# FY-81

# ANNUAL OPERATING PLAN

## CENTRAL

## RECEIVER SYSTEMS

## PROGRAM

FISCAL YEAR 81

# ANNUAL OPERATING PLAN

# SOLAR THERMAL SYSTEMS/APPLICATIONS

San Francisco Operations Office
U.S. Department of Energy

February 1981

FY81 AOP

Solar Thermal Systems/Applications

TABLE OF CONTENTS

I. Budget Summary

# Section I

## Budget Summary

Section I.

SOLAR THERMAL SYSTEMS AND APPLICATIONS
PROJECTS BUDGET SUMMARY

(Revised FY 81 Budget Breakout for SAN AOP for
Solar Thermal Systems/Applications (BA, $M)

| WBS | Task/Project | | Oper. | Constr. | Total |
|---|---|---|---|---|---|
| 1.0 | Industrial Process Heat (IPH) Systems and Applications Group | Subtotals: | 8.00 | 0.01 | 8.01 |
| | 1.1 IPH Line-Focus Projects | | 3.10 | 0.01 | 3.11 |
| | 1.2 IPH Central Receiver (CR) Retrofit Projects | | 2.00 | 0.00 | 2.00 |
| | 1.3 Solar Thermal Enhanced Oil Recovery (STEOR) Projects | | 0.50 | 0.00 | 0.50 |
| | 1.4 CR Cogeneration Projects | | 2.40 | 0.00 | 2.40 |
| 2.0 | Electric Systems and Applications Group | Subtotals: | 10.55 | 18.00 | 28.55 |
| | 2.1 Solar CR 10 MWe Pilot Plant | | 5.60 | 18.00 | 23.60 |
| | 2.2 Utility CR Repowering Projects | | 4.20 | 0.00 | 4.20 |
| | 2.3 IEA Small Solar Power Systems (SSPS) Projects | | 0.25 | 0.00 | 0.25 |
| | 2.4 Advanced Central Receiver (ACR) Utility Systems | | 0.50 | 0.00 | 0.50 |
| 3.0 | Environmental Studies | Subtotals: | 0.355 | 0.00 | 0.355 |
| | | TOTALS: | 18.905 | 18.01 | 36.915 |

# II. Executive Summary

## Section II. Project Executive Summary

The United States Department of Energy (DOE) is engaged in the development and commercialization of solar thermal systems as a means of significantly increasing the potential for solar energy to reduce our nation's dependency upon nonrenewable and imported fuels. The DOE Solar Thermal Energy Systems (STES) program element of the Solar Applications for Industry sub-program involves phased activities to assist United States industry in establishing the technical and economic readiness of mid- and high-temperature solar concentrating collector systems as a prerequisite to commercialization. In the present phase, designs are being developed and evaluated designs are being integrated into Technical Feasibility Demonstration experiments and pilot plants.

The major markets identified thus far for energy produced by solar thermal systems are industrial process heat and electric power generation. To penetrate these markets Solar Thermal Systems and Applications is pursuing projects in an Industrial Process Heat (IPH) Systems and Applications Group and an Electric Systems and Applications Group. Supporting work is being done on Solar Thermal Energy Systems Environmental Studies and Market Assessment as they relate to the STES program element mission. The foundation for the Solar Thermal Systems and Applications project groups is the current and previous work performed by the STES Research and Development and Technology Development branches. Their vigorous efforts to identify and solve fundamental problems and develop the critical solar components to the point that the designs which are most attractive are near manufacturing readiness provide Systems and Applications a technology resource to draw from for its projects.

For the IPH Systems and Applications Group and the Electric Systems and Applications Group this technology resource has been and is being utilized at various levels for their activities. Projects such as the Solar Central Receiver 10 MWe Pilot Plant, IEA Small Solar Power Systems, and IPH Line-Focus will be near or become operational in FY 81. IPH Central Receiver Retrofit and Utility Central Receiver Repowering, have completed the first phase of site-specific conceptual designs. Seven Central Receiver Cogeneration projects will complete similar site-specific conceptual designs in FY81. A Request of Proposals for advanced conceptual design work for all these applictions -- electric generation, industrial process heat and cogeneration-- will be issued and contracts expected in FY81.

