietary in the reports. Following resolution of this matter, 37 project files were received by ESG. Preliminary reviews were conducted by a screening committee and technical reviewers were assigned. At the close of the reporting period, technical evaluation is 60% complete for the project reports in ESG possession. It is noted that ESG has yet to receive the remaining 43 project files for the completion of Task I.

Task II involves the monitoring of 30 ongoing projects including quarterly telecons with the grantees and one site visit. In addition, Task II provides for technical assistance for up to six grantees. During the reporting period, there was no activity towards accomplishment of this task. Monitoring cannot begin until DOE identifies the projects to be monitored.

Task III is the dissemination of technical information on Task I projects identified by ESG and selected by DOE as having "significant technical value and promise for commercialization." The information dissemination activities involve the development and execution of information dissemination plans through trade organizations and target audiences chosen by DOE.

Although all project files have not been received for Task I completion, preliminary work has commenced on developing criteria for identifying projects with technical significance and commercial value. Draft information dissemination plan outlines have been developed and include such items as potential audience, transfer product, mechanism and schedule.

3.0 DISCUSSION AND SPECIAL REMARKS

In general, satisfactory progress is being made considering the effort which has been expended during the reporting period. It should be noted that approximately 2.5 man years was expended.

Roughly 25% of the time of Mr. E. Ray Dunn, who is listed as the principle investigator, was devoted to the contract during the period. Mr. Dunn serves as the overall manager for ESG and coordinates the effort in-house. It is expected that Mr. Dunn will spend 75% of his time on the contract during the next quarter. Also, the overall level of effort will increase substantially since personnel are now being freed from other work.

There are no urgent problems; however, there is continuing concern that ESG, Inc. have not received all of the information needed from DOE regarding the Appropriate Technology Small Grants Program. A renewed effort will be made to obtain the remaining information, including travel to Chicago should this be necessary to facilitate the needed information exchange.

APPENDIX A
LISTING OF DOCUMENTS

Jone, William M., and Jacobs, Ronald A., Analysis of Field Test Data From Domestic Solar Water Heaters in the Southern United States - Period Through May 1982. Atlanta: Energy Systems Group, ESG, Inc. (1982).

Lau, Andrew S., Hill, John M. and Ball, David E., Analysis of Selected Photovoltaic Systems and Storage Options for Residential Applications in Hot Humid Climates. Atlanta: Energy Systems Group, ESG, Inc. (1982).

APPENDIX B
FIGURES RELATED TO COOLING LOADS IMPACT STUDY TEXT

Figure 1
ESTIMATION VS. TNODE SIMULATION
USING COOLING DEGREE-HOURS

Figure 2
ESTIMATION VS. TNODE SIMULATION
USING COOLING DEGREE-DAYS

APPENDIX C

FIGURES RELATED TO DESIGN TOOL DEVELOPMENT TEXT

Figure 1
SUNSPACE SYSTEM B7

Figure 2
DIRECT GAIN SYSTEM A2
LANL AND FCHART/SLR CORRELATIONS

Figure 3
WATER WALL SYSTEM B3

Figure 4
VENTED TROMBE WALL SYSTEM D3

Figure 5
UNVENTED TROMBE WALL SYSTEM F1

Figure 6

COMPARISON OF SHADING ALGORITHMS

Latitude=45 Infinite Extension

Figure 7 COMPARISON OF SHADING ALGORITHMS

Latitude=35 Infinite Extension

Utzinger and Klein

ALBUQUERQUE, NM TROMBE WALL

LANL VOL 3 ———

FCHART/SLR - - -

Figure 8

SEATTLE, WA WATER WALL

LANL VOL. 3 ———

FCHART/SLR - - -

Figure 9

BISMARCK, ND
TROMBE WALL

LANL VOL. 3 ———

FCHART/SLR — — —

Figure 10

ALBUQUERQUE, NM
SUNSPACE

LANL VOL. 3 ———

FCHART/SLR - - -

Figure 11

SEATTLE, WA DIRECT GAIN

LANL VOL. 3 ———

FCHART/SLR - - -

Figure 12

APPENDIX D
AGENDA FROM TECHNICAL REVIEW MEETING

SOLAR HOT WATER FIELD TEST TECHNICAL REVIEW MEETING

July 14-15, 1982
Atlanta Hilton Hotel
Atlanta, Georgia

AGENDA

Wednesday, July 14

Embassy Room

8:15 a.m.	Registration	
8:30 a.m.	Welcome and Introduction Mr. William E. Stoney	
8:45 a.m.	MEASUREMENT AND DATA REDUCTION TECHNIQUES - <i>A series of presentations with emphasis on data analysis methodologies.</i> Mr. Rob Taylor, San Diego Gas & Electric Company Ms. Pam McKeever, Public Service of New Mexico Mr. Maier Perlman, Ontario Hydro Division	
10:15 a.m.	Break	
10:30 a.m.	MEASUREMENT AND DATA REDUCTION TECHNIQUES (continued) Mr. Harry Rand, Illinois Power Company Mr. Robert L. Royster, Carolina Power & Light Company	
12:00 noon	Luncheon <i>Useful Applications for SHW Monitoring Data</i> Mr. Fran Wessling, Tennessee Valley Authority	State Club Room
2:00 p.m.	MEASUREMENT AND DATA REDUCTION TECHNIQUES (continued) Mr. Marvin Stacken, Kansas Power & Light Company Mr. Tom White, Bonneville Power Administration	
3:15 p.m.	Break	
3:30 p.m.	STATISTICAL RESULTS OF DATA COLLECTION EFFORTS - <i>Presentations emphasizing the comparison of field test data with computer modeling and laboratory tests.</i> Mr. Steve Baker, Consultant for Oregon Dept. of Energy Mr. Tom Burnett, Portland General Electric Company Mr. William M. Jones & Andrew S. Lau, Energy Systems Group of ESG, Inc.	
5:30 p.m.	Reception	State Club Room

Thursday, July 15

Embassy Room

8:30 a.m.

DESIGN IMPLICATIONS OF FIELD TEST DATA - *Presentations using field test results to analyze the effects of major design elements on system performance.*

Mr. Greg Askew, Tennessee Valley Authority

Dr. William K. Aungst, Pennsylvania State University

10:15 a.m.

Break

10:30 a.m.

RELIABILITY AND MAINTAINABILITY - *Data on the field reliability and maintainability of solar hot water systems.*

Mr. Jonathan Costa, Pacific Gas and Electric Company

Mr. Ron Jacobs, Energy Systems Group of ESG, Inc.

Mr. David Odegard, Northern Energy Corporation

12:00 noon

Lunch

1:15 p.m.

DISCUSSION OF "STANDARD" DATA REDUCTION METHODOLOGY - *Comparison of field test data results and discussion of a consensus approach to data reduction and analysis.*

Mr. William E. Stoney, Discussion Leader

3:00 p.m.

Adjourn

Sponsored by the U. S. Department of Energy, Office of Conservation and Renewable Energy.