

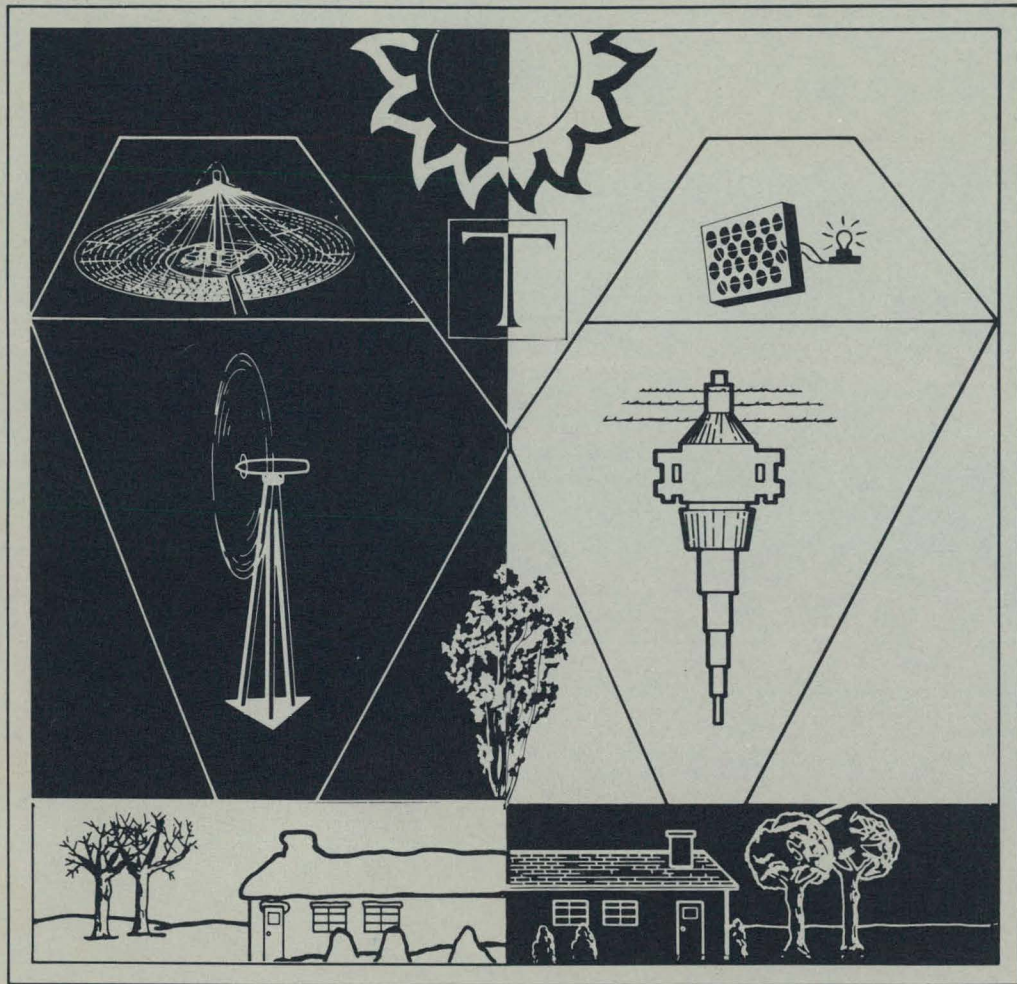
DOE/ET-0020/1

# ENVIRONMENTAL AND RESOURCE ASSESSMENT PROGRAM

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UC-59, 62, 63a  
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**PROGRAM  
SUMMARY  
JANUARY  
1978**



DIVISION OF SOLAR TECHNOLOGY  
WASHINGTON, D.C. 20545

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**U.S. DEPARTMENT OF ENERGY**

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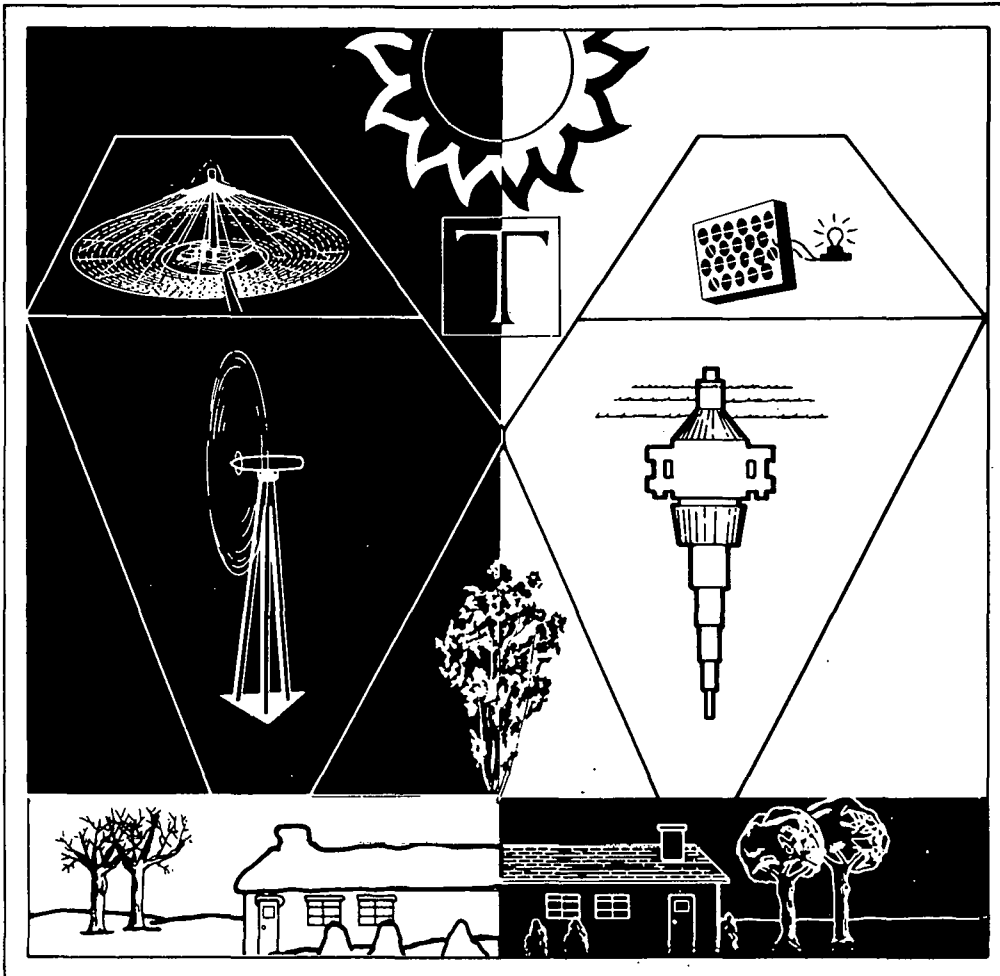
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# ENVIRONMENTAL AND RESOURCE ASSESSMENT PROGRAM

DOE/ET-0020/1  
UC-59, 62, 63a

## PROGRAM SUMMARY JANUARY 1978



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# Preface

On October 26, 1974, the Solar Energy Research Development and Demonstration Act (Public Law 93-473) was signed into law, authorizing a vigorous Federal program of research, development and demonstration. Its goal was to provide the nation with the option of using solar energy as a viable source for meeting future energy requirements. In response to the mandates of this act, major efforts were conducted within the Division of Solar Energy of the Energy Research and Development Administration (ERDA) to work with industry to develop and introduce, at the earliest possible date, economically competitive and environmentally acceptable solar energy systems.

These responsibilities were transferred to the new U.S. Department of Energy (DOE) on October 1, 1977. ERDA's Division of Solar Energy (SOLAR) was simultaneously reorganized into two distinct organizational components:

- The Division of Solar Technology (SOLAR/ET), which functions as a part of the Office of the Assistant Secretary for Energy Technology.
- The Division of Solar Applications (SOLAR/CS), which functions as a part of the Office of the Assistant Secretary for Conservation and Solar Applications.

As a result of this reorganization, the Solar Heating and Cooling Program, and the Technology Transfer Program, were transferred into SOLAR/CS. An overview of the current DOE organization is shown in Figure 1.

Program planning continues under the guidelines established by PL 93-473 and by three other legislative acts passed by the 93rd Congress: the Solar Heating and Cooling Demonstration Act of 1974 (PL 93-409), the Energy Reorganization Act of 1974 (PL 93-438), the Federal Nonnuclear Energy Research and Development Act of

1974 (PL 93-577). Together these four laws grant DOE and other Federal agencies the authority to pursue a research program aimed at effective solar energy use. Under this authority, SOLAR/CS and SOLAR/ET will work to promote a fully coordinated solar energy program and to complement efforts in the private sector to develop solar energy resources.

The major programs and subprograms of the Solar Energy Program during 1977 were:

- a. Solar Electric Systems
  - (1) Wind Energy Conversion.
  - (2) Photovoltaic Energy Conversion.
  - (3) Solar Thermal Electric Conversion.
  - (4) Ocean Thermal Energy Conversion (OTEC).
  - (5) Solar Satellite Power Systems.
- b. Fuels from Biomass
  - (1) Production and Collection of Biomass.
  - (2) Conversion of Biomass.
- c. Technology Support and Utilization
  - (1) Technology Transfer.
  - (2) Environmental and Resource Assessment.
- d. Solar Heating and Cooling
  - (1) Barriers and Incentives.
  - (2) Demonstration.
  - (3) Research and Development.
  - (4) Agricultural and Industrial Process Heat.

A Program Summary is issued for each program annually. It is an overview of the ongoing research, development, and demonstration efforts of the preceding fiscal year. This Program Summary describes each of the Environmental and Resource Assessment projects funded during FY 1977. (October 1, 1976 through September 30, 1977.) The accomplishments of the Environmental and Resource Assessment (ERAB) Program are highlighted and plans for continued activities in this technology area are included.

# DEPARTMENT OF ENERGY

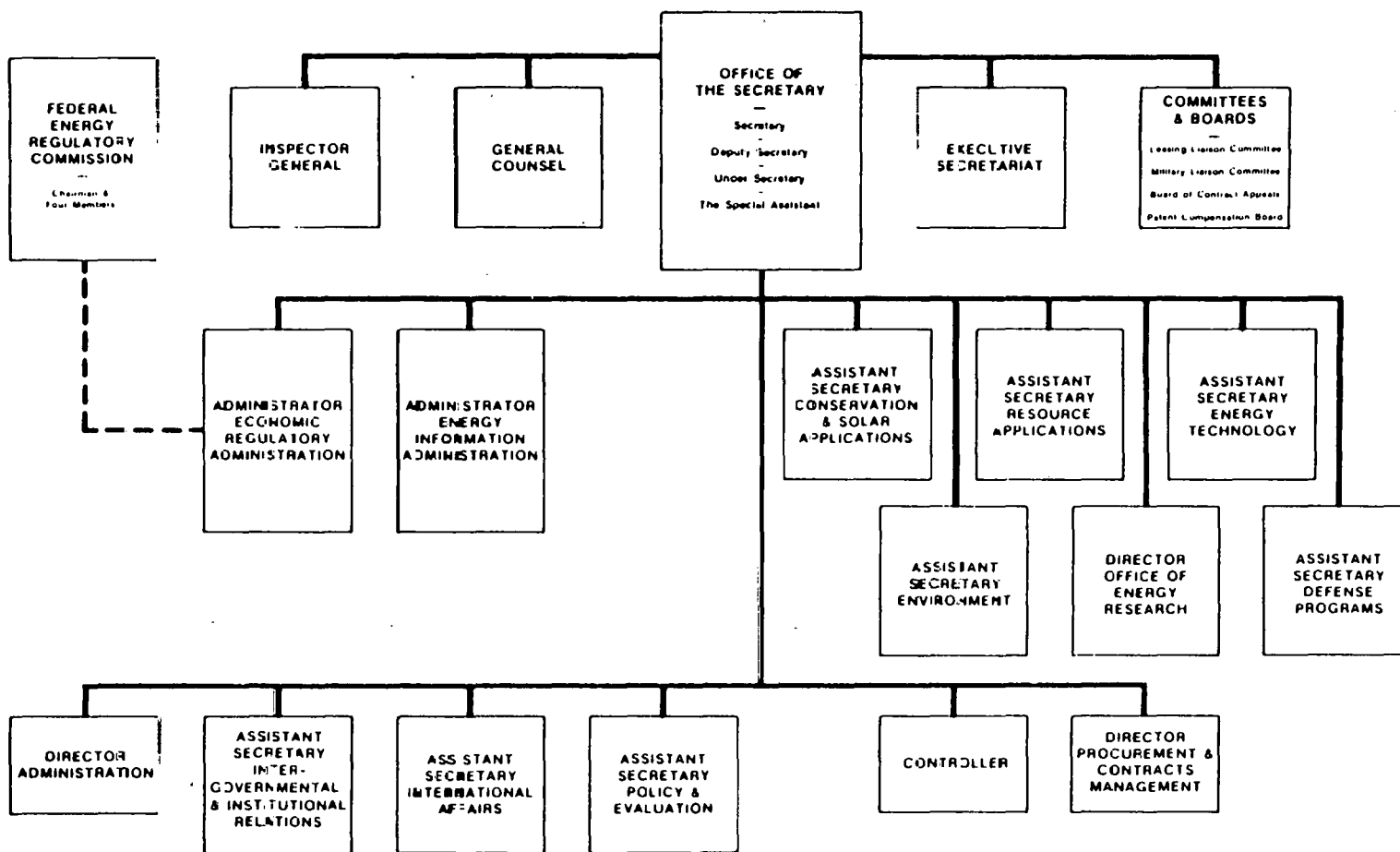


FIGURE 1. DOE Organization Overview.

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# Introduction

## The Environmental and Resource Assessment Program

The Department of Energy (DOE) has established a program in Environmental and Resource Assessment (ERA) that embodies the planning, funding and management of projects directed toward accomplishing the following goals:

- Ensuring that the widespread implementation of solar technologies\* will protect and enhance the nation's environmental quality.
- Identifying and evaluating possible indirect or unintended effects on society of solar technologies early in the decision making process so that negative effects may be mitigated.
- Collecting, processing, certifying and archiving geophysical data (insolation, wind, ocean thermal gradients, wave, etc.) required to develop and design solar systems.
- Determining the material resources required for the development of solar technologies and the implications of dedicating such resources to that development.

## Mission

To achieve the ERA Program goals, studies and research projects are conducted in four program elements:

1. **Environmental Assessment.** The National Environmental Policy Act of 1969 (NEPA) implemented by Executive Order on March 5, 1970, and the guidelines of the Council on Environmental Quality of August 1, 1973, require that all agencies of the Federal Government prepare detailed environmental statements on major Federal actions significantly affecting the quality of the human environment. The objective of NEPA is to build into the Federal agency decision-making process, at the earliest possible point, an appropriate and careful consideration of all environmental aspects of a proposed action in order that adverse environmental effects may be avoided or minimized.
2. **Technology Assessment.** The Solar Energy Research, Development and Demonstration Act of 1974

(P.L. 93-473), Paragraph 6.(6)(3) requires DOE to "perform or cause to be performed technology assessments relevant to the utilization of solar energy."

Technology Assessments (TA) are studies directed toward identifying unintended effects on society of the introduction or development of a new technology. These effects must be identified as early in the decision making process as possible so that their impacts may be evaluated by all those concerned.

3. **Resource Assessment.** The Resource Assessment activities employ the existing capabilities of the National Oceanic and Atmospheric Administration (NOAA) supplemented by public and private agencies to collect, analyze, record, and disseminate solar radiation, wind, cloud, ocean and other meteorological information. As user data requirements are determined, existing data sources are evaluated and selected data compiled in useful formats. Data shortfalls are identified, and methods for standardizing the collection and reporting of data are implemented. These data and information are made available to all interested parties.

4. **Material Assessment.** Material Assessment encompasses the identification of those raw materials and/or processes which may be critical to the development and large scale implementation of solar energy technology.

## Organization and Program Participation

The Environmental and Resource Assessment Branch of DOE's Division of Solar Technology provides centralized management of the ERA Program to take advantage of the interdependences of the four program elements and to eliminate duplication. This branch formulates program objectives and develops plans to achieve program goals. Management of the ERA Program includes coordinating the activities of DOE participants with the activities of other Federal agencies, state and local governments, universities, private industry, the public, and international groups.

ERA program tasks and projects are accomplished through contracts and cooperation with other government agencies, industry, universities, and individuals.

\* Solar Heating and Cooling of Buildings, Agricultural and Industrial Process Heat, Photovoltaics, Thermal Power Systems, Wind Conversion Systems, Ocean Systems and Biomass.

# Resource Assessment

Successful research and development of solar energy systems requires the accurate assessment of the energy source. Resource assessment thus provides the geophysical data required by the various solar energy technologies. This geophysical data includes all possible sources of energy such as:

- Insolation
- Wind
- Ocean Thermal Gradients
- Ocean Waves
- Ocean Currents
- Salinity Gradients

Although much is known about these energy sources, past data has not necessarily been collected with an energy application in mind. The resource assessment program must collect, standardize, certify, process, and archive geophysical data for solar energy applications.

## Solar Radiation

The solar radiation that arrives at the earth's surface is a combination of direct beam and diffuse radiation. This combination is referred to as global solar radiation. As shown in Figure 2, a portion of incoming solar radiation is scattered as it strikes the various elements that form the earth's atmosphere. This scattering produces diffuse radiation.

## Insolation Data Requirements

If systems are to be designed for converting the sun's energy to man's use, the properties of that energy must be measured and the results placed in usable formats.

The principal solar parameters to be measured to support solar RD and D are global, direct, diffuse, and total radiation on an inclined surface. The most widely measured of these solar parameters is global radiation. Measurement of the spectral distribution of solar radiation is also important to several solar technologies such as photovoltaics and fuels from biomass.

## Status

During fiscal year 1977 the DOE/NOAA solar insolation national network of 35 sites became operational and was expanded to 38 sites with the addition of stations in Hawaii, Puerto Rico and Guam. Eight universities located in different climatological regions were awarded grants to establish Solar Energy Meteorological Research and Training sites. This combined work is depicted on Figure 3.

A model by which meteorological data may be used to generate insolation data has been developed and verified. This model has generated data for 200 sites within the United States, thereby greatly expanding the nation's insolation

data base. Model verification data span a 75 year historical period.

All insolation and related meteorological data will be archived in a standard computer format known as SOLMET for maximum dissemination. (Figure 4).

Microclimatic studies of possible insolation data differences for urban/rural, mountain/valley and coastal/inland areas have been initiated. Statistical analyses were begun to improve forecasting of solar insolation data and to design a standard or average year for use in analysis of solar collector systems. Meetings have been held with state, regional and industrial technical representatives to share information and help develop regional data of high quality.

## Future

The DOE/NOAA insolation network will be expanded to collect the direct insolation data needed for analysis and design of concentrating solar collectors. A key activity underway will develop methods to package and disseminate solar radiation data to different users based upon their needs.

## Ocean Thermal Gradients

In support of Ocean Thermal Energy Conversion (OTEC) and other ocean energy applications, ERAB funds programs in physical and biological-ecological oceanographic data acquisition, develops measurement and monitoring strategies required for thermal resource assessment, siting and plant design and develops environmental impact assessments/statements.

The OTEC technology is unique in that it will be located in deep tropical ocean waters and will exploit the ocean as a natural solar radiation collector and storage medium. The data base required is primarily ocean thermal difference data, but also includes physical circulation, air/sea interaction, chemical and biological parameters. The latter are required to analyze the thermal resource perturbations and set guidelines on siting, design and monitoring strategies as well as provide information for the environmental assessment process.

Data from eight projects conducted through FY 1977 provided preliminary assessment of the thermal resource potential throughout the Gulf of Mexico and in the immediate vicinity of Hawaii and Puerto Rico (Figure 5). Field observation programs acquiring thermal, current, meteorological, chemical and biological oceanographic data were initiated at sites near St. Croix, United States Virgin Islands, and off Mobile-New Orleans in the Gulf of Mexico. Comprehensive site characterizations from archival data for sites of U.S. interest were also initiated. Finally, three projects concerning the oceanographic data requirements for OTEC siting and design specifications were undertaken.

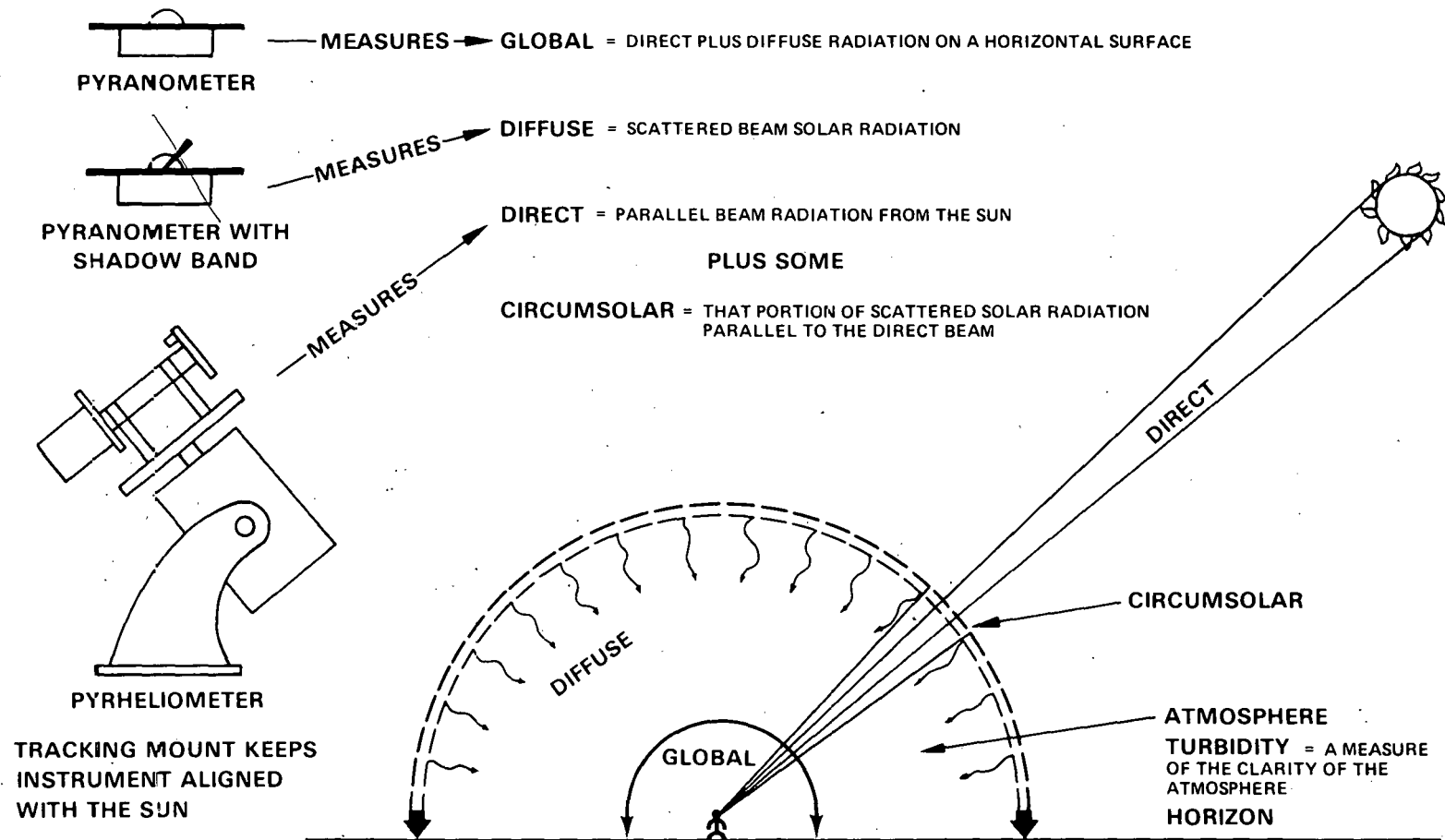


FIGURE 2. *Types of Insolation and Measurements Instruments.*

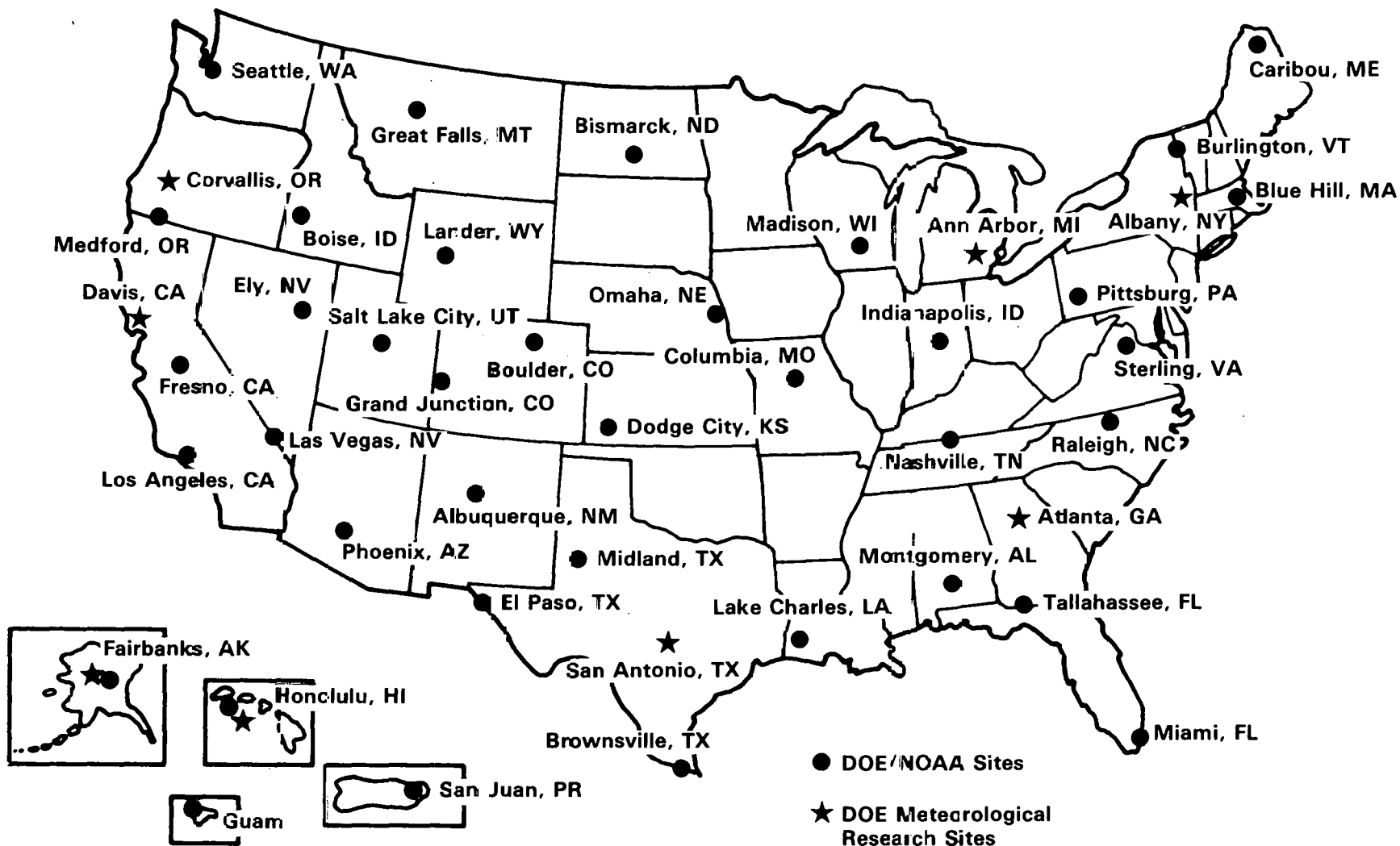


FIGURE 3. DOE/NOAA 38 Solar Radiation Monitoring Network and DOE 8 Solar Energy Meteorological Research and Training Sites.

IDENTIFICATION							SOLAR RADIATION OBSERVATION										
TAPE DECK #	WBAN STN #	SOLAR TIME				LST TIME	ETR KJ/m <sup>2</sup>	RADIATION VALUES KJ/m <sup>2</sup>								SUNSHINE MIN	
		YR	MO	DAY	HRMN			DIRECT	DIFUSE	NET	TILT	GLOBAL			A		B
9724	XXXXX	XX	XX	XX	XXXX	XXXX	XXXX	1XXXX	1XXXX	1XXXX	1XXXX	1XXXX	1XXXX	1XXXX	1XXXX	1XXXX	XX
FIELD NUMBER	001	002	003			004	101	102	103	104	105	106	107	108	109	110	111

SURFACE METEOROLOGICAL OBSERVATION																					
OBSERVING TIME	CEILING	SKY COND	VSBY hm	WEATHER	PRESSURE kPa		TEMP °C		WIND		CLOUDS								SNOW COVER		
					SEA LEVEL	STA-TION	DRY BULB	DEW-PT.	DIRECTION	SPEED	TOTAL	LOWEST	SECOND		THIRD	FOURTH					
	dam																				
XX	XXXX	1XXXX	XXXX	XXXXXXXX	XXXXX	XXXXX	XXXX	XXXX	XXX	XXXX	XX	XX	XX	XXXX	XX	XX	XXXX	XX	XX	XXXX	XX
201	202	203	204	205	206	207	208	209												210	

TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT
001	001 - 004	TAPE DECK NUMBER
002	005 - 009	WBAN STATION NUMBER
003	010 - 019	SOLAR TIME (YR, MO, DAY, HOUR, MINUTE)
004	020 - 023	LOCAL STANDARD TIME (HR AND MINUTE)
101	024 - 027	EXTRATERRESTRIAL RADIATION
102	028 - 032	DIRECT RADIATION
103	033 - 037	DIFFUSE RADIATION
104	038 - 042	NET RADIATION
105	043 - 047	GLOBAL RADIATION ON A TILTED SURFACE
106	048 - 052	GLOBAL RADIATION ON A HORIZONTAL SURFACE - OBSERVED DATA
107	053 - 057	GLOBAL RADIATION ON A HORIZONTAL SURFACE - ENGINEERING CORRECTED DATA
108	058 - 062	GLOBAL RADIATION ON A HORIZONTAL SURFACE - STANDARD YEAR CORRECTED DATA
109, 110	063 - 072	ADDITIONAL RADIATION MEASUREMENTS
111	073 - 074	MINUTES OF SUNSHINE
201	075 - 076	TIME OF COLLATERAL SURFACE OBSERVATION (LST)
202	077 - 080	CEILING HEIGHT (DEKAMETERS)
203	081 - 085	SKY CONDITION
204	086 - 089	VISIBILITY (HECTOMETERS)
205	090 - 097	WEATHER
206	098 - 107	PRESSURE (KILOPASCALS)
207	108 - 115	TEMPERATURE (DEGREES CELSIUS TO TENTHS)
208	116 - 122	WIND (SPEED IN METERS PER SECOND)
209	123 - 162	CLOUDS
210	163	SNOW COVER INDICATOR

FIGURE 4. Computer Format for Hourly Solar Radiation Data and Other Meteorological Data.

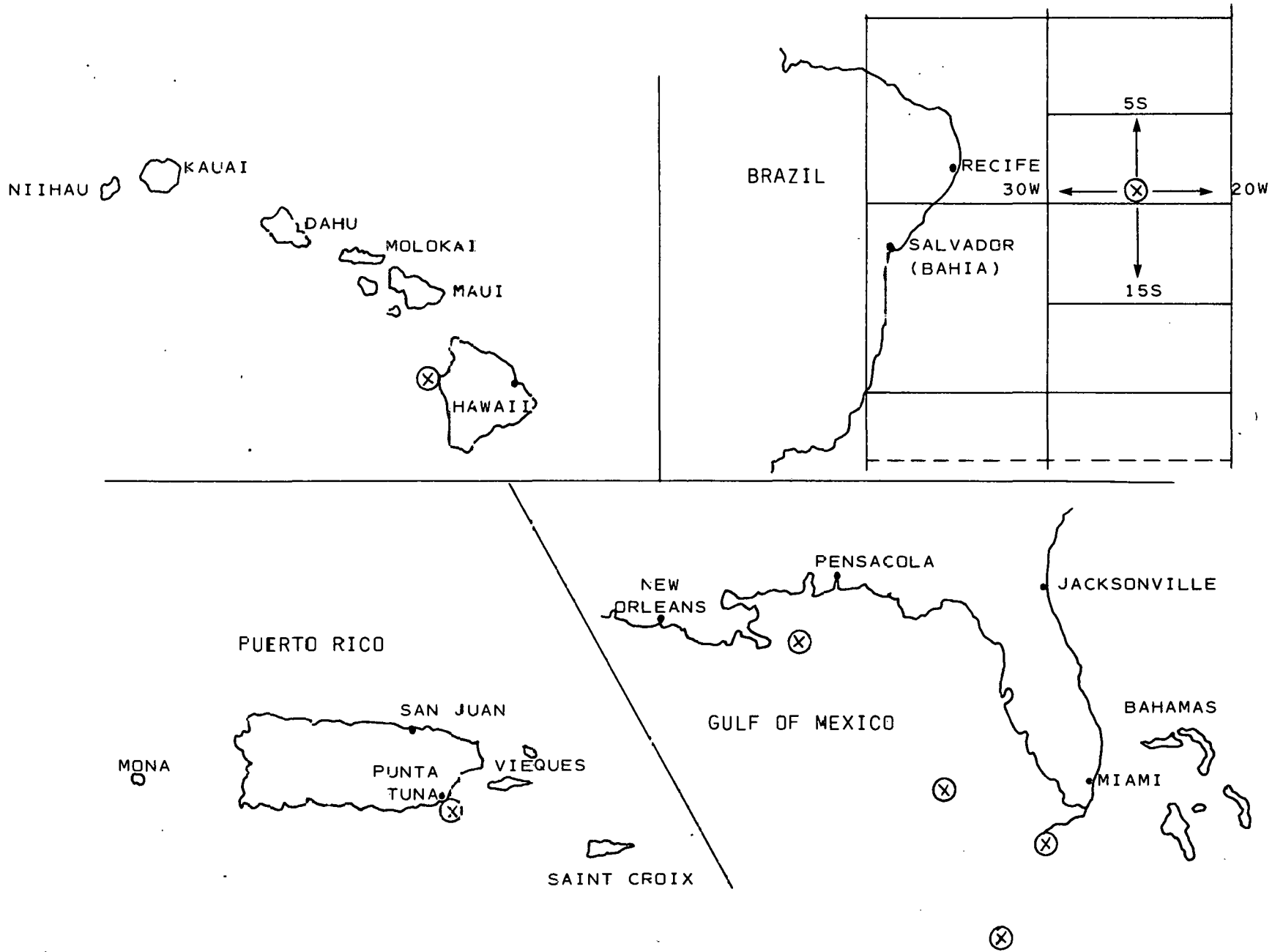


FIGURE 5. General Site Location Map.

Archival data and recently acquired measurement information is entered into the NOAA National Oceanographic Data Center (NODC) in standard format and is being made available to both OTEC participants and NODC Users.

An Environment and Resource Assessment Workshop was held in June, 1977 to define future activities and focus on required measurements. The results of this public workshop are available.(26)\*

## Future

The plan for OTEC resource and siting programs for FY 78 includes the following five major projects:

- OTEC Thermal Resource Study
- Sea Surface Satellite Data
- Physical Oceanographic Measurements-all sites
- Biological-Chemical Oceanographic Measurements-all sites
- Ocean Currents-Waves Interaction Study

Data from these programs will be made available through NOAA/NODC in standard formats to OTEC participants. It is anticipated that measurement programs at OTEC sites will continue into FY 79/80 and that monitoring activities will be undertaken for OTEC test and demonstration projects through the 1980's.

In addition, a project addressing the resource data for wave energy extraction systems will be initiated in FY 1978.

## Wind

Wind velocity and direction as well as frequency and duration is vital in designing and siting of wind conversion systems. Both global and site specific data are required.

## Status

The ERA projects related to this solar technology support extensive data collection and modelling activities of the Wind Energy Conversion System (WECS) Branch (See WECS Program Summary). Specifically, a statistical analysis of the frequency, duration and velocity of wind as related to solar insolation occurrence has been started. This analysis will use NOAA data from 26 sites for time periods of 25 years.

An inventory of all wind data in NOAA archives is also being conducted.

## Environmental Assessment

An important goal of all solar energy Research, Development, and Demonstration (RD and D) is the protection and enhancement of the Nation's environmental quality,

and the protection of the public's health and safety. Solar energy is a relatively clean source of energy; however, there will be some environmental, health, and safety impacts associated with each solar energy technology. It is the purpose of the Environmental program to identify potential environmental effects, both positive and negative, which may accompany the development, implementation and operation of the various solar technology systems and to recommend mitigation strategies.

Any major act by mankind modifies nature's existing balance. The ultimate selection of energy technology alternatives will be tempered by the need to minimize adverse impacts and maximize the relative societal benefits of the various choices. It is essential, therefore, to gather and distribute accurate environmental data to support decision making processes.

## Statutory Requirements

The National Environmental Policy Act of 1969 (NEPA) formalizes the public's desire to prevent damage to the environment, to protect and improve the public health and welfare, and to promote greater understanding of ecological systems. NEPA requires that for all major Federal actions which may significantly effect the environment, a public Environmental Impact Statement must be issued. Environmental Impact Statements are discussed in more detail later.

Implementation of NEPA, and other laws such as the Non-nuclear Energy Research and Development Act of 1974, the Clean Air Act, the Noise Control Act, and the Federal Water Pollution Control Act, requires certain actions and prescribes procedures for assuring that environmental factors are fully considered. In the development of solar energy technology, the Environmental and Resource Assessment program is designed to respond to both the letter and spirit of these requirements.

The environmental assessment program activities are designed to carry out research toward environmental acceptability of solar options. The process chosen to accomplish this goal is depicted in Figure 6. This figure shows two paths; one assuring that NEPA requirements are met and the other that research and analysis of identified environmental effects are accomplished in a timely manner.

Program Assessments/Environmental Factors have been prepared identifying potential environmental concerns for each of the solar technologies (17). Working with these assessments, Environmental Development Plans (EDPs) have been created linking the planned RD and D activities of each solar technology to environmental effects research previously identified (16). From these activities explicit multi-year Environment Research Programs are being designed. The EDP's reflecting both technology RD

\* Refers to Bibliography.

**Environmental  
Health & Safety Issues**

**NEPA  
Legislative Requirements**

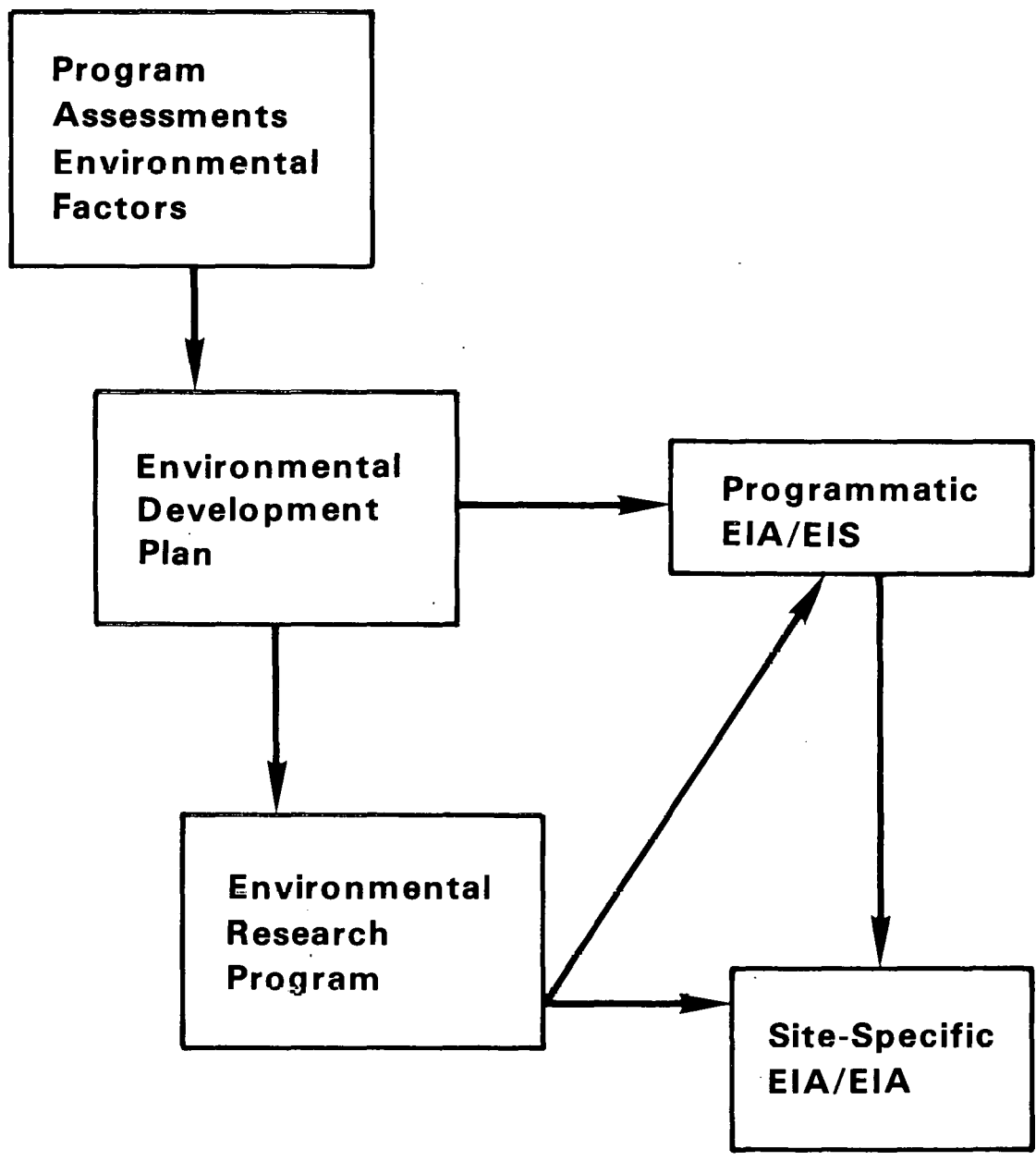


FIGURE 6. *The Environmental Assessment Process.*



and D activities and environmental concerns, act as a direct input to programmatic Environmental Impact Assessments. The Programmatic Environmental Impact Assessments (EIA) will serve as a data base and concept definition foundation for required Site Specific EIA's/EIS's.

The two paths described are mutually reinforcing in that the NEPA legislative requirements for performing EIS's will be enhanced by current environmental effects research, and in turn the programmatic EIA's will help ensure that necessary research and analysis are carried out in a timely manner.

## Status

Program Assessments/Environmental Factors were published for each solar technology in March 1977. EDP's have been completed and will soon be published. A Programmatic EIS is in final draft review for solar heating and cooling. Significant environmental research was done in support of the Solar Heating and Cooling of Buildings Program. Major projects have been initiated to quantify the health, safety, and ecological concerns associated with the heat transfer and storage materials used in the solar heating and cooling demonstration program. A major result of this work was a set of draft standards for the selection, storage, use, transportation, and ultimate disposal of working fluids.

An effort was initiated to provide understanding of the effects of solar electric systems on the desert ecology. This analysis will provide a methodology and identify variables to be characterized in subsequent ecological monitoring at solar thermal and photovoltaic sites.

For OTEC, significant efforts included the near, intermediate and far-field physical climatic impacts modeling of OTEC discharges. Biological-ecological impact studies were initiated.

## Future

Figure 7 lists by technology key environmental issues which will be included in ERAB environmental research programs for FY 1978-FY 1980. Programmatic EIA's for Agricultural and Industrial Process Heat, Biomass, OTEC and Photovoltaic are planned for FY 1978 to be followed in FY 1979 by PEIA's for Wind Energy Systems and Solar Thermal Power Systems. (It should be noted that site-specific EIA's and/or EDS's for a number of Wind Systems and the 10 megawatt Solar Thermal Pilot Plant system are being reviewed.)

## Technology Assessments

For some time there has been a growing concern about the general impact of technology on our society. Citizens have become concerned that technologies which attempt

to satisfy demands for the amenities of advanced society are responsible in many cases for unintended social problems. Technology Assessment (TA) has evolved from this social concern.

Technology assessments are policy studies aimed at identifying and evaluating the long-term, unintended effects of technological development upon society. These effects include, but are not limited to, legal, institutional political, lifestyle and socioeconomic impacts.

## Status

In FY 1977 ERAB published "Solar Energy in America's Future, A Preliminary Assessment" (42) which examined the social and environmental consequences of different potential national energy futures including scenarios for enhanced solar and conversion. Based upon review and analysis of this and other technology assessment activities it became apparent that further TA activities should focus at the state and local level. Further, it was recognized that an attempt should be made to identify potential social impacts of various decentralized solar technologies.

One day workshops were held with local citizens in Durham, NH; Amherst, MA and Eugene OR to examine local social and environmental effects of decentralized solar systems and to test a method to involve the public in the assessment process. A cooperative effort was carried out with the state of Oklahoma to develop a process for state level solar assessment. A comprehensive study was undertaken by George Washington University to examine the social consequences of the use of decentralized solar systems. The first volume of this study (14) describes the methods and purposes of technology assessment and discusses its applicability to energy policymaking. The second volume (8) uses a matrix of social indicators to identify and describe the principal social impacts of small scale solar systems, including wind systems, photovoltaics, solar hot water, solar heating and biomass wood stoves. This study will be available in 1978.

## Future

A program plan has been developed for community level technology assessment of decentralized solar systems. The program will assess, on the community level, the social feasibility and likely social consequences of widespread adoption of decentralized solar systems. Further it will establish methods by which communities can plan for and assess their own solar futures. The program includes the development of prototypical solar scenarios for urban, rural and suburban localities, and the commissioning of task teams in representative communities to work with local citizens in the assessment of energy futures. It also contains provisions to examine current social trends of relevance to the development of solar energy. Public attitudes and values with respect to energy development and

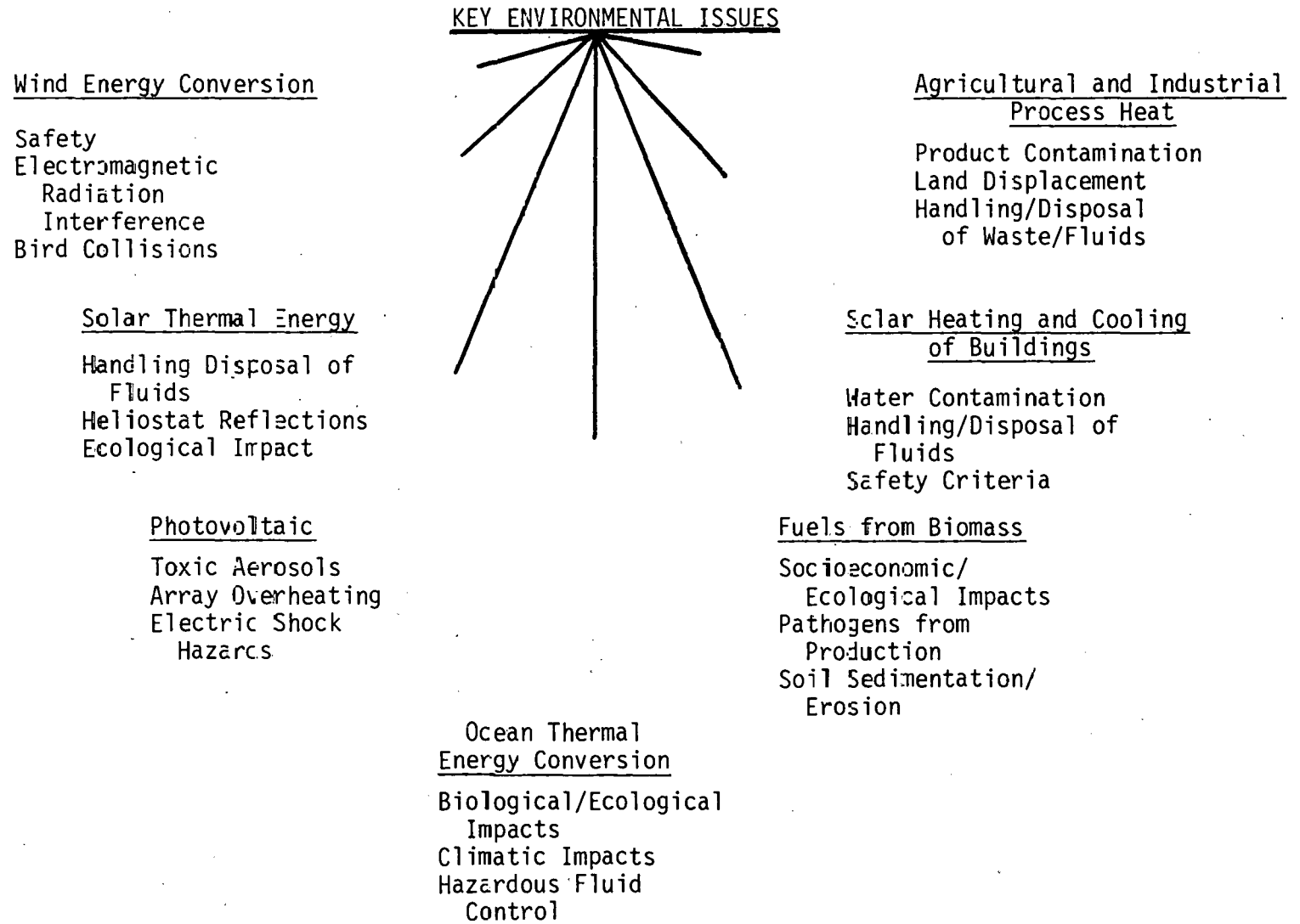


FIGURE 7. Key Environmental Issues Associated with Each of the Solar Technologies.

the social cost of different energy supply systems will be studied.

## Materials Assessment

The development and commercialization of solar energy systems will require the dedication of natural resources and corresponding manufacturing processes in quantities which may represent significant portions of known reserves and production capacities. Forecasts of the impact of solar energy technology on resources such as copper, aluminum, and gallium are required so that energy RD and D efforts do not pursue technologies which will prove impractical for commercialization. Methodologies are required to assess:

- Criticality of materials to the implementation of solar energy technology
- Criticality of material manufacturing processes to the implementation of solar energy technology
- U.S. material resources availability
- U.S. material resource reserves
- World material resources availability
- World material resource reserves
- Alternate materials and material manufacturing processes.

### Status

The Environmental and Resource Assessment Branch has developed a methodology for identifying potential mate-

rial constraints that may hinder the implementation of solar energy technologies. The methodology involves selecting reference solar designs that are representative of specific solar energy technologies and delineating the total materials required to construct the number of systems estimated from market penetration scenarios. Total materials requirements are estimated for the time frame from the present until the year 2000. The methodology then compares these material requirements with projection of materials requirements for non-solar applications. An interactive computer program provides a screening of materials that may have potential availability problems.

The materials cycle shown in Figure 8 provides the basis for the material assessment methodology. The methodology has been tested using two photovoltaic systems, a total of twelve systems from both the Agricultural and Industrial Process Heat program as well as 13 types of photovoltaic cells.

This methodology permits early warnings of a material which may become critical or experience extreme shortfalls in processing capabilities. It may be used individually by each solar technology or by all the solar technologies in concert.

### Future

In FY 1978 it is expected that the data base and reference design data sets will be expanded to include all solar technologies as required. Preliminary analyses will be conducted to identify potential material capacity problems.

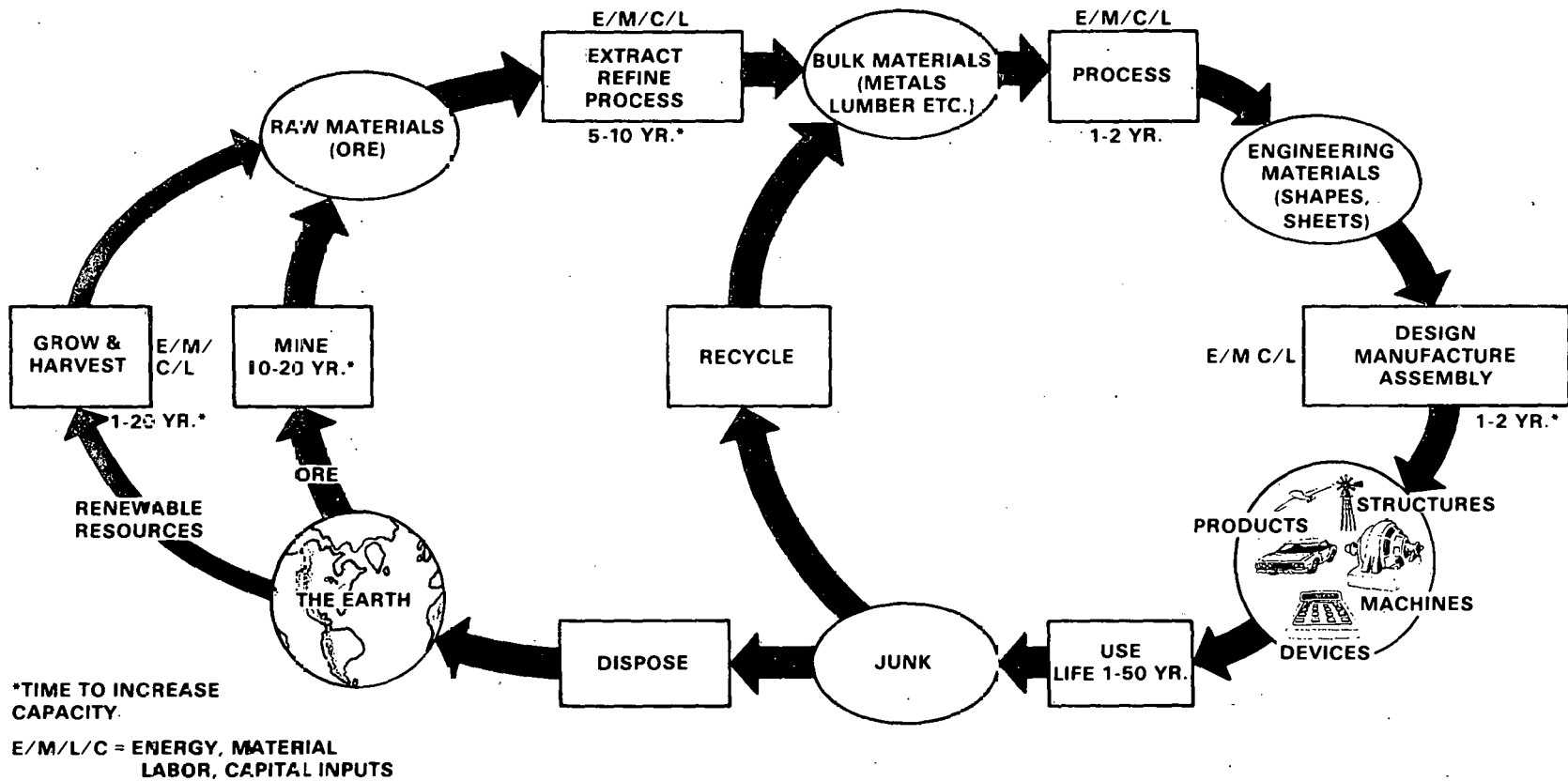


FIGURE 8. *The Materials Cycle.*

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# FY 1977 SUMMARY TABLES

## Program Element

### RESOURCE ASSESSMENT

• *Program Sub-Element*

#### NETWORK COORDINATION AND DATA COLLECTION

<i>Organization</i>	<i>Title</i>	<i>Projected Contribution</i>
National Oceanic & Atmospheric Administration (NOAA) Air Resources Laboratories	Adding Strip-Chart Recorders to DOE/NOAA Network	Improves data collection; aids in quality control of solar radiation data collection.
National Oceanic & Atmospheric Administration (NOAA) Air Resources Laboratories	NOAA Calibration Center Support	Provides data quality control and a national solar radiation instrument calibration center.
Batelle-Pacific Northwest Laboratories	Ground Based Insolation Measurement at Selected Field Sites	Provides direct and diffuse solar radiation data for photovoltaics and bioconversion technologies.
Sandia Laboratories	IEA Portable Insolation Monitor	Supports site specific solar resource assessment activities.
National Oceanic and Atmospheric Administration (NOAA) Atlantic Oceanographic and Meteorological Laboratory	Ocean Currents and Thermal Observations	Provides comprehensive data base for OTEC design and siting.
Research Triangle Institute	Sea Surface Satellite Data	Assesses variations in sea surface temperature for OTEC thermal resource.

# FY 1977 SUMMARY TABLES

## Program Element

### RESOURCE ASSESSMENT

● *Program Sub-Element*

#### DATA MANAGEMENT

<i>Organization</i>	<i>Title</i>	<i>Projected Contribution</i>
National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center	Final Preparation of SOLMET Tapes	Enhances solar radiation and other meteorological data available in printed form and magnetic tape.
National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center	Proposal for Index of Wind Records	Provides U. S. wind data in standard format.
National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center	Advanced Funding for Meteorological Data Requests	Provides rapid response to meteorological data inquiries.
National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory	User Meeting to Co-ordinate Research Program	Provides a co-ordinated meteorological data management plan.
National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center	Processing, Research and Site Specific Data	Research and site specific data will be archived and summarized.
National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center	Keying on Tape the Intermediate data on SOLMET	Hourly weather data will be on all SOLMET data tapes.
National Oceanic and Atmospheric Administration (NOAA) National Oceanographic Data Center	Oceanographic Data Base for OTEC	Provides updated data base for OTEC.



# FY 1977 SUMMARY TABLES

## Program Element

### RESOURCE ASSESSMENT

• *Program Sub-Element*

#### RESEARCH AND ANALYSIS

<i>Organization</i>	<i>Title</i>	<i>Projected Contribution</i>
University of Alabama	Solar Radiation Instrument Catalog UAH-1	Reference source of technical, operational and cost data in selection of solar radiation instruments.
University of Alabama	Solar Radiation Data Analysis, UAH-2	Reclaims solar radiation data.
University of Alabama	Solar Radiation Network Design Handbook, UAH-3	Provides reference guide for establishing radiation measurement stations.
University of Alabama	Educational and Seminar Support Activities	Increase in overall expertise available to DOE. Furtherance of environmental information exchange within SOLAR and the interested public.
National Oceanic & Atmospheric Administration (NOAA) Air Resources Laboratories	Urban/Rural Radiation Differences in the St. Louis Area	Defines urban/rural solar and meteorological differences.
Research Triangle Institute	Coastal-Inland Solar Radiation Difference Study	Provides model to estimate solar radiation in variety of coastal-inland regions.
Utah State University	Mountain-Valley Solar Radiation Difference Study	Provides radiation data for systems design in mountain-valley regions.
Arizona State University	Study of Temporal and Spatial Variation of Climatic and Solar Radiation in Metropolitan Phoenix Area	Established comparability of area data to allow assessment of microclimatic insolation differences.
National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratories	Estimation of Insolation at Selected Locations	Expands insolation data base for design of solar energy systems; improved interpolation between existing data points through model development.
Sandia Laboratories	Solar Heating and Cooling Standard Insolation Year	Defines standard insolation years for rapid and efficient simulation modeling.
Northrop Services, Inc.	Joint Probability of Wind and Solar	Identify promising sites for hybrid solar energy systems.
Northrop Services, Inc.	Forecasting and Interpolation Analysis	Aids in definition of future network requirements.
Eight Universities (See page 64)	Solar Energy Research and Training Sites	Provides research quality meteorological data at eight sites for advanced solar energy research and a training center.
Watt Engineering, LTD.	A Study of the Distribution and Characteristics of Solar Radiation in the U. S.—A Program to Develop Material for a Solar Radiation Users Manual	An accurate but not excessively complex model for direct and diffuse insolation. Material for a much needed, general user's manual on insolation.

## RESOURCE ASSESSMENT (cont.)

### RESEARCH AND ANALYSIS—Continued

<i>Organization</i>	<i>Title</i>	<i>Projected Contribution</i>
National Oceanic & Atmospheric Administration (NOAA), Wave Propagation Laboratory	Effects of Aerosols and Clouds on Solar Radiation	A unique data set for improving solar radiation models; research measurements; recommendations for solar radiation model improvements; and increase ability to forecast insolation as well as estimate insolation between monitoring sites.
Ocean Data Systems, Inc.	Ocean Thermal Structure Analysis	Provides improved data base for OTEC environmental assessment, siting and design issues.
Wood's Hole Oceanographic Institution Florida Institute of Technology	Oceanographic Data for OTEC Data Study of Geographical Distribution of the OTEC Resource in the Florida Current	Provides framework for OTEC environmental resource data requirements. Provides detailed analysis for OTEC site selection.
Bretschneider Consultants	Design Current and Wave Criteria for Potential OTEC Sites	Provides input to environmental impact and design of 1 MWe OTEC test platform.

Table 4

## FY 1977 SUMMARY TABLES

### Program Element

### ENVIRONMENTAL ASSESSMENT

◆ *Program Sub-Element*

#### LEGISLATIVE ENVIRONMENTAL ASSESSMENTS

<i>Organization</i>	<i>Title</i>	<i>Projected Contribution</i>
Energy and Environmental Analysis, Inc.	Environmental Impact Statement of the Solar Heating and Cooling Program	Develops the programmatic EIS for the Solar Heating and Cooling Program.
Energy and Environmental Analysis, Inc.	Environmental Development Plans for Solar Energy	Identifies key environmental issues and schedules environmental research to resolve same in coordination with technology development timetable.
Oak Ridge National Laboratory	Environmental Analysis of Photovoltaic Large Scale Experiments	Assists in preparation of environmental impact assessments for photovoltaic systems applications.
Interstate Electronics Corporation	Environmental Impact Assessment-Ocean Test Platforms for OTEC	Identifies OTEC problems and methods to mitigate problems.

# FY 1977 SUMMARY TABLES

## Program Element

### ENVIRONMENTAL ASSESSMENT

• *Program Sub-Element*

#### ENVIRONMENTAL ASSESSMENT STUDIES

<i>Organization</i>	<i>Title</i>	<i>Projected Contribution</i>
Sandia Laboratories	Environmental and Fire Hazard of Heat Transfer Fluids and Storage Media Used for Solar Heating and Cooling	Identifies material properties in an effort to establish health and safety requirements for solar heating and cooling systems.
Los Alamos Scientific Laboratory	Potential Effects of Solar System Working Fluids on Ecosystem	Estimates dangers and determines effects of working fluid leaks on ecosystem.
Sandia Laboratories	Disposal and Recycling of Hazardous Chemicals from SHACOB	Identify treatment, packaging, storage and disposal methods of hazardous solar heating and cooling chemicals.
National Bureau of Standards	Over-Temperature and Fire Hazard Investigation of Residential Solar Heating and Cooling Systems	Documents safety of systems; provides data for improving safety standards.
Lovelace Biomedical and Environmental Research Laboratories	Health Effects of Materials Used in Solar Heating and Cooling Systems: Assessment Using Experimental Biological Systems	Develops exposure guides; defines control technology develops cost/risk/benefit analysis; guides decision making processes.
Arizona State University	Preliminary Assessment of the Impact of Solar Collectors on Desert Ecosystems	Enables DOE to take the most intelligent approach and resolve methodological problems at an early date prior to funding an extensive monitoring program to determine the effects of arrays of solar collectors on the desert ecology.
Los Alamos Scientific Laboratories	Transport of Toxic Solar Energy Working Fluids Released to the Atmosphere	Documents procedures for study and analysis of atmospheric releases of toxic substances.
Florida Solar Energy Center	OTEC Environment and Resource Assessment Workshop	A forum for OTEC/ERA program review and planning.
Lawrence Berkeley Laboratory	Program Management Support: Biological and Ecological Effects of OTEC	Provides management support for biological/ecological effects of OTEC studies.
Lockheed Center for Marine Research	Marine Biota Impact Assessment for OTEC	Provides plan for data required in OTEC environmental assessment.
Argonne National Laboratories	Program Management Support: Oceanographic and Climatic Impacts	Provides management support on all hydrodynamic modeling efforts for the OTEC program.
Naval Ocean Research and Development Activity (NORDA)	Theoretical Fluid Dynamical Studies of Resource Availability and Environmental Impact of OTEC	Foundation for additional investigation of physical/climatic and biological/ecological effects of OTEC.
Hydronautics, Inc.	Experimental Study of Flow Problems Related to OTEC	Describes unique OTEC conditions such as recirculation potential and other adverse environmental impacts.
Ocean Data Systems, Inc.	Ocean Physical/Climatic Impacts Model Reviews	Contributes to decision making in support of OTEC environmental assessment.

Table 6

## FY 1977 SUMMARY TABLES

### Program Element

#### TECHNOLOGY ASSESSMENT

• *Program Sub-Element*

#### TECHNOLOGY ASSESSMENT STUDIES

<i>Organization</i>	<i>Title</i>	<i>Projected Contribution</i>
The Institute on Man and Science	Program Analysis and Development: Values, Community and Decentralization Issue	Helps coordinate and develop solar TA program; investigates social issues of relevance to solar development.
University of New Hampshire; University of Massachusetts DOE Richland Operations Office	Community Workshops on Social and Environmental Effects of Solar Technologies	Provides information on local social and environmental affects and public attitudes and concerns which affect solar technology development.
George Washington University	Technology Assessment: Decentralized Solar Energy Sources	Clarifies nature and potential use of technology assessment. Provides an initial identification and review of social concerns likely to accompany development of decentralized solar technologies.
PRC Systems Sciences Co.	Development of Procedures for a DOE Solar Energy Forecast	Provides framework for a DOE solar energy forecasting methodology.
University of Tulsa	Assessment of a Methodology for Conducting State Level Technology Assessment and Planning	Provides a model for state/regional public involvement in solar energy technology assessment

Table 7

## FY 1977 SUMMARY TABLES

### Program Element

#### MATERIALS ASSESSMENT

• *Program Sub-Element*

#### MATERIALS RESOURCE ASSESSMENTS

<i>Organization</i>	<i>Title</i>	<i>Projected Contribution</i>
Battelle-Pacific Northwest Laboratories	Critical Materials and Processes Analysis	Identifies materials and manufacturing processes posing potential barriers to solar energy implementation.

# Fiscal Year 1977—Project Summary Sheets

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**Resource Assessment:  
Network Coordination and Data Collection**

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<b>TITLE</b>		<b>ORGANIZATION</b>
Adding Strip-Chart Recorders to DOE/NOAA Network		National Oceanic & Atmospheric Administration (NOAA) Air Resources Laboratories 8060 13th Street Silver Spring, MD. 20910
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$107,500.00	Dr. Lester Machta	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Silver Spring, MD.	23 months—February 1, 1977	E(49-26)-1041 T009

**PROJECT SUMMARY:**

*Objective:*

Add strip-chart recorders to the DOE/NOAA solar radiation network as a backup to digital recorders.

*Approach:*

Strip-chart recorders were added to the DOE/NOAA solar radiation network. These back up the digital cassette recorders now under order.

*Benefit:*

The addition of strip-chart recorders:

1. Ensure the most complete data collection possible from the NOAA/ERDA solar radiation network;
2. Aid in the quality control of the solar radiation data.

<b>TITLE</b> NOAA Calibration Center Support	<b>ORGANIZATION</b> National Oceanic & Atmospheric Administration (NOAA)—Air Resources Laboratories 8060 13th Street Silver Spring, MD. 20910	
<b>AMOUNT</b> \$150,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. Lester Machta	
<b>WORK LOCATION</b> Silver Spring, MD.	<b>DURATION-AWARD DATE</b> 12 months—May 1, 1977	<b>CONTRACT NO.</b> E(49-26)—1041 T013

**PROJECT SUMMARY:**

*Objective:*

Provide centralized quality control and processing of insolation data for the 38-station DOE/NOAA network. Provide the national master calibration center.

*Approach:*

Establish a group for insolation sensor calibration, maintenance, and data processing at NOAA's Air Resources Laboratories in Boulder, Colorado. The group will be the master center for nationwide instrument calibration and will process insolation data collected by the NOAA network.

*Benefit:*

The center will provide the central calibration, maintenance, and data processing required to produce the high quality solar radiation data needed from the base solar radiation network. Also, the center will be the national master calibration center for solar radiation sensors.

<b>TITLE</b>		<b>ORGANIZATION</b>
Ground Based Insolation Measurement at Selected Field Sites		Battelle-Pacific Northwest Laboratories Richland, WA. 99352
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$102,000	Edward K. Kleckner	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Richland, WA.	24 months—January 1, 1977	E(45-1)—1830

**PROJECT SUMMARY:**

*Objective:*

Build and field test two spectral insolation monitoring devices capable of measuring seven spectral bands in the direct and diffuse components. This will provide spectral data for photovoltaic and bioconversion technologies.

*Approach:*

Battelle-Pacific Northwest Laboratories will build two self-contained units to monitor the direct and diffuse solar irradiance in seven spectral bands. The device will be capable of operating unattended at remote locations for 1 to 2 weeks. The two sensors will be located at Boulder, Colorado, and Albuquerque, New Mexico. A program of measurement and analysis will be initiated with emphasis on intercalibration with other instrumentation located at these two sites. All data will be provided to the National Depository for general distribution. Models will be used to synthesize insolation as a function of wavelength and air mass. The device will also yield cloud cover and turbidity.

*Benefit:*

Spectral direct and diffuse irradiation data will be available for the photovoltaic and bioconversion technologies. The device can also yield cloud cover as a function of time of day, season, and location. Additionally, on clear days, a measurement of turbidity will be available.

Bibliography Reference No. None to Date

<b>TITLE</b> IEA Portable Insolation Monitor		<b>ORGANIZATION</b> Sandia Laboratories Albuquerque, New Mexico 87115
<b>AMOUNT</b> \$ 50,000	<b>PRINCIPAL INVESTIGATOR</b> John Dickinson	
<b>WORK LOCATION</b> Los Alamos, New Mexico	<b>DURATION-AWARD DATE</b> 12 months—April 1, 1977	<b>CONTRACT NO.</b> S-189-77-22 189-No. So131 (Sandia)

**PROJECT SUMMARY:**

*Objective:*

Build a portable insolation monitoring package to international specifications and write measurements manual.

*Approach:*

An existing portable sensor package will be modified to meet the specifications internationally agreed upon. A manual for the device will be written.

*Benefit:*

A standard mobile meteorological instrument package will be available in support of site specific solar resource assessment activities as well as support international solar energy objectives.

<b>TITLE</b> Ocean Currents and Thermal Observation		<b>ORGANIZATION</b> National Oceanographic and Atmospheric Administration (NOAA)—Atlantic Oceanographic and Meteorological Laboratory Miami, FL 33149
<b>AMOUNT</b> \$250,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. Robert Molinari	
<b>WORK LOCATION</b> Miami, FL	<b>DURATION-AWARD DATE</b> 15 months—April 4, 1977	<b>CONTRACT NO.</b> EX-76-A-291041 T018

**PROJECT SUMMARY:**

*Objective:*

Using requirements for oceanographic data as specified for OTEC, provides necessary detail of observational data over a 15-month period at sites of principal U.S. economic interest.

*Approach:*

The following tasks are required to achieve the stated objectives:

1. Determine OTEC system and subsystem design specifications in terms of required oceanographic data.
2. Review all previous archival data resource studies for OTEC.
3. Develop a measurement program for critical oceanographic data and sites as specified by DOE.
4. Commence an at-sea observation program of ocean currents and temperatures, including reporting and analysis of data to meet OTEC requirements.

*Benefit:*

Provides a comprehensive oceanographic data base for OTEC design and siting.

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**TITLE**  
Sea Surface Satellite Thermal Data

**ORGANIZATION**  
Research Triangle Institute  
Research Triangle Park, NC 27709

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**AMOUNT**  
\$ 93,439

**PRINCIPAL INVESTIGATOR**  
Dr. Fred Vukovich

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**WORK LOCATION**  
Research Triangle Park, NC

**DURATION-AWARD DATE**  
12 months—June 7, 1977

**CONTRACT NO.**  
EG-77-C-05-5441

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**PROJECT SUMMARY:**

*Objective:*

Provide an analytical tool for synoptic assessment of thermal resource variations at sites of probable OTEC locations via infrared (IR) satellite imagery.

*Approach:*

The following tasks are required to achieve the stated objective:

1. Determine OTEC thermal resource data requirements by review of existing system and subsystems specifications.
2. Assess the state of practice in thermal IR imagery via satellite and compare to OTEC requirements.
3. Develop a methodology for acquiring relevant data and apply to OTEC resource assessment.
4. Prepare a scheme for OTEC operational usage of IR data.
5. Analyze existing IR data and include in OTEC data summaries/atlas(es).

*Benefit:*

Provides a synoptic assessment of principal variant (sea surface temperatures) in OTEC thermal resource.

**Resource Assessment:  
Data Management**

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<b>TITLE</b> Final Preparation of the SOLMET Tapes	<b>ORGANIZATION</b> National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center Federal Building, Asheville, NC 28801	
<b>AMOUNT</b> \$ 50,000	<b>PRINCIPAL INVESTIGATOR</b> Frank Quinlan	
<b>WORK LOCATION</b> Asheville, NC	<b>DURATION-AWARD DATE</b> 15 months—September 30, 1977	<b>CONTRACT NO.</b> E(49-26)—1041 T019

**PROJECT SUMMARY:**

*Objective:*

1. Update SOLMET TAPES after one year of public use.
2. Define the phase shift problem in the SOLMET TAPES; develop strategy to solve problem; and correct second addition of SOLMET as appropriate.

*Approach:*

The NCC will update the SOLMET TAPES and manual after one year of public use. This will include an investigation of phase shift problem and a strategy to solve the problem. The appropriate corrections will be made to the SOLMET TAPES. This work will be completed in 12 months after signature of both parties. A final report will be due 15 months after signature.

*Benefit:*

Will provide the public with the most accurate historical, hourly insolation and related weather data possible at 26 locations in the U.S.

<b>TITLE</b> Proposal for Index of Wind Records		<b>ORGANIZATION</b> National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center Federal Building Asheville, NC 28801
<b>AMOUNT</b> \$ 47,000 TQ	<b>PRINCIPAL INVESTIGATOR</b> Michael J. Changery	
<b>WORK LOCATION</b> Asheville, NC	<b>DURATION-AWARD DATE</b> 15 months—October 1, 1976	<b>CONTRACT NO.</b> E(49-26)—1041 T007

**PROJECT SUMMARY:**

*Objective:*

This project has indexed the existing wind records for the United States.

*Approach:*

The National Climatic Center (NCC) is preparing a publication indexing wind observations available for the United States. The index is in an agreed-to standard format.

*Benefit:*

This project provides the user community with a readily available index of U.S. wind data in a standard format. The U.S. wind sites have a brief history on each site including anemometer height.

<b>TITLE</b>		<b>ORGANIZATION</b>
Advanced Funding for Meteorological Data Requests		National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center Federal Building Asheville, North Carolina 28801
<b>AMOUNT</b>		<b>PRINCIPAL INVESTIGATOR</b>
\$ 8,500 TQ		Frank Quinlan
\$ 5,000 FY 78		
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Asheville, NC	42 months—October 1, 1976	E(49-26)—1041 T008

**PROJECT SUMMARY:**

*Objective:*

Provide advance funding for small meteorological data request to the National Climatic Center (NCC).

*Approach:*

The National Climatic Center (NCC) will set up a fund to answer the Environmental and Resource Assessment Branch (ERAB) request for meteorological data related to solar energy. This account will be an advance of funds account.

*Benefit:*

1. ERAB will have a fund at NCC against which to charge small meteorological data requests.
2. A task order will not have to be written for these small requests.
3. This will reduce the response time to a minimum, thus allowing ERAB to answer other branches' meteorological data needs quickly and efficiently.

Bibliography Reference No. None to Date.

<b>TITLE</b> User Meeting to Coordinate Research Programs		<b>ORGANIZATION</b> National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratories 8060 13th Street Silver Spring, MD. 20910
<b>AMOUNT</b> \$ 25,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. Lester Machta	
<b>WORK LOCATION</b> Silver Spring, MD.	<b>DURATION-AWARD DATE</b> 8 months—May 1, 1977	<b>CONTRACT NO.</b> E(49-26)—1041 T014

**PROJECT SUMMARY:**

*Objective:*

Conduct a conference coordinating Federal, regional and local meteorological network planning. This will develop a coordinated data management plan for solar energy related meteorological monitoring.

*Approach:*

A September 1977 meeting has been held. Federal, regional, state, and local experts discussed meteorological monitoring for solar energy applications. These discussions are leading to a coordinated meteorological data management plan.

*Benefit:*

A coordinated meteorological data management plan is being developed. This plan will ensure quality meteorological resource and support data for this national solar energy effort directed towards eliminating duplication of effort.

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**TITLE**

Processing Research and Site Specific Data

**ORGANIZATION**National Oceanic and Atmospheric Administration  
(NOAA) Climatological Analysis Division  
National Climatic Center  
Federal Building  
Asheville, North Carolina 28801

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**AMOUNT**\$150,000  
\$ 43,000 FY 78**PRINCIPAL INVESTIGATOR**Frank Quinlan

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**WORK LOCATION**

Asheville, NC

**DURATION-AWARD DATE**

33 months—May 1, 1977

**CONTRACT NO.**E(49-26)—1041 T016

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**PROJECT SUMMARY:***Objective:*

An archival system and special formats will be designed to store and summarize research and site specific data collected by the resource assessment program.

*Approach:*

Design of the archival system will allow quick and easy data transfer. Special data formats and summary formats will be designed for each data set. These formats will be standard for each solar energy technology.

*Benefit:*

The research and site specific data collected by the resource assessment program will be archived and summarized. The archival system will have technology-keyed formats to facilitate quick and easy data transfer.

<b>TITLE</b> Keying on Tape the Intermediate Weather Data on the SOLMET TAPE		<b>ORGANIZATION</b> National Oceanic and Atmospheric Administration (NOAA) Climatological Analysis Division National Climatic Center Federal Building Asheville, North Carolina 28801
<b>AMOUNT</b> \$ 35,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. N.B. Guttman	
<b>WORK LOCATION</b> Asheville, NC	<b>DURATION-AWARD DATE</b> 16 months—January 1, 1977	<b>CONTRACT NO.</b> E(49-26)—1041 T010

**PROJECT SUMMARY:**

*Objective:*

Key to magnetic tape the intermediate hourly weather data on the SOLMET tape for approximately 35 solar radiation stations.

*Approach:*

The National Climatic Center (NCC) will key to magnetic tape the intermediate hourly weather data to the SOLMET tape. This will give the tapes hourly weather data instead of 3-hourly data.

*Benefit:*

Hourly weather data will be on all the new network SOLMET data tapes, thus providing the most complete meteorological data set possible to the solar energy user community.

Bibliography Reference No. None to Date

<b>TITLE</b>		<b>ORGANIZATION</b>
Oceanographic Data Base for Ocean Thermal Energy Conversion (OTEC)		National Oceanic and Atmospheric Administration (NOAA) Environmental Data Service National Oceanographic Data Center Washington, D.C. 20235
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 44,800	James Churgin	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Washington, D.C.	6 months—April 1, 1977	EX-76-A-29-1041 Task Order T017

**PROJECT SUMMARY:**

*Objective:*

Develop as complete a statement as possible of required oceanographic data from existing and updated archives.

*Approach:*

The following tasks were required to achieve the stated objective:

1. Determined OTEC system and subsystem design specifications in terms of required oceanographic data.
2. Established a common formula for displaying required oceanographic data.
3. Reviewed this format with DOE Program Manager.
4. Prepared necessary atlas(es).

*Benefit:*

Provides a common updated base for oceanographic data for OTEC.

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**Resource Assessment:  
Research and Analysis**

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<b>TITLE</b> Solar Radiation Instrument Catalog UAH-1	<b>ORGANIZATION</b> University of Alabama in Huntsville Center for Environmental and Energy Studies Huntsville, AL. 35807	
<b>AMOUNT</b> \$106,724 (Total Award Tasks 1,2,3)	<b>PRINCIPAL INVESTIGATOR</b> D.L. Christensen W.L. Reid	
<b>WORK LOCATION</b> Huntsville, AL	<b>DURATION-AWARD DATE</b> 12 months—January 1, 1977	<b>CONTRACT NO.</b> EG-77-S-05-5362 Task 1

**PROJECT SUMMARY:**

*Objective:*

Compile a comprehensive catalog of solar radiation instrumentation based on previous and proposed UAH research efforts. (This effort was based on the research results of UAH Contract NAS 8-31293 Task 3).

*Approach:*

The research effort for preparing the catalog included:

1. Listing and identification of instrumentation manufacturers and vendors.
2. Compiling and categorizing available information into a reference matrix through direct contact with manufacturers/vendors.
3. Preparing a technical data information format for use in definitive analysis of manufacturer/vendor instruments including examples and instructions for completion.
4. Providing all listed manufacturers/vendors with data forms, and contacting manufacturers/vendors as necessary to insure maximum return of information and continuity in format and data.
5. Assembling manufacturer/vendor matrix and technical data sheets into format ready for printing (camera ready).
6. Providing all materials for final printing and distribution.

*Benefit:*

This effort provides a reference source detailing technical, operational, and cost data for individuals, organizations, or businesses to aid in the analysis and selection of solar radiation instruments.

<b>TITLE</b> Solar Radiation Data Analysis, UAH-2		<b>ORGANIZATION</b> University of Alabama in Huntsville Center for Environmental and Energy Studies Huntsville, AL 35807
<b>AMOUNT</b> (See Task 1)	<b>PRINCIPAL INVESTIGATOR</b> D.L. Christensen E.A. Carter	
<b>WORK LOCATION</b> Huntsville, AL.	<b>DURATION-AWARD DATE</b> 12 months—January 1, 1977	<b>CONTRACT NO.</b> EG-77-S-05-5362 Task 2

**PROJECT SUMMARY:**

*Objective:*

Develop a methodology to digitize, reduce, and prepare solar radiation data now on strip charts to computer data tape and print-out format for easy access. Develop a routine procedure to evaluate the data and process strip charts on a production basis as required. (This effort was based on research results of UAH Contract NAS8-31293, Task 4.)

*Approach:*

The University of Alabama in Huntsville (UAH) has:

1. Coordinated with DOE and NOAA to select strip charts which will be digitized.
2. Coordinated with DOE and NOAA to determine the format for tape storage and read-out of digitized data. The data has been digitized, then integrated over each hour to provide a solar radiation value in the metric system per hour and a total value for each day. In addition, a point has been selected for solar noon and the solar radiation value for solar noon has been determined on those days which are free of clouds.
3. Provided assistance to M&S Computing.
4. Provided necessary controls over the data provided, such as comparisons with other data and evaluation of "solar noon" measurements.
5. Prepared the necessary reports of data digitized.
6. Provided a confidence factor for the data.

M&S Computing has provided the following:

1. The capability to digitize the solar radiation strip chart data and reduce the data to the specified format. DOE in coordination with NOAA has provided some strip chart data which had previously been distributed in order to compare the M&S program with programs at NCC.
2. An estimated cost for digitizing representative strip charts.
3. Digitized and reduced sample data sets. (This material has been provided to the UAH for further evaluation.)

*Benefit:*

This capability permits reclaiming much solar radiation data which would otherwise perish. The data selected for reclaiming will become a valuable part of the solar radiation data base and will provide information sooner and at a lower cost than required over the next several years for obtaining new sources of data.

<b>TITLE</b> Solar Radiation Network Design Handbook UAH-3	<b>ORGANIZATION</b> University of Alabama in Huntsville Center for Environmental and Energy Studies Huntsville, Alabama 35807	
<b>AMOUNT</b> (See Task 1)	<b>PRINCIPAL INVESTIGATOR</b> D.L. Christensen E.A. Carter	
<b>WORK LOCATION</b> Huntsville, AL	<b>DURATION-AWARD DATE</b> 12 months—January 1, 1977	<b>CONTRACT NO.</b> EG-77-S-05-5362 Task 3

**PROJECT SUMMARY:**

*Objective:*

Prepare a Solar Radiation Network Design handbook which provides guidelines by first determining the need for a network, and then establishing the operating procedures. The handbook includes procedures established by the world Meteorological Organization (WMO) so that it may be proposed for international use. Widespread dissemination of significant data is a primary objective of this research program.

*Approach:*

Existing networks (NOAA, TVA, Canadian, JPL, and any state networks) have been examined and evaluated for widespread applications. Documents describing these networks have been reviewed and visits have been made where determined desirable. The handbook includes, but is not limited to, the following general topics:

- 1) Establishing the Purpose and Objectives of the Network.
- 2) Survey of Existing Sites and Select Promising New Sites.
- 3) Selection of Equipment.
- 4) Quality Control Requirements.
- 5) Calibration and Maintenance Procedures.
- 6) Selection of Optimum Method of Recording Data.
- 7) Organizing the Collection of the Data.
- 8) Reducing Data to Standard Formats.
- 9) Data Storage and Retrieval.
- 10) Overall Economic Factors.
- 11) Data Dissemination and Exchange.
- 12) Data Utilization Factors.

*Benefit:*

The proposed handbook provides access and reference to the best knowledge and experience in establishing from one to many solar radiation measuring stations. The handbook includes information from many sources, organized so that solar radiation data may be made compatible with all other data. It will be useful to meet private requirements such as those of power companies, universities, and industries, as well as Federal, State, and local Government projects. It is envisioned that it will provide guidelines so that all DOE-sponsored projects will produce compatible solar radiation base-line data.

<b>TITLE</b>		<b>ORGANIZATION</b>
Educational and Seminar Support Activities		Center for Environmental and Energy Studies University of Alabama Huntsville, AL. 35807
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 25,000	D.L. Christensen	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Huntsville, AL	12 months—January 8, 1977	EG-77-S-05-5362 Task 4

**PROJECT SUMMARY:**

*Objective:*

Provide educational materials and seminars related to Environmental and Resource Assessment.

UAH will host seminars in Washington, D.C. DOE headquarters for ERAB. These seminars will be aimed at increasing the level of profession expertise available to ERAB. Further, UAH will draft educational materials for ERAB use.

*Benefit:*

The overall expertise available to ERAB will be increased, thus providing a greater service capability to SOLAR. The educational aids will further environmental information exchange within SOLAR and the interested public.

Bibliography Reference No. None to Date.

<b>TITLE</b> Urban-Rural Radiation Differences in the St. Louis Area		<b>ORGANIZATION</b> National Oceanic & Atmospheric Administration (NOAA) Air Resources Laboratories 8060 13th Street Silver Spring, MD. 20910
<b>AMOUNT</b> \$ 50,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. James Peterson	
<b>WORK LOCATION</b> Silver Spring, MD.	<b>DURATION-AWARD DATE</b> 15 months—January 1, 1977	<b>CONTRACT NO.</b> IA E(49-26)—1041 T011

**PROJECT SUMMARY:**

*Objective:*

Provide a tool to size solar devices used in an urban environment and quantify any air pollution impacts on solar energy utilization.

*Approach:*

The NOAA/ARL meteorological data base for the St. Louis area will be analyzed. This analysis will include establishing how solar radiation and other meteorological characteristics vary across an urban environment. These variations will be archived as a special data set supporting solar applications near and in urban areas.

*Benefit:*

Urban-solar radiation and meteorological differences will be defined so the impacts of air pollution on solar energy can be included in the design of solar systems.

Bibliography Reference No. None to Date.

<b>TITLE</b> Coastal-Inland Solar Radiation Difference Study		<b>ORGANIZATION</b> Research Triangle Institute Research Triangle Park, NC. 27709
<b>AMOUNT</b> \$202,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. Walter Bach	
<b>WORK LOCATION</b> Research Triangle Park, NC.	<b>DURATION-AWARD DATE</b> 24 months—September 1, 1977	<b>CONTRACT NO.</b> EG-77-C-02-4470

**PROJECT SUMMARY:**

*Objective:*

Define the coastal-inland solar radiation gradients. This data set will support analysis of solar energy systems in a coastal climatic region.

*Approach:*

An experiment will be designed so that the coastal-inland solar radiation difference can be defined. Direct and global radiation will be monitored.

*Benefit:*

The coastal-inland solar radiation gradient will be defined so this difference may be included in solar energy applications as appropriate. The model will provide a means to estimate solar radiation in other coastal-inland regions. The solar energy significance of the difference will be used as an input to meteorological network design.

Bibliography Reference No. None to Date.



<b>TITLE</b> Mountain-Valley Solar Radiation Difference Study	<b>ORGANIZATION</b> Utah State University Logan, Utah	
<b>AMOUNT</b> \$179,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. Inge Dirmbirn	
<b>WORK LOCATION</b> Logan, Utah	<b>DURATION-AWARD DATE</b> 24 months—February 1, 1977	<b>CONTRACT NO.</b> EG-77-S-07-1656

**PROJECT SUMMARY:**

*Objective:*

Define mountain-valley insolation gradients. Provide a data set supporting solar energy applications in mountain-valley systems.

*Approach:*

An experiment will be designed so the mountain-valley solar radiation distribution can be defined. Direct and global solar radiation will be monitored in a rocky mountain valley system. One year's data will be collected and lead to a model.

*Benefit:*

Mountain-valley solar radiation data will be available so solar energy systems can be designed for such a region. Additionally, a model will be proposed, thus allowing solar radiation estimates in other mountainous regions. The significance of the differences to solar energy will then be evaluated.

Bibliography Reference No. None to Date.

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**TITLE**

A Study of the Temporal and Spatial Variation of  
Climatic and Solar Radiation in the Metropolitan  
Phoenix Area

**ORGANIZATION**

Arizona State University  
Tempe, AZ. 85281

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**AMOUNT**

\$ 20,000

**PRINCIPAL INVESTIGATOR**

Robert Durrenberger

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**WORK LOCATION**

Tempe, AZ.

**DURATION-AWARD DATE**

12 months—August 1, 1977

**CONTRACT NO.**

EG-77-S-04-3969

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**PROJECT SUMMARY:***Objective:*

Assess the comparability of insolation data taken in the metropolitan Phoenix area. If comparability is established, assess the micro-climatic differences in insolation in an urban-rural area.

*Approach:*

The University will gather insolation data taken in the Phoenix area and determine the comparability of the data. If the data from these sites is comparable, the University will further analyze the data for urban-rural solar radiation differences.

*Benefit:*

The comparability of the Phoenix area data will be established. This will allow an assessment of the micro-climatic insolation differences in a decent urban-rural environment. These differences can then be assessed for their impact on solar technologies.

Bibliography Reference No. None to Date.

<b>TITLE</b> Estimation of Insolation at Selected Locations	<b>ORGANIZATION</b> National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratories 8060 13th Street Silver Spring, MD. 20910	
<b>AMOUNT</b> \$160,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. Lester Machta	
<b>WORK LOCATION</b> Silver Spring, MD.	<b>DURATION-AWARD DATE</b> 12 months—April 1, 1977	<b>CONTRACT NO.</b> E(49-26)—1041 T015

**PROJECT SUMMARY:**

*Objective:*

Develop tool/model to estimate insolation data at many locations throughout the United States.

*Approach:*

The cloud regression model for solar radiation will be applied to 200 locations throughout the United States with the appropriate input data.

*Benefit:*

This project will expand the insolation data base required for design of solar energy systems. The estimated data will also allow for better interpolation between existing insolation data points, thus fixing the present network size and eliminating the need for additional sites in a cost-effective manner.

<b>TITLE</b>		<b>ORGANIZATION</b>
Solar Heating and Cooling Standard Insolation Year		Sandia Laboratories Albuquerque, New Mexico 87715
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 57,500	R.R. Prairie	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Albuquerque, NM	12 months—April 1, 1977	S-187-77-30 189 NO. SOL-32 (Sandia)

**PROJECT SUMMARY:**

*Objective:*

Define a simplified standard insolation year for solar heating and cooling design and evaluation applications; develop the standard year so defined.

*Approach:*

The ASHRAE Weather Data, Energy, and Solar committees will first define the concept of a simplified standard insolation year for design and evaluation of solar heating and cooling devices. From this definition, ASHRAE will develop such a standard year.

*Benefit:*

All collectors can be compared to standard data base (for a given location); thus, "nameplate" ratings will be comparable for solar devices. A simplified standard insolation design year will be available so simulation modeling can be accomplished more rapidly and efficiently.

Bibliography Reference No. None to Date.

<b>TITLE</b>		<b>ORGANIZATION</b>
Joint Probability of Wind and Solar		Northrop Services, Inc. Huntsville, AL. 35807
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 95,000	Marlin Sloan	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Huntsville, AL.	12 months—May 1, 1977	EG-77-C-01-4016

**PROJECT SUMMARY:**

*Objective:*

Develop the probability of days with solar and wind, solar only, wind only, and neither for 25 to 50 locations in the United States. Analysis results will indicate promising locations for hybrid energy systems.

*Approach:*

The study will determine seasonal probability of consecutive days with both insolation and wind, insolation only, wind only, and neither for 25 to 50 locations. The insolation variable may be the solar radiation available from the National Climatic Center or cloud cover. These seasonal probabilities will be published in a user manual in a format agreed to by NSI and DOE.

*Benefit:*

This probability analysis will identify promising sites for hybrid solar energy systems. These probabilities also will serve as resource planning data for Federal, state, and private groups interested in hybrid systems.

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**TITLE**

Forecasting and Interpolation Analysis

**ORGANIZATION**Northrop Services, Inc.  
Huntsville, AL. 35807

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**AMOUNT**

\$141,000

**PRINCIPAL INVESTIGATOR**John Woo

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**WORK LOCATION**

Huntsville, AL

**DURATION-AWARD DATE**

12 months—September 1, 1977

**CONTRACT NO.**EG-77-C-02-4494

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**PROJECT SUMMARY:***Objective:*

1) Define the representative area served by each past solar radiation site (51) and the ability of the NOAA model and satellite techniques to interpolate insolation between sites; 2) define the representative area served by each new insolation site (35) and the ability of the NOAA model and satellite techniques to interpolate insolation between sites; and 3) compile an inventory of techniques to calculate tilted solar radiation and evaluate these at selected locations.

*Approach:*

The representative area served by the past 51 solar radiation sites and the new 35 solar radiation sites will be defined. Additionally, the ability of the NOAA model and satellite techniques to interpolate between these sites will be evaluated.

A third subtask will be to inventory the techniques available for calculating tilted insolation values and evaluate these techniques at selected sites.

*Benefit:*

The definition of the representative areas for the past and new solar radiation network will define future network requirements. The evaluation of the modeling techniques will help establish the number of required solar radiation sites—the better these models aid interpolation, the fewer sites will be needed (thus lowering costs).

The inventory of tilted modeling techniques and their evaluation will establish which model to use or if new work is needed. This will also establish if tilted measurements are required.

Bibliography Reference No. None to Date.

<b>TITLE</b> Solar Energy Research and Training Sites	<b>ORGANIZATION</b> Eight Universities Listed Below	
<b>AMOUNT</b> \$200,000 Per Site (\$1,600,000 Total)	<b>PRINCIPAL INVESTIGATOR</b> See Below	
<b>WORK LOCATION</b> 8 sites	<b>DURATION-AWARD DATE</b> 60 months—September 1, 1977	<b>CONTRACT NO.</b> See Below

**PROJECT SUMMARY:**

*Objective:*

Establish an eight station meteorological research network to: (1) collect detailed insolation and meteorological data needed for advanced solar energy studies; (2) act as a regional training center.

*Approach:*

Eight meteorological research and training sites have been selected. The sites have a resident research meteorologist with a background in solar radiation monitoring. Approximately 45 atmospheric variables will be measured including spectral composition of solar radiation, circumsolar, polarization, total oxone, precipital water, and the other standard meteorological and radiation data. The sites will also serve as regional training centers to ensure a base of well-trained meteorologists and engineers for future solar radiation efforts.

*Benefit:*

This project will provide a detailed meteorological data set of the highest accuracy possible for advanced solar energy research. The center will also provide a regional training center to assure standard measurement practices in the United States and a base of well-trained meteorologists and engineers.

<i>Principal Investigator</i>	<i>Contract No.</i>	<i>Location</i>
Dr. Kinsell L. Coulson	EG-77-G-03-2867	University of California (Davis) Davis, CA. 95616
Dr. Ronald Stewart	EG-77-G-05-5611	State University of New York (Albany) Albany, NY 12222
Dr. C.G. Justus	EG-77-G-05-5604	Georgia Institute of Technology Atlanta, GA. 30332
Dr. Eugene Clark	EG-77-G-05-5605	Trinity University San Antonio, TX 78284
Dr. E. Wendell Hewson	EY-77-G-06-1059	Oregon State University Corvallis, OR 97331
Dr. Donald J. Portman	EG-77-G-05-5612	University of Michigan Ann Arbor, MI. 48109
Dr. Gerd Wendler	EG-77-G-06-1060	University of Alaska Fairbanks, AK 99701
Dr. Colin S. Ramage	EG-77-G-03-2868	University of Hawaii Honolulu, HI 96822

Bibliography Reference No. None to Date.

<b>TITLE</b>		<b>ORGANIZATION</b>
A Study of this Distribution and Characteristics of Solar Radiation of in the U.S.—A Program to Develop Material for a Solar Radiation Users Manual		Watt Engineering, Lt'd RR #1, Box 183½ Cedaredge, Colorado 81413
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 64,000	Arthur Watt	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Cedaredge, Colorado	4 months—August 15, 1976	E(49-18)—2552

**PROJECT SUMMARY:**

*Objective:*

Develop material for a Solar Radiation Users Manual.

*Approach:*

This project will be done in two tasks. First—a model will be developed for direct and diffuse radiation in the following steps:

1. The acquisition and analysis of insolation data and its presentation in concise and condensed manner;
2. The development of an accurate but not excessively complex insolation model; and
3. A comparison of observed direct and diffuse radiation terms with those calculated employing the models developed under this program.

Second—material for a users manual of the following outline will be developed:

1. Preface
2. Introduction
3. The sun and its radiation
4. The earth and its atmospheres
5. Insolation models
6. Clear and cloudy day insolation
7. Geographic and time distribution of solar radiation over the U.S.A.

*Benefit:*

1. Will provide an accurate but not excessively complex insolation model for direct and diffuse.
2. Will provide the material for a much needed general users manual on insolation.



<b>TITLE</b> Effects of Aerosols and Clouds on Solar Radiation	<b>ORGANIZATION</b> National Oceanic and Atmospheric Administration (NOAA) Wave Propagation Laboratory Boulder, Colorado 80302	
<b>AMOUNT</b> \$118,000 \$150,000 FY 78	<b>PRINCIPAL INVESTIGATOR</b> Dr. Vernon Derr	
<b>WORK LOCATION</b> Boulder, Colorado	<b>DURATION-AWARD DATE</b> 24 months—January 1, 1977	<b>CONTRACT NO.</b> E(49-26) 1041 T012

**PROJECT SUMMARY:**

*Objective:*

Provide a unique data set to improve basic solar radiation models, including effect of aerosols and clouds on solar radiation.

*Approach:*

In phase I of this project (sponsored by NSF) the system experimental design was tested. The experiment involved assembling such equipment as a lidar, acoustic sounder, and spectral radiation monitoring equipment. In addition, ground based on airborne in situ measurements of aerosol characteristics were made. Other measurements such as ozone, precipital water, and sky photography were also taken. Phase II will apply the instrumentation at six locations in the United States. The data will be used to determine cloud and aerosol effects on solar radiation, particularly effects on the direct and diffuse. The data will be used to improve solar radiation models and recommend appropriate research measurements for future modeling efforts. Two to three sites will be in the Eastern United States.

*Benefit:*

The project will provide a unique data set for improving solar radiation models. Additionally, this work will provide research measurements, recommendations for solar radiation model improvements, and thus increase our ability to forecast insolation as well as estimate insolation between monitoring sites.

Bibliography Reference No. None to Date.

<b>TITLE</b> Site Specific Thermal Data		<b>ORGANIZATION</b> Ocean Data Systems, Inc. 6000 Executive Boulevard Rockville, MD. 20852
<b>AMOUNT</b> \$ 77,438*	<b>PRINCIPAL INVESTIGATOR</b> Paul Wolff	
<b>WORK LOCATION</b> Rockville, MD.	<b>DURATION-AWARD DATE</b> 6 months—February 23, 1977	<b>CONTRACT NO.</b> EG-77-C-01-4028

**PROJECT SUMMARY:**

*Objective:*

Define the ocean thermal structure at four specific locations, with resolution of 1 degree C, 10 M in depth and 1 km horizontal distance; conduct monthly archival data assessments.

*Approach:*

Update the historical data file; prepare preliminary data summaries; and prepare final data summaries.

*Benefit:*

The thermal resource for OTEC will be defined at sites of principal U.S. interest adequate for resource assessment and final site selection.

\* Fully funded within Ocean Systems Branch, EA 03-04.

**TITLE**

Ocean Thermal Structure Analysis

**ORGANIZATION**Ocean Data Systems, Inc.  
6000 Executive Blvd.  
Rockville, MD. 20852

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**AMOUNT**

\$ 29,937

**PRINCIPAL INVESTIGATOR**

Paul Wolff

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**WORK LOCATION**

Rockville, MD

**DURATION-AWARD DATE**

5 months—June 23, 1977

**CONTRACT NO.**EG-77-C-01-4028  
(change order)

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**PROJECT SUMMARY:***Objective:*

Provide a more useful ocean thermal resource assessment and data base for environmental assessment and siting of 100 MWe OTEC demonstration plant.

*Approach:*

Add Key West, Florida, thermal data to present study; develop most probable temperature sounding and associated standard deviations for each 1° square in present study; produce summary tables of temperature characteristics by 1° square; prepare a final report.

*Benefit:*

These efforts will provide a better data base for OTEC environmental assessment, siting, and design issues.

<b>TITLE</b>		<b>ORGANIZATION</b>
Oceanographic Data for Ocean Thermal Energy Conversion (OTEC) Design		Wood's Hole Oceanographic Institute Wood's Hole, MA 02543
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$136,370*	James Mavor	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Wood's Hole, MA	12 months—April 1, 1977	EG-77-S-02-4293

**PROJECT SUMMARY:**

*Objective:*

Provide (1) discrete site selection criteria based on OTEC design, (2) a plan and schedule for matching the ocean data base to design, construction and test, and (3) a plan for acquiring requisite oceanographic data.

*Approach:*

The following tasks are required to achieve the stated objectives:

1. Determine present OTEC design specifications using DOE direction and completed studies.
2. Determine available ocean data base for sites specified by DOE.
3. Review data base for applicability to OTEC.
4. Develop plan/schedule for matching data base to design and integrate into OTEC subsystems plan and schedule.
5. Match data to design using above plan.
6. Determine what additional data are required and develop a plan to acquire data.

*Benefit:*

Provides a logical framework for fulfilling OTEC environmental resource and design data requirements in a time frame sufficient to acquire data.

\* Fully funded by Ocean Systems Branch EA 03-04

<b>TITLE</b>		<b>ORGANIZATION</b>
A Study of the Geographical Distribution of the OTEC Resource in the Florida Current		Florida Institute of Technology Melbourne, FL 32901
<b>AMOUNT</b>		<b>PRINCIPAL INVESTIGATOR</b>
\$ 9,995*		Dr. Ross McCluney
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Melbourne, FL	9 months—June 1, 1977	EG-77-G-05-5518

**PROJECT SUMMARY:**

*Objective:*

Perform an analysis of the seasonal and geographical distribution of the OTEC resource in the Florida Current.

*Approach:*

The following tasks were required to achieve the stated objectives:

1. Acquisition and organization of data.
2. Development of an interpolation model.
3. Calculation of trend surfaces.
4. Mapping of trend surfaces.
5. Thermocline analysis of maps.

*Benefit:*

Provides detailed analysis for the purposes of OTEC site selection.

\* Fully funded with Ocean Systems Branch, EA 0304.

Bibliography Reference No. None to Date.

<b>TITLE</b>		<b>ORGANIZATION</b>
Design Current and Wave Criteria for Potential OTEC Sites		Bretschneider Consultants Honolulu, HA 96015
<b>AMOUNT</b>		<b>PRINCIPAL INVESTIGATOR</b>
\$ 9,980*		Dr. Charles Bretschneider
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Honolulu, HA	1 month—June 8, 1977	EG-77-X-01-2849

**PROJECT SUMMARY:**

*Objective:*

Provide data on design current and wave criteria for potential OTEC plant sites.

*Approach:*

Applicable data for the following variables were provided to satisfy the stated objective:

1. Currents
  - a. Surface currents.
  - b. Profile currents.
  - c. Currents critique.
2. Waves
  - a. Height, period, spectra for southern swell, Hawaii.
  - b. Spectra for sea states at all sites.
  - c. Hurricane parameters at all sites.

*Benefit:*

Provides engineering design and potential environmental impact data for 1 MWe OTEC test platform and its cold water pipe.

\* Fully funded by Ocean Systems Branch EA 03-04

**Environmental Assessment:  
Legislative Environmental Assessments**

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<b>TITLE</b>		<b>ORGANIZATION</b>	
Environmental Impact Statement of the Solar Heating and Cooling Program		Energy and Environmental Analysis, Inc. 1701 N. Fort Meyer Drive Arlington, VA. 22209	
<b>AMOUNT</b>		<b>PRINCIPAL INVESTIGATOR</b>	
\$ 68,000		Dr. Robert L. Sansom	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>	
Arlington, VA.	12 months—September 30, 1977	E(49-18)—2323 Mod. #1	

**PROJECT SUMMARY:**

*Objective:*

Complete a Programatic Environmental Impact Statement (EIS) for the Solar Heating and Cooling of Buildings (SHACOB) Program.

*Approach:*

A Programatic Environmental Impact Assessment is being completed for the SHACOB program and will be used as the basis for the EIS of that program.

*Benefit:*

This project continues the legislative environmental assessment plan of the SHACOB program. The Heating and Cooling Demonstration Program is a major Federal action. This EIS will enable DOE to determine if the action has potential significant environmental effects and what programming actions are appropriate for continuing RD&D activities.

Bibliography Reference No. None to Date.

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<b>TITLE</b> Environmental Development Plans for Solar Energy	<b>ORGANIZATION</b> Energy and Environmental Analysis, Inc. 1701 N. Fort Meyer Drive Arlington, VA. 22209
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<b>AMOUNT</b> \$109,000	<b>PRINCIPAL INVESTIGATOR</b> John Holmes
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<b>WORK LOCATION</b> Arlington, VA.	<b>DURATION-AWARD DATE</b> 12 months—June 1, 1977	<b>CONTRACT NO.</b> EG-77-C-01-4054
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**PROJECT SUMMARY:**

*Objective:*

Prepare Environmental Development Plans for each of seven solar technologies.

*Approach:*

A team from ERAB, technology developers, and the contractor participated in the preparation and review of EDP's. Each EDP reviewed the status of the technology and any relative environmental and safety research. Further, environmental and safety issues were outlined, and a research plan was presented to develop needed information. The research plan and legislative environmental requirements will be folded into the technology development plans.

*Benefit:*

The EDP provides an environmental research plan that is in step with the technology. Thus, most environmental and safety issues are identified early in the R&D phase of the technology so mitigation or control can be developed before widespread use.

<b>TITLE</b> Environmental Analysis of Photovoltaic Large Scale Experiments		<b>ORGANIZATION</b> Oak Ridge National Laboratory Energy Division Environment Impact Section Oak Ridge, TN 37830
<b>AMOUNT</b> \$ 12,000	<b>PRINCIPAL INVESTIGATOR</b> Harry Arnold	
<b>WORK LOCATION</b> Oak Ridge, TN	<b>DURATION-AWARD DATE</b> 7 months—March 1, 1977	<b>CONTRACT NO.</b> S-189-77-19

**PROJECT SUMMARY:**

*Objective:*

Prepare environmental impact assessments of photovoltaic large scale experiments and perform related studies as required by solar energy programs or projects.

*Approach:*

Contractor provided technical assistance and all materials and services required to produce final documents in accordance with ERDA requirements. Contractor assigned qualified personnel in the technical disciplines of photovoltaic conversion, engineering ecology, economics, and sociology; provided materials and editorial and analytical services; submitted finished mats of environmental impact assessments, statements and reports.

*Benefit:*

The project will assist ERAB's program in the preparation of environmental impact assessments. An EIA will be prepared for the Remote Island Large Scale Photovoltaics Experiment in Bermuda and, if required, for the Agricultural Experiment at Mead Laboratory, University of Nebraska.

Bibliography Reference No. None to Date.

<b>TITLE</b>		<b>ORGANIZATION</b>
Environmental Impact Assessment Ocean Test Platforms for Ocean Thermal Energy Conversion (OTEC)		Interstate Electronics Corporation 707 E. Vermont Avenue P.O. Box 3117 Anaheim, CA 92803
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 53,551	S.T. Kelly	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Anaheim, CA	9 months—September 1, 1977	EG-77-C-06-1033

**PROJECT SUMMARY:**

*Objective:*

Prepare environmental impact assessments of the 1 MWe (OTEC-1) and 5 MWE (OTEC-5) OTEC floating test facilities.

*Approach:*

Environmental impact assessments required the following tasks:

1. Existing system and subsystem specifications were reviewed with DOE/OTEC Program Manager and designated contractor.
2. Environmental issues were identified and an environmental development plan was critiqued.
3. Data requirements and availability were assessed and priorities on data acquisition were set.
4. Possible design modifications to mitigate unresolvable impacts are being suggested.
5. A recommendation as to the need for an OTEC-1 EIS will be made.

*Benefit:*

Provides a timely environmental problem identification and a method for mitigating these problems prior to final design and construction of these test facilities.

Bibliography Reference No. None to Date.

**Environmental Assessment:  
Environmental Assessment Studies**

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<b>TITLE</b> Environmental and Fire Hazard of Heat Transfer Fluids and Storage Media Used for Solar Heating and Cooling	<b>ORGANIZATION</b> Sandia Laboratories Albuquerque, New Mexico 87115	
<b>AMOUNT</b> \$115,000*	<b>PRINCIPAL INVESTIGATOR</b> J. Q. Searcy	
<b>WORK LOCATION</b> Albuquerque, NM	<b>DURATION-AWARD DATE</b> 22 months—March 1, 1977	<b>CONTRACT NO.</b> 040789 189 No. AL 5418A

**PROJECT SUMMARY:**

*Objective:*

Identify and promulgate a list of acceptable material, heat transfer fluids and storage media used in solar home heating and cooling units.

*Approach:*

The following tasks are required to achieve the stated objective:

1. For FY 1977, the list of candidate materials will be reviewed for acceptability of toxicity, flammability, economics and engineering properties as defined in the literature. A publication, identifying those acceptable materials, will be made available to the public.
2. For FY 1978, those materials which required experimental confirmation of acceptability will be reviewed and a supplementary publication will be prepared.

*Benefit:*

Resolution of a major uncertainty related to solar home heating and cooling units.

\* Fully funded by Assistant Secretary for Environment.

Bibliography Reference No. None to Date.

<b>TITLE</b>		<b>ORGANIZATION</b>
Potential Effects of Solar System Working Fluids on Ecosystem		Los Alamos Scientific Laboratory Los Alamos, NM 87545
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 75,000*	D. Wilson	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Los Alamos, NM	17 months—May 1, 1977	W-7405-ENG-36

**PROJECT SUMMARY:**

*Objective:*

Determine the transport and effects of fluids and additives in soils, and to analyze the paths for entry of fluids into ground water supplies.

*Approach:*

The following tasks were required to achieve the stated objective:

1. The capacity of various soils to absorb the fluids and additives and the effects of these fluids on soil chemistry and microbiology were estimated.
2. The effects of working fluids on vegetation, particularly those plants commonly grown near residential and commercial buildings were investigated.
3. The movement of fluids through various soils, geologic formations and ground water were determined.
4. The concentration of working fluids expected in ground water supplies following leakage from heating and cooling systems, and the risk of contaminating municipal and private water supplied were estimated.
5. The effect of working fluids on residential septic systems was determined.
6. The pattern of working fluid leakage expected from normal operations, overheating and fire were considered.

*Benefit:*

1. Estimated the potential danger of working fluid leakage to septic systems municipal and private well systems.
2. Determined the effect of leaked fluids on lawns, gardens and natural vegetation near residential and commercial buildings utilizing solar heating and cooling.

\* Partially (\$37,500) funded by Assistant Secretary for Environment.

Bibliography Reference No. None to Date.



<b>TITLE</b> Disposal and Recycling of Hazardous Chemicals from Solar Heating and Cooling of Buildings (SHACOB)		<b>ORGANIZATION</b> Sandia Laboratories Albuquerque, New Mexico 87115
<b>AMOUNT</b> \$ 30,000	<b>PRINCIPAL INVESTIGATOR</b> H.W. Church	
<b>WORK LOCATION</b> Albuquerque, NM	<b>DURATION-AWARD DATE</b> 19 months—April 1, 1977	<b>CONTRACT NO.</b> (29-1)-789 189 no. SOL-53

**PROJECT SUMMARY:**

*Objective:*

Methods of treatment, packaging, interim storage, transporting and disposal or recycling of selected toxic or hazardous chemicals were evaluated, e.g., transfer fluids that have completed their service life in solar heating and cooling (SHAC) systems.

*Approach:*

The following tasks were required to achieve the stated objective:

1. The proposed safety methods to be used for treatment, packaging, interim storage, transporting, disposal or recycling of the acceptable working fluids were evaluated.
2. The need for new or improved methods to meet the objective was identified.

*Benefit:*

At the present time, there are no established means of disposal of the finite lifetime chemicals of SHAC systems. As a result, toxic liquids may be discarded in municipal sewage systems or directly on the ground.

Bibliography Reference No. None to Date.

<b>TITLE</b>		<b>ORGANIZATION</b>
Over-Temperature and Fire Hazard Investigation of Residual Solar Heating and Cooling Systems		National Bureau of Standards Washington, D.C. 20234
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 50,000	Irwin Benjamin	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Washington, D.C.	20 months—May 1, 1977	I.A. No. EA-77-A-01-6010 TO No. A 045-SE

**PROJECT SUMMARY:**

*Objective:*

Analyze the structural characteristics and operational functions of various heating and cooling designs under consideration by DOE in order to: (1) determine the potential for seepage or introduction of toxic or hazardous substances into areas accessible to people in over-temperature conditions and before, during, or after a fire; and (2) develop countermeasures, where necessary, to safeguard to occupants and the dwelling.

*Approach:*

The following tasks were required to achieve the stated objective:

1. Engineering analyses of eight to ten different systems under development, either partially or wholly by DOE, were conducted.
2. Systems were subjected to over-temperature and fire conditions to identify design features that could result in system or component failures leading to: a) seepage or introduction of toxic or hazardous substances into living or other portion of building structure.
3. Nature of design and/or material defects was determined.
4. Recommendations to improve design and/or upgrade materials to withstand the adverse effects of over-temperature and fire are being developed.

*Benefit:*

The safety of residential SHAC systems with respect to over-temperature and fire are documented as adequate, or the method for upgrading their safety to an acceptable level has been developed. Data for development of improved safety standards will be available.

Bibliography Reference No. None to Date.

<b>TITLE</b> Health Effects of Materials Used in Solar Heating and Cooling Systems: Assessment Using Experimental Biological Systems	<b>ORGANIZATION</b> Lovelace Biomedical and Environmental Research Laboratories Albuquerque, NM 87115	
<b>AMOUNT</b> \$100,000*	<b>PRINCIPAL INVESTIGATOR</b> C. Hobbs	
<b>WORK LOCATION</b> Albuquerque, New Mexico	<b>DURATION-AWARD DATE</b> 17 months—May 1, 1977	<b>CONTRACT NO.</b> EY-76-C-04-1013 189 No. RPIS

**PROJECT SUMMARY:**

*Objective:*

Conduct hazards assessment as needed to define and quantify health effects associated with the large-scale utilization of solar heating and cooling of building technology.

*Approach:*

The following tasks are required to achieve the stated objectives:

1. The results of the preliminary toxicological survey will be reviewed and evaluated by toxicologists.
2. Toxicological testing will utilize a multi-tier approach employing a series of test systems of different biological complexity. To the extent possible, rapid screening in simple biological systems (microorganisms, *Drosophila*, or mammalian cell culture) and short-term testing in intact animals will be emphasized.
3. Quantitative dose-response data will be used to develop predictive models applicable to human exposures; to the extent possible, such models will be validated against human data.

*Benefit:*

Output from the testing effort will help to: (1) develop human exposure guides, (2) define needs for control technology, (3) guide decisions regarding technology advancement, (4) develop cost/risk/benefit analyses, and (5) prepare comprehensive environmental impact statements.

\* Partially (\$50,000) funded by Assistant Secretary for Environment.

<b>TITLE</b> Preliminary Assessment of the Impact of Solar Collectors on Desert Ecosystems		<b>ORGANIZATION</b> Arizona State University Department of Botany and Microbiology Tempe, AZ 85281
<b>AMOUNT</b> \$ 43,068	<b>PRINCIPAL INVESTIGATOR</b> Duncan T. Patten	
<b>WORK LOCATION</b> Tempe, AZ	<b>DURATION-AWARD DATE</b> 18 months—May 1, 1977	<b>CONTRACT NO.</b> EC-77-5-02-4339

**PROJECT SUMMARY:**

*Objective:*

Develop methodological guidelines for the systematic evaluation of the impacts of solar collectors on desert ecosystems. Develop a research plan to monitor ecological impacts at a collector site or simulated model of collector array.

*Approach:*

This was a planning study to evolve a detailed research plan. The investigator determined:

- 1) The instruments, measurements, and experiments required and the results expected from each.
- 2) The advantages and disadvantages of building a simulation model vs. monitoring an actual site.
- 3) Methods for monitoring the effects of construction and routine operations.
- 4) Detailed characteristics of a simulation model.

Investigator searched existing literature and met with officials responsible for solar thermal electric demonstration plants at Albuquerque and Barstow.

*Benefit:*

DOE intends to fund an extensive monitoring program to determine the effects of arrays of solar collectors on the desert ecology. This study will enable us to take the most intelligent approach and resolve methodological problems at an early date.

<b>TITLE</b>		<b>ORGANIZATION</b>
Transport of Toxic Solar Energy Working Fluids Released to the Atmosphere: Information Requirement		Los Alamos Scientific Laboratory Los Alamos, New Mexico 87545
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 13,000*	S. Barr	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Los Alamos, New Mexico	7 months—July 1, 1977	W-7405-ENG-36

**PROJECT SUMMARY:**

*Objective:*

This project involves a two-part objective:

1. Inventory available models and/or routines for determining the atmospheric dispersion, transport and transformations of released working fluids in the vicinity of solar heating and cooling systems.
2. Apply appropriate models and/or routines to particular examples of toxic materials and assess risk exposures.

*Approach:*

Presently available models and/or routines for determining atmospheric transport and dispersion of released compounds will be inventoried and evaluated for use in conjunction with solar heating and cooling systems. Using the most appropriate routines and several simulated hazard situations, determination will be made of the phase, particle size distribution, drift chemical and physical transformations and dose probabilities for various released species and distances from the source.

*Benefit:*

Procedures for study and analysis of atmospheric releases of toxic substances will be documented. Sample "hazard situations" will have been evaluated as regards atmospheric dose and exposure.

\* Fully funded by Assistant Secretary for Environment.

<b>TITLE</b> Ocean Thermal Conversion (OTEC) Resource Assessment Workshop		<b>ORGANIZATION</b> Florida Solar Energy Center Cape Canaveral, FL. 32920
<b>AMOUNT</b> \$ 9,879*	<b>PRINCIPAL INVESTIGATOR</b> Dr. Ross McCluney	
<b>WORK LOCATION</b> Cape Canaveral, FL.	<b>DURATION-AWARD DATE</b> 4 months—June 15, 1977	<b>CONTRACT NO.</b> EG-77-G-05-5547

**PROJECT SUMMARY:**

*Objective:*

Using the workshop as a medium, selected researchers defined data acquisition and reporting programs in support of OTEC siting as well as environmental, resource and technological assessments.

*Approach:*

To satisfy the stated objective, the following steps were taken:

1. A list of knowledgeable oceanographic researchers familiar with the ocean data base at sites of interest to DOE/OTEC was prepared.
2. The workshop was convened and papers presented by researchers were integrated.
3. An integrated proceedings volume was provided to DOE.

*Benefit:*

Provides DOE and Ocean Systems the background for a plan for ocean data acquisition.

\* Fully funded in Ocean Systems Branch, EA 03-04.

<b>TITLE</b> Program Management Support: Biological and Ecological Effects of OTEC		<b>ORGANIZATION</b> Lawrence Berkeley Laboratory Berkeley, CA. 94720
<b>AMOUNT</b> \$ 30,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. Pat Wilde	
<b>WORK LOCATION</b> Berkeley, CA.	<b>DURATION-AWARD DATE</b> 6 months—May 19, 1977	<b>CONTRACT NO.</b> LBL 189 No. 475-C

**PROJECT SUMMARY:**

*Objective:*

Provide program management support to ERAB on all biological/ecological effects of OTEC studies.

*Approach:*

The following tasks were required to satisfy the stated objective:

1. Assessed status and continually reviewed experience with the bio-ecologic effect of large ocean engineering systems which are relevant to OTEC.
2. Evaluated and integrated pertinent knowledge from completed and on-going OTEC projects.
3. Elicited from OTEC contractors their potential bio-ecologic concerns.
4. Summarizing the above points, gaps in knowledge were identified and specific topics for further study were recommended.
5. Headquarters was assisted in the preparation of RFP's; then the products of the RFP's were evaluated and integrated into the bio-ecologic program.
6. Information was disseminated in the form of reports, etc., insuring appropriate OTEC groups were well-informed and have appropriate bio-ecological data.
7. Ameliorating strategies during OTEC tests were recommended.
8. Bio-ecological studies were documented in proper form for eventual use in EA's.

*Benefit:*

Provides a coordinated effort by qualified specialists on all biological/ecological effects of OTEC studies.

<b>TITLE</b>		<b>ORGANIZATION</b>	
Marine Biota Impact Assessment for Ocean Thermal Energy Conversion (OTEC)		Lockheed Center for Marine Research 6350 Yarrow Drive Carlsbad, CA. 92008	
<b>AMOUNT</b>		<b>PRINCIPAL INVESTIGATOR</b>	
\$ 84,925		Mr. Scott Robertson	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>	
Carlsbad, CA.	12 months—September 15, 1977	EG-77-C-06-1032	

**PROJECT SUMMARY:**

*Objective:*

Establish a data base on exposure of marine biota to OTEC discharges for preparation of environmental impact assessments. Consideration to be given to both closed and open cycle discharges.

*Approach:*

The following tasks are required to achieve the stated objective:

1. Laboratory and/or in situ experiments will be designed to assess the effect of exposure to OTEC physical and chemical conditions on ocean flora and fauna, such as corrosion products, screening systems, biocides, etc.
2. Develop a plan for subjecting specific species, common to one or more OTEC candidate sites to chemical and physical environmental changes simulating those anticipated during passage through heat exchangers or in passing through the outflow of the plant, and insure that this plan specified that:
  - a. The observed effects will be analyzed and extrapolated to estimate total impacts of OTEC commercial-size plant operation.
  - b. Assessment will be made of the ecological effects of chemical releases from OTEC plants.
  - c. Assessment will be made of the ecological impact of toxic effects of metallic ion releases from OTEC plants (i.e., corrosion products).
  - d. Assessment will be made of the effect on marine life of screening systems located at OTEC intake structures.

*Benefit:*

A plan and experimental design to provide the data for environmental assessment of OTEC is available prior to final system design.

Bibliography Reference No. None to Date.



<b>TITLE</b> Program Management Support: Oceanographic and Climatic Impacts		<b>ORGANIZATION</b> Argonne National Laboratories 9700 South Cass Avenue Argonne, IL 60499
<b>AMOUNT</b> \$ 60,000	<b>PRINCIPAL INVESTIGATOR</b> Wyman Harrison	
<b>WORK LOCATION</b> Argonne, IL	<b>DURATION-AWARD DATE</b> 9 months—December 31, 1976	<b>CONTRACT NO.</b> ANL 189-49553

**PROJECT SUMMARY:**

*Objective:*

Provide program management support to ERAB (DOE) on all hydrodynamical modeling efforts for OTEC.

*Approach:*

The following tasks were required to achieve the stated objective:

1. Status and direction ERDA(DOE) contracts: E(49-26)1005, E(49-18)2348, and E(11-1)2909 were assessed.
2. These project results were integrated into overall OTEC project.
3. Existing and proposed projects were evaluated.
4. Regular contact with project contractors was provided.
5. Contractor draft reports to ERDA(DOE) were reviewed.
6. Hydrodynamic modeling literature was reviewed.
7. Physical data base improvement for model verification was recommended.

*Benefit:*

A coordinated effort by qualified specialists on all hydrodynamical modeling efforts for OTEC.

<b>TITLE</b>		<b>ORGANIZATION</b>
Theoretical Fluid Dynamical Studies of Resource Availability and Environmental Impact of Ocean Thermal Energy Conversion (OTEC)		Naval Ocean Research and Development Activity (NORDA) Bay St. Louis, Mississippi 39520
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 59,000	Dr. Steve Paiscek	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Bay St. Louis, Miss.	6 months—August 15, 1977	E(49-26)1005

**PROJECT SUMMARY:**

*Objective:*

The objective of this work is to complete the analysis of local and far field environmental impacts associated with OTEC operation.

*Approach:*

The following tasks are required to achieve the stated objective:

1. Assessment of far field thermal impacts;
2. Far field dynamic and thermal impacts;
3. Climate Impacts.

*Benefit:*

The completion of this work will lay the foundation for additional investigation.

<b>TITLE</b> Experimental Study of Flow Problems Related to Ocean Thermal Energy Conversion (OTEC) (Change Order)		<b>ORGANIZATION</b> Hydronautics, Inc. Laurel, MD. 20810
<b>AMOUNT</b> \$ 48,000	<b>PRINCIPAL INVESTIGATOR</b> Dr. T.R. Sundaram	
<b>WORK LOCATION</b> Laurel, MD	<b>DURATION-AWARD DATE</b> 6 months—June 30, 1977	<b>CONTRACT NO.</b> EX-76-C-01-2348 (change order)

**PROJECT SUMMARY:**

*Objective:*

The principal objective of this work was to experimentally investigate the external flow problems unique to OTEC with emphasis on recirculation.

*Approach:*

The following tasks were achieved to satisfy the stated objective:

1. Recirculation experiments for different geometrical configurations were performed.
2. Experiments on combined effects of current and stratification were performed.
3. Limited experiments on 6-foot cube verified and complemented MIT's flow field schematization.

*Benefit:*

Full description of the conditions unique to OTEC that might lead to recirculation of discharge waters causing adverse environmental impacts and reduced OTEC efficiency is available.

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**TITLE**

Ocean Physical Climatic Impacts Model Reviews

**ORGANIZATION**Ocean Data Systems, Inc.  
6000 Executive Boulevard  
Rockville, MD. 20852

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**AMOUNT . .**

\$ 4,952

**PRINCIPAL INVESTIGATOR**Paul Wolff

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**WORK LOCATION**

Rockville, MD

**DURATION-AWARD DATE**

. 1 month—February 28, 1977

**CONTRACT NO.**EG-77-X-01-1807

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**PROJECT SUMMARY:***Objective:*

Review reports on the following ERDA(DOE) contracts: ERDA E(49-26)1005, ERDA E(49-18)2348, ERDA E(11-1)2909.

*Approach:*

The following tasks were satisfied to achieve the stated objective:

1. Problem was stated in realistic terms.
2. Methods used were examined.
3. Assumptions used were evaluated.
4. Applicability of results to OTEC was stated.

*Benefit:*

The results of this effort contribute to DOE management plan and decision as to the direction of further hydrodynamical modeling efforts in support of the environmental assessment of OTEC.

## Technology Assessment

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<b>TITLE</b>		<b>ORGANIZATION</b>
Program Analysis and Development: Values, Community and Decentralization Issue		The Institute on Man and Science Rensselaerville, NY 12147
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 90,000	Dr. Gordon Enk	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Rensselaerville, NY	12 months—September 15, 1977	EX-77-C-01-4120

**PROJECT SUMMARY:**

*Objective:*

To provide program support services and analyses on the areas of values, community, and decentralization.

*Approach:*

Contractor will prepare analytical papers, hold conferences, evaluate strategies and methodologies for conducting future work, identify areas of concern, and review ERAB(DOE) technology assessment documents as requested in the areas of values, community, and decentralization.

*Benefit:*

The issues listed above have been identified by ERAB(DOE) as central to its technology assessment effort. The contractor's effort will help SOLAR to identify problems, develop a research program, and evaluate its technology assessment activities in these three areas.

<b>TITLE</b>		<b>ORGANIZATION</b>
Community Workshops on Social and Environmental Effects of Solar Technologies		University of New Hampshire; Durham, New Hampshire 03820  University of Massachusetts; Amherst, Massachusetts 01002  DOE Richland Operations Office Richland, WA. 99352
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$ 24,000	Fred K. Manasse Richard Beebe Richard Durham	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
various locations	5 months—May 15, 1977	EY-76-5-00-2230

**PROJECT SUMMARY:**

*Objective:*

Assess at the local level, the social, institutional, environmental, and life style effects of the utilization of decentralized solar technologies; involve local groups in the assessment process.

*Approach:*

The contractor worked with the state energy offices and local citizen groups to organize one-day workshops in Durham, NH, Amherst, MA, and Eugene, OR. At the workshops, citizens reviewed DOE documents on solar energy environmental and social effects, and discussed the implications of solar development for their community and region. Workshop proceedings have been prepared by the contractors and submitted.

*Benefit:*

Workshops have provided SOLAR with information about public attitudes and concerns which are likely to affect solar development. They have helped identify local effects of decentralized solar technologies and give citizens a chance to participate directly in the assessment process.



<b>TITLE</b>		<b>ORGANIZATION</b>
Technology Assessment: Decentralized Solar Energy Sources		George Washington University School of Engineering and Applied Science Office of Energy Programs Washington, D.C. 20052
<b>AMOUNT</b>	<b>PRINCIPAL INVESTIGATOR</b>	
\$261,500	Dr. Ali B. Cambel	
<b>WORK LOCATION</b>	<b>DURATION-AWARD DATE</b>	<b>CONTRACT NO.</b>
Washington, D.C.	12 months—April 26, 1977	EG-77-G-01-4040

**PROJECT SUMMARY:**

*Objective:*

Provide a summary of the current state of technology assessment and its applicability to solar energy.  
 Carry out a preliminary assessment of the social effects of decentralized solar systems.  
 Support ERAB (DOE) technology assessment program planning and implementation activities.

*Approach:*

A document will be prepared containing: 1) a description of the methods and purposes of technology assessment and its applicability to policy making in solar energy; 2) a discussion of decentralized solar technologies and the major benefits and drawbacks to their use; 3) an assessment of the social affects of each decentralized solar technology based on a list of quality of life indicators developed by the contractor. Subcontracts will be issued on a task order basis for support activities to the ERAB technology assessment program.

*Benefit:*

From this activity, SOLAR will achieve a clarification of the nature and potential use of technology assessment, a preliminary evaluation of the social effects of decentralized solar technologies and assistance in carrying out its technology assessment program.

<b>TITLE</b> Development of Procedures for a DOE Solar Energy Forecast	<b>ORGANIZATION</b> PRC Systems Sciences Company 2600 Old Springhouse Road McLean, VA 22101	
<b>AMOUNT</b> \$ 37,000	<b>PRINCIPAL INVESTIGATOR</b> Eloise Bean William Babcock	
<b>WORK LOCATION</b> McLean, VA	<b>DURATION-AWARD DATE</b> 14 months—February 1, 1977	<b>CONTRACT NO.</b> EX-76-C-01-2532 T006

**PROJECT SUMMARY:**

*Objective:*

Develop a conceptual framework for a methodology that would be appropriate for a solar energy forecast. Develop a set of key criteria by which alternate energy forecasts and forecast methodologies can be compared and evaluated.

*Approach:*

Methodologies utilized in major post embargo forecasts were reviewed; specific technology forecasts for individual solar applications were reviewed; regional energy models to provide the basis for the necessary inclusion of the regional aspects of solar energy technologies were reviewed; a set of key criteria to compare and evaluate alternate energy forecasts and methodologies was developed; regional aspects of the forecast conceptual framework were analyzed; a conceptual framework within which a solar energy forecast can be performed was developed.

*Benefit:*

The conceptual framework represents the appropriate scope and depth for a DOE solar energy forecasting methodology. The framework is complete in its identification of the important technological considerations of each solar technology and the crucial interactions between these solar technologies and the entire energy system.

<b>TITLE</b> Assessment of a Methodology for Conducting State Level Technology Assessment and Planning	<b>ORGANIZATION</b> University of Tulsa Tulsa, OK 74104	
<b>AMOUNT</b> \$ 50,000	<b>PRINCIPAL INVESTIGATOR</b> Bruce V. Ketcham	
<b>WORK LOCATION</b> Tulsa, OK	<b>DURATION-AWARD DATE</b> 18 months—April 1, 1977	<b>CONTRACT NO.</b> EG-77-G-05-5445

**PROJECT SUMMARY:**

*Objective:*

Work with the State of Oklahoma determined the elements and organizational infrastructure required to ensure that long- and short-term social factors are addressed in the development of a solar energy plan.

A model for state/regional technology planning in solar energy development was provided.

*Approach:*

Planned and conducted a workshop, including the selection of participants, preparation and distribution of background materials and the convening of the workshop itself; evaluated the workshop; prepared a state solar energy plan to be reviewed by consultants, an advisory committee, and DOE.

*Benefit:*

The project aids SOLAR/DOE efforts in three areas: 1) the assessment of the social impact of solar energy technology development; 2) the collection of solar resource data; 3) the development of planning mechanisms for ensuring that technology assessment planning is accomplished on a state/regional level with public involvement.

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**Materials Assessment:  
Materials Resource Assessment**

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<b>TITLE</b> Critical Materials and Processes Analysis		<b>ORGANIZATION</b> Batelle-Pacific Northwest Laboratories Richland, WA 99352
<b>AMOUNT</b> \$285,000	<b>PRINCIPAL INVESTIGATOR</b> Raymond Watts	
<b>WORK LOCATION</b> Richland, WA	<b>DURATION-AWARD DATE</b> 14 months—October 1, 1977	<b>CONTRACT NO.</b> E(45-11-1830)

**PROJECT SUMMARY:**

*Objective:*

Identify the criticality of materials and manufacturing processes to the implementation of solar energy; develop an interactive model so the impacts of solar energy and on solar energy can be assessed.

*Approach:*

Assessment of the criticality of material and manufacturing processes includes identifying limited material resources, manufacturing capabilities and manufacturing processes that are energy intensive.

This inventory was placed in a computer model so the data and changes can be actively manipulated to forecast impacts on and of solar energy.

*Benefit:*

Critical materials and manufacturing processes posing barriers to solar energy implementation were identified. Analysis of these materials and processes suggest alternatives so solar energy commercialization will not be impeded. The active computer model insures efficient access to the data and allows manipulation so forecasts can be made of the impacts on and of solar energy.

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## **Appendix On Unsolicited Proposal Requirements**

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# APPENDIX ON UNSOLICITED PROPOSAL REQUIREMENTS

SOLAR recognizes that the unsolicited proposal is a valuable means by which unique or innovative methods or approaches can be made available in developing energy technology. Unsolicited proposals are offered in the hope that SOLAR will enter into a contract with the offeror for researching, developing, or providing services indicated within the proposal. These proposals should not be merely an advance proposal for a specific requirement which would normally be procured by competitive methods.

It is SOLAR's policy to encourage and foster the submission of unsolicited proposals. Since the preparation of an unsolicited proposal represents a substantial investment of time and effort by the offeror, organizations or individuals who are interested in submitting an unsolicited proposal are encouraged to make preliminary inquiries relating to SOLAR's needs before expending extensive effort in preparing a detailed unsolicited proposal.

Favorable evaluation of an unsolicited proposal is not, in itself, sufficient justification for SOLAR to enter into contract with the offeror. Generally, any unsolicited proposal is unacceptable and must be rejected if it (a) is available to the Government without restriction from another source, (b) closely resembles that of a pending competitive solicitation, or (c) is not sufficiently unique to justify acceptance.

Individuals and organizations may submit unsolicited proposals at any time to SOLAR. Proposals related to solar energy programs may be submitted to:

Division of Solar Technology  
Office of the Director  
U.S. Department of Energy  
Washington, D.C. 20985

Since unsolicited proposals may form the basis for technical evaluation or contract negotiations, each should contain detailed information on the purpose and objective of the proposed work; an indication of the offeror's background and previous experience; a concise statement of work; information relating to organization, facilities, and qualifications; other pertinent data; and a detailed cost estimate.

Because of the great degree of interest in solar energy programs and the similarities among many proposed concepts and research and development ideas (which pre-

clude funding them on an unsolicited basis), most projects are supported as a result of solicitations. Solicitation mechanisms used by SOLAR include:

- a. *Requests for Proposals*. Requests for Proposals (RFP) are used to contract for a specific scope of work.
- b. *Program Research and Development Announcements*. The Program Research and Development Announcements (PRDA) are used to solicit proposals where a specific need is not sufficiently definable to use the traditional RFP process.
- c. *Program Opportunity Notices*. The Program Opportunity Notices (PON) are used for technological demonstrations where the objective is the acceleration of commercial application of new energy technologies and systems.

By their very nature, demonstration projects for solar energy technology do not lend themselves to consideration on an unsolicited basis. In addition, innovative concepts submitted on an unsolicited basis should promise a clear benefit to the solar energy program by offering a potential for improvement in cost or performance over other approaches.

Additional information on proposal preparation may be found in:

- a. *Guide for the Submission of Research and Development Proposals by Individuals and Organizations*, available at no cost from DOE, Division of Procurement, Washington, D.C. 20545.
- b. *Guide for the Submission of Research Proposals from Educational Institutions*, available at no cost from DOE, Office of University Programs, Washington, D.C. 20545.
- c. *Guide for the Preparation of Proposals for Special Projects in Energy Education and Training*, available at no cost from DOE, Office of Public Affairs, Educational Programs Branch, Washington, D.C. 20545.

Procurement regulations containing additional information concerning contracting policy and procedures are available at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.