Section II.

1.1 Industrial Process heat (IPH) Line-Focus Projects

A. Project Description and Goals

The IPH line-focus projects are experiments initiated over several years of technology base development as a means of demonstrating state-of-the-art components and subsystems required for solar energy applications. As sufficient technology became available to warrant the support of an experiment, industry was given an opportunity to competitively participate in the design, construction, and operation of solar system experiments meeting specific DOE requirements. The systems are retrofited into existing commercial industrial facilities and are either ground or roof mounted fields of line-focusing concentrating (trough) collectors.

The projects have progressed from low temperature (<212°F) applications through intermediate to high-temperature (212°F-550°F) heat/steam applications. Early system experiments use an average 10,000 square feet field of collector aperature. Based on the success of the small-scale experiments, large scale projects cost-shared by the government and industry are under construction. The goals of these projects are to (1) demonstrate safe, reliable, commercially available solar systems in near-term markets, (2) acquire system performance data and operating costs, and (3) reduce system costs through economies of scale.

B. Project Status

Nine IPH systems are presently under construction, eight of which are scheduled to be completed, tested and accepted during FY81. Each project was competitively selected over the period 1977 to 1979 through solicitations in specific technical ranges i.e., low temperature/pressure or high temperature/pressure heat or steam delivered. At the end of Phase I - design, each project is evaluated for construction, Phase II. Included in the construction phase is system testing and acceptance. It is at this point that each project is expected to perform as a commercially viable system. Each accepted system is then run through Phase III-Operations which is expected to be 1-2 years of data collection/analysis and training the owner in system operations and maintenance.

C. FY80 Major Project Accomplishments

- Developed solar system check-out procedure and testing plan.
- Accepted solar system Johnson & Johnson Pharmecutical Plant, Sherman, Texas and initiated operations.
- Completed final designs of four large-scale (50,000 $ft^2$) line-focus IPH systems.

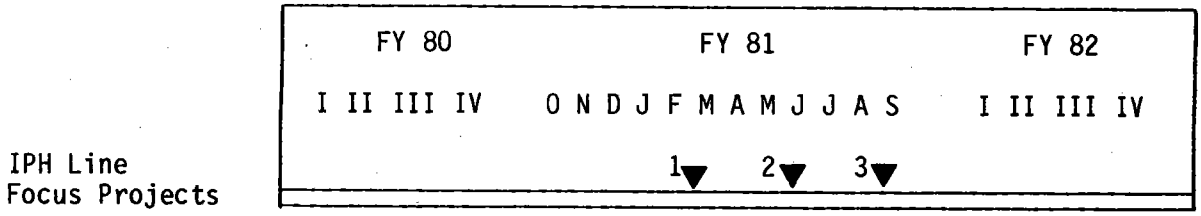
D. FY81 Planned Accomplishments

- Complete construction and acceptance testing of six experimental line-focus steam producing systems in 212°F-550°F range; initiate operations.

Section II.

- Complete construction and acceptance testing of two large-scale demonstration projects.
- Complete final design and initiate construction to upgrade field test systems.
- Publish report on Standardized Data Acquisition Systems.

E. Controlled Milestones and Schedule




1. Conduct acceptance testing of 3 small-scale systems.
2. Conduct acceptance testing of 3 small-scale systems.
3. Conduct acceptance testing of 2 large scale demonstration systems.

F. Resource Summary

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| IPH Line Focus Projects | 3.1 | 2.6 | .01 | .01 |

G. Major New or Continuing Procurements

See attached "Upcoming Procurement" Forms.

Section II.

1.2 IPH CR Retrofit Projects

A. Project Description and Goals

"Retrofit" is the integration of a solar central receiver system into an existing industrial facility to supply a substantial portion of the daytime process heat requirements with solar energy. CR Retrofit applications are diverse since the IPH process requirements include both process steam and direct process heat (air) and vary from 350°F to 2500°F. CR Retrofit has the potential of displacing up to 0.5 quads of fossil fuel per year after 1990 in the Southwest, and like Repowering, has potential for saving enormous quantities of fossil fuel.

The objectives of Retrofit Projects are similar to those of the Repowering Projects as outlined in Section II.2.2A, but focussed on industrial heat applications rather than the generation of electricity.

B. Project Status

A strong response from industry and utilities was received to the RFP issued in FY80 for conceptual designs and six retrofit proposals were selected and completed in that year. A second RFP will be issued in FY81 for continued design work on the most promising projects. Final design and construction of projects will follow.

C. FY80 Major Project Accomplishments

- Awarded six contracts on conceptual designs for Solar CR Retrofit
- Completed and published six Retrofit conceptual designs
- Completed technical evaluations of all Retrofit conceptual designs

D. FY81 Planned Project Accomplishments

See Section II.2.2.D (Repowering)

E. Controlled Milestones and Schedule

See Section II.2.2.E (Repowering)

F. Resource Summary

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| Retrofit | BA | BO | BA | BO |
| | 2.0 | 2.0 | -- | -- |

G. Major New or Continuing Procurements

An RFP to be issued in FY81.

Section II.

1.3 Solar Thermal Enhanced Oil Recovery Projects

A. Project Description and Goals

A requirement for large amounts of medium temperature thermal energy in the form of steam for enhanced oil recovery (EOR) exists in an essential industry, the domestic oil industry. Satisfying this requirement in part with solar energy will accomplish several objectives. It will reduce the consumption of scarce national resource, crude oil, in producing steam for enhanced oil recovery. It will increase the potential production of this resource in those oil fields in which environmental constraints prevent further burning of fossil fuels for steam generation. It will also prove to be a primary stimulant toward the use of solar energy for other industrial process heat applications. The use of steam for EOR of heavy oil constitutes a very large market for medium temperature concentrating solar thermal systems. Even if only fractionally penetrated by solar, this market could so stimulate the increase in production base for solar thermal systems as to cause major cost reductions. With prospective cost reductions of the order to 50% from 1980 costs, many other IPH markets could be opened to the application of solar thermal energy systems.

Surveys show that most of this market can be satisfied by steam at 500°F, thus allowing penetration by either line-focus or point-focus systems, with the choice left to the user.

The specific accomplishments anticipated from this program include stimulation of oil industry interest in solar steam generation for EOR development of information documenting the technical and feasibility of this solar application. They also include the execution of projects which the oil industry itself determines to be needed to support private ventures in the use of solar thermal energy for enhanced oil recovery.

B. Project Status

The issuance of Program Opportunity Notice (P.O.N.) in early 1979 led to the award of two design studies for line-focus solar steam generating systems to start in October 1979. One of the studies resulted in a combination of solar system design and oil field selection which exhibited too many technical uncertainties to warrant further DOE support of a hardware installation and test phase. The other design study resulted in an interesting solar system design but the contractor rejected further DOE support in favor of a totally private venture which, however, subsequently was cancelled. A new program plan was developed based on the information developed by these studies, and implementation of the plan was initiated in September 1980 with a data search centered on oil field data of importance to future solar thermal EOR (STEOR) system design and market analysis. A sample of major oil producers on the four largest heavy crude fields in California was contacted to determine applicable technical and economic facts and projections. In November 1980, an opinion survey will be initiated to determine industry attitudes and concerns relating to STEOR and to solicit input concerning industry preferences with respect to STEOR performance

and economic requirements. Concurrently, studies into the financial requirements of STEOR will be initiated to determine under what business and economic arrangements STEOR system purchase and use by industry would be viable without further direct DOE financial support.

The results of these various studies will be evaluated and presented to the oil industry shortly to assist that industry in clarifying its needs for DOE program-type support to private initiatives using solar for enhanced oil recovery.

C. FY80 Major Project Accomplishments

- Two industry studies and preliminary systems designs for STEOR were published which showed that the use of line-focus concentrating collectors for steam generation at pressures up to 800 psia was feasible; also that EOR market for solar steam generation systems is sufficiently large to accomplish DOE 50% cost reduction goals for parabolic collectors by 1985.

- Initiated work to collect technical data pertinent to oil field steam requirements, current and future steam capacity requirements on major oil field properties.

D. FY81 Planned Project Accomplishments

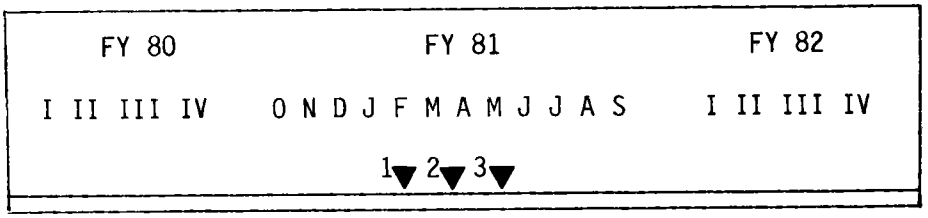
- Continue studies of financial arrangements to allow profitable acquisition of STEOR systems by private industry without DOE subsidy.

- Complete collection and correlation of technical data and industry opinion pertinent to oil field steam requirements to serve as basis for market analysis and future STEOR system designs.

- Conduct information exchange workshop or private meetings with industry to develop plans for specific projects which provide technical support to privately financed industry STEOR projects and which respond to needs defined by the oil industry.

- Complete revised STEOR program plans based on information obtained from project activities.

E. Controlled Milestones and Schedule



Section II.

1. Complete correlation of technical data and analysis of industry opinion pertinent to oil field steaming requirments.

2. Conduct workshop with industry to determine needs defined by oil industry to support privately financed STEOR systems.

3. Complete revised STEOR program plans.

F. Resource Summary

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| STEOR | 0.500 | 0.500 | -- | -- |

G. Major New or Continuing Procurement

To Be Determined

Section II.

1.4 Central Receiver (CR) Cogeneration projects

A. Project Description and Goals

Cogeneration systems provide electrical and/or mechanical energy plus thermal energy and are also referred to as Total Energy Systems. A Central Receiver (CR) Cogeneration system consists of a solar central receiver integrated into a new or existing cogeneration facility. A CR cogeneration facility has an advantage over other types of electric power plants or fuel burning installations because cogeneration is currently not classified as either an electric power plant or a major fuel burning installation and is therefore exempt from the requirements of the Fuel Uses Act. Cogeneration is also promising because it requires lower capital cost per energy unit produced since the conversion of energy producted to useful work (electrical, mechanical, thermal) approaches 100%.

The objectives of the CR Cogeneration Projects are to obtain site specific engineering designs, system specifications, economic criteria, and operating experience with central receiver technology. Also, these projects will reduce the amount of fossil fuels consumed/or electrical and thermal energy and provide a market for large scale production of heliostats, the most expensive component of the central receiver system. The DOE CR cogeneration program will provide technical data to the potential user to guide the user in selecting the optimal system configuration for the given application.

B. Project Status

It was recognized that CR cogeneration holds promise for effecting lower capital cost per unit energy consumed due to the nearly complete utilization of the solar energy collected. Also, the potential market for solar cogeneration is significant. However, much less is known about specific potential applications of CR cogeneration than about utility repowering or IPH retrofit. As such, the cogeneration cycle, in its conceptual phase, carries a strong component of the users educating DOE, both in their proposals and in the resulting studies.

CR cogeneration was identified in FY 79 as an important element in the Central Receiver Program. The concept and planning was developed in FY80 and resulted in a Request for Proposal (RFP) being issued for "Conceptual Design of a Solar Central Receiver System Integrated with a Cogeneration Facility." Proposals were requested in two categories:

Category A: CR cogeneration for Industrial process.

Category B: CR cogeneration for heating applications.

The responses were very favorable and seven proposals were selected for funding; five in category A and two in category B. The plan is for a nine month conceptual design study period, following which the Cogeneration Program will merge with the Repowering Program, with the objective of cost-shared demonstration projects.

Section II.

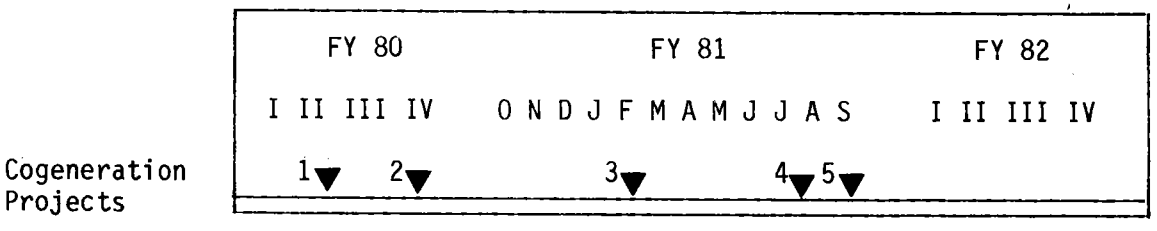
C. FY 80 Major Project Accomplishments

- Received authority to issue an RFP for "Conceptual Design of a Solar Central Receiver System Integrated with a Cogeneration Facility".
- Selected seven proposals for funding; five in category A and two in category B.
- Negotiated and let contracts for the selected proposals.

D. FY 81 Planned Project Accomplishments

- Complete the seven site specific CR cogeneration conceptual design studies
- Publish the final reports from the conceptual design studies
- Issue an RFP for continued design work for cogeneration, repowering and industrial process heat applictions.

E. Controlled Milestones and Schedule




1. Approval to issue RFP
2. Negotiate and let contracts for site specific conceptual designs
3. Mid Term review of contractors conceptual designs
4. Publish final reports of contractor conceptual designs
5. Award contracts under RFP for continued design work. Cogeneration program merges with Repowering Program.

F. Resource Summary

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| Cogeneration Projects | 2.4 | 2.4 | -- | -- |

Section II.

G. Major New or Continuing Procurements

None currently planned from the FY 81 DOE program budget.

Section II.

## 2.0 Electric Systems and Applications Group

### 2.1 10 MWe Solar Thermal Central Receiver Pilot Plant

#### A. Project Description and Goals

The Pilot Plant is sized to provide 10 MWe to the grid using water/steam as the working fluid. The tower mounted receiver is a once-through to superheat external type unit operating at approximately 1500 psig and 950°F. A dual admission turbine also accepts steam from the thermal storage system at approximately 400 psig and 550°F. The oil/rock thermal storage system operates on a thermocline principal and is sized to provide at least 28 MWe-hrs at a peak power of 7 MWe. The 1818 heliostats are glass/metal structures which continuously track the sun via computer control.

The project is a joint utility and Government funded project. The Associates, comprised of Southern California Edison Company, the Los Angeles Department of Water and Power, and the California Energy Commission, are participating in the engineering management, construction, and technology transfer activities of the project, in accordance with a Cooperative Agreement between DOE and the Associates. The plant will be built on Southern California Edison property east of Barstow at Daggett.

The overall project capital cost of $139.5 million is divided between the Department of Energy (DOE) and the Associates. DOE is funding the solar facilities ($118 million) portion of the plant and the associates are funding the turbine-generator facilities ($21.5 million). The plant will be operated and maintained by Edison operations personnel, but costs will be shared between DOE and Edison.

The project is the first U.S. integration of central receiver hardware and software into a functional power generation plant whose performance and reliability will be assessed in a utility operational context. Primary objectives are to demonstrate technical feasibility, economic potential, environmental acceptability, and to serve as a test facility for the follow-on Repowering Projects.

#### B. Project Status

The project is a cooperative effort between DOE and a Utility partner who was chosen in January 1977. The prime DOE industrial design contractors were selected in August 1978. Site construction was begun in September 1979 under the guidance of an industrial construction manager.

#### C. FY 80 Major Project Accomplishments

- Completed Plant Preliminary Design
- Selected Heliostat Production Supplier
- Completed Site Earthwork
- Completed Heliostat Foundation Installation
- Opened Visitor Information Center
- Awarded Mechanical Contract

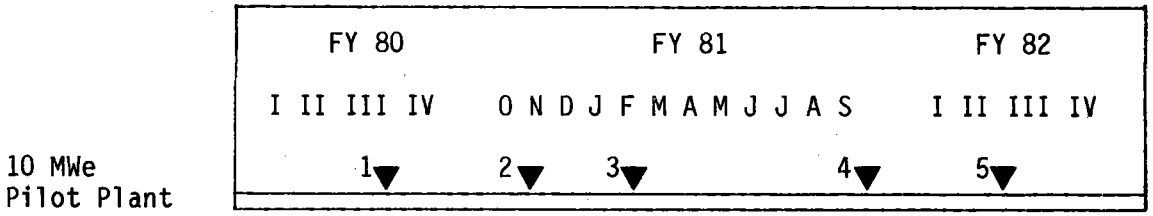
Section II.

D. FY 81 Planned Project Accomplishments

- Implement "Test" Facility activities as agreed to by Congressional Committees
- Complete all site construction
- Prepare for Startup and Operational Testing

E. Controlled Milestones and Schedule

Critical benchmarks in FY 81 leading to the key milestone of turbine roll in December 1981 are shown below:




1. Under Secretary release for continued site construction
2. $8M additional funding available
3. $10M authorization/appropriation available to complete $118M TEC
4. Complete site construction
5. Turbine roll

F. FY81 Resource Summary

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| 10 MWe Pilot Plant | 5.60 | 5.60 | 18.0 | 68.0 |

G. FY81 Major New and Continuing Procurements (B/A $M)

- DOE Laboratories .85
- Federal Research Center .7
- Industrial Contractors 20.17
- Cooperative Agreement 1.88

Section II.

## 2.2 Utility CR Repowering Projects

### A. Project Description and Goals

"Repowering" is the integration of a solar central receiver system into an existing utility facility to supply a substantial portion of the daytime peak electric power requirements with solar energy. Repowering projects represent a near term objective since they can be constructed and operated within the next 4-6 years because they will use existing power generating systems. Repowering has the potential of displacing up to 0.5 quads of fossil fuel per year in the Southwest after year 1990 and therefore offers a significant potential benefit as fuel saver.

The objective of the Repowering projects is to obtain engineering designs, detailed systems specifications, cost/benefit ratios, and detailed construction and procurement plans for site-specific applications. These projects will familiarize as many potential users as possible to the technical, and economic aspects of central receiver technology.

### B. Project Status

The Repowering, Retrofit, and Cogeneration projects will be the major step between the 10 MWe Pilot Plant and ultimate commercialization of central receiver technology, and as such, will receive a high priority in the overall Central Receiver Program. A strong response from industry and utilities was received to the RFP for repowering and retrofit conceptual designs in FY80 and seven repowering proposals were selected and completed in that year. Repowering projects appear feasible in the immediate future because the utilities' energy requirements are well defined, utilities amortize investments over periods of several years and repowering has potential to displace 0.5 quads per year of fossil fuels after the year 1990. An RFP will be issued early in FY81 to continue design work on the most promising projects. Final design and construction of projects will follow.

### C. FY80 Major Project Accomplishments

- Awarded seven contracts on conceptual designs for Solar Central Receiver Repowering.
- Completed and published seven Repowering conceptual designs
- Completed technical evaluations of all Repowering conceptual designs

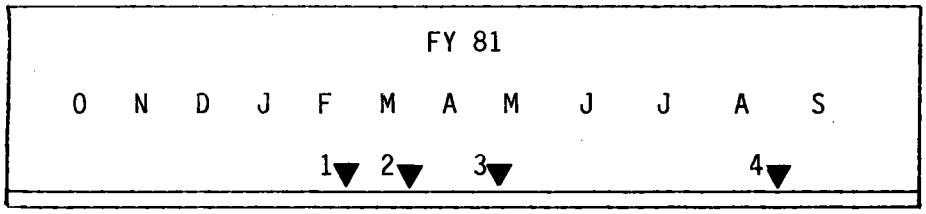
### D. FY81 Planned Project Accomplishments

- Complete the Program Element Plan for Repowering/Retrofit/ Cogeneration
- Issue an RFP for additional site based design and analysis work

Section II.

- Convene a CEB to evaluate proposals to the RFP.
- Award contracts to the most qualified proposals responding to the RFP.

E. Controlled Milestones and Schedule




1. Complete the Program Element Plan for Repowering/Retrofit/ Cogeneration.
2. Issue and RFP for additional site based design and analysis work.
3. Convene a CEB to evaluate proposals to the RFP.
4. Award contracts to the most qualified proposals responding to the RFP.

F. Resource Summary

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| Repowering | 4.2 | 4.2 | -- | -- |

G. Major New or Continuing Procurements

An RFP to be issued in FY81.

Section II.

## 2.3 IEA Small Solar Power Systems (SSPS)

### A. Project Description and Goals

The International Energy Agency (IEA) is an autonomous body within the Organization for Economic Cooperation and Development (OECD). One of the solar demonstration projects undertaken by the IEA is the SSPS projects being built in the Province of Almeria, Spain. SSPS projects funding is from contributions by the nine participating IEA member countries of Austria, Belgium, Germany, Greece, Italy, Spain, Sweden, Switzerland and the United States of America.

The SSPS projects consist of a Central Receiver System (CRS) plant and a Distributed Collector System (DCS) plant with similar 500 KWe outputs located adjacent to each other. Liquid sodium is the primary receiver heat transfer fluid in the CRS. Sodium operating temperatures are between 270°C and 530°C. The DCS uses oil as the heat transfer fluid in the line-focus collectors with temperature limits of 225°C to 295°C.

The goals of the IEA SSPS projects are to (1) determine the the readiness of these two solar technologies to deliver electric power to a utility grid or stand-alone operations, (2) acquire data on the operational reliability, investment costs, and running cost of these plants, and (3) determine what further technical and economical developments are required for widespread electrical applications of these small solar power systems.

### B. Project Status

In CY 1977 seven DCS proposals and five CRS proposals were evaluated by an international team to select one DCS and CRS concept for a final design phase. This final design phase was the one year Stage 1 of the IEA SSPS projects. Based on the results of Stage 1, which ended in CY 1978, and after re-evaluating the scope of the projects and receiving firm commitments for funding from the participating IEA member countries, the IEA SSPS projects entered Stage 2 in May, 1979. Stage 2 comprises a two year period for the procurement, manufacturing, and installation of the plants and a subsequent two years of test and operations. By the start of FY 81 both plants will be over half way through their construction phase. At the end of FY 81 both plants will be operation and will have just started their test and operation phase. FY 82 will include a significant part of the test and operation phase with the balance being done in FY 83. The current Stage 2 of the IEA SSPS projects ends in May, 1983.

### C. FY 80 Major Project Accomplishements

- Completed the Critical Design Review, required before the contractors could begin procurement and manufacturing, of the CRS plant (excluding the heliostat field system) and the DCS plant.

- Contracted for the heliostat field and completed the Critical Design Review of the heliostat field system which uses the 10 MWe Pilot Plant heliostat modified to have different focal lengths for IEA.

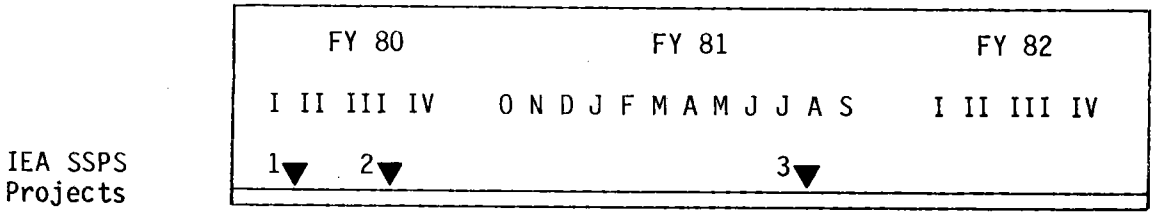
Section II.

- Contracted, started, and completed site civil construction including main plant building, offices, warehouse, and heliostats and collector field foundations.
- Began the installation of CRS equipment at the site consisting of storage tanks, sodium heat transfer components, and electrical subsystems.
- Began installation of DCS equipment at the site consisting of German and United States collectors, storage vessel and piping, and power conversion components.

D. FY 81 Planned Accomplishements

- Finalize the planning for the test and operations phase including contracting for plant operators, establishing an international team of experts to plan and conduct tests, and develop a reporting system to provide data to participating countries.
- Complete installation of all CRS equipment at the site, perform functional testing of subsystems and systems, perform acceptance testing of CRS plant, and begin test and operations phase.
- Complete installation of all DCS equipment at the site, perform functional testing of subsystems and systems, perform acceptance testing at DCS plant, and begin test and operations phase.

E. Controlled Milestones and Schedule




1. Start civil work at the site
2. Start installation of plant equipment
3. Plant acceptance and begin test and operations

Section II.

F. Resource Summary

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| IEA SSPS Projects | .250 | .250 | -- | -- |

Note: US/DOE contribution to IEA projects for FY 81 is 1.14 million Deutsche marks. Converted to dollar from Deutsche marks, using an exchange rate of $1 = 1.8 DM, this is equivalent to 633.4 thousand dollars.

G. Major New or Continuing Procurements

None currently planned from the FY 81 DOE program budget.

Note: IEA project procurements are made from the IEA project budget which consists of contributions from participating countries.

Section II.

## 2.4 Advanced Utility Central Receiver Systems

### A. Project Description and Goals

The goal of this task is to maintain a channel for identification, development (where appropriate and potentially cost-effective) and evaluation of solar central receiver technologies and applications which:

- Offer mid-to-long-term payoff in terms of performance/cost ratios and energy/capacity displacements exceeding those of the steam Rankine, tower-heliostat configurations now in the implementation stage;
- Involve potential utility and related applications beyond the scope of the near-term repowering projects.

To achieve maximum leverage from the funds allocated to this task, emphasis is placed on cooperative undertakings with utility-oriented institutions and other governmental agencies, and on involvement of small and small/disadvantaged business and educational institutions. Examples of FY81 work underway or currently under consideration under this task include:

- Support (on a no-funds-exchanged basis) of the Electric Power Research Institute (EPRI) open-Brayton cycle hybrid Full System Experiment, which incorporates the Boeing-built 1-MWt, 1500°F hot-air cavity receiver successfully tested in 1978-79 at the DOE CRTF, with a fossil combustor and a modified 100-200-kWe gas-turbine generator set; testing and operational evaluation at the CRTF are scheduled for late 1982;
- Coordinated support (with EPRI) of further development of utility-oriented performance, cost and operational modeling of solar central receiver electrical power plants; for 1981, Westinghouse will evaluate operational strategies for solar power plants in otherwise conventional generation systems, and initiate development of a dynamic, optimal dispatching model for such systems;
- Continued data exchange and site parameter evaluation for the proposed Water & Power Resources Service (WPRS) 100-MWe solar central receiver power plant utilizing the Lower Colorado River hydroelectric system as an effective long-term storage component; by far the most effective approach to long term storage available to date, this concept will be applicable to a number of utility systems;
- Completion of a cost/performance evaluation by Veda, Inc. (a small business enterprise) of an innovative central receiver configuration involving elevated heliostats and a low-level receiver, with potential application to industrial use in areas of high land value.
- Extension of testing of liquid-metal heat pipes intended for a 1500°F-plus hot-gas solar receiver by Dynatherm, Inc. (a small business) to obtain statistical confidence in the life expectancy of such units under thermal cycling duty.

Section II.

B. Project Status

Current status of the efforts under this task described in the previous paragraph is as follows:

- The EPRI/Boeing FSE design phase was initiated in mid-1980, and preliminary design review was completed at the end of the year. Detail design review and decision to proceed to fabrication/assembly is expected in early 1981;

- In 1980, Westinghouse completed evaluation of cost/performance of advanced central receiver peaking, hybrid and storage-coupled plant concepts in six synthetic utility systems adapted from EPRI models. With moderate-duration storage (3-6 hrs.), and if DOE cost goals are met, advanced plants can be competitive in high-insolation areas where oil and gas are in use to some extent;

- The report of the WPRS assessment (concept definition and site selection) study, completed in February, 1980 was released in September; PL 96-375 authorized (subject to appropriation of funds required) the Service to proceed to a 3-year feasibility (preliminary design and cost estimation) study of a 100-MWe central receiver plant in AZ, CA or NV, tied into the Lower Colorado hydroelectric/fossil grid; Yuma, AZ is the preferred site;

- The Veda Unified Heliostat Array offers improved optical performance, but is not cost competitive with "conventional" central receiver systems unless very high land values are assumed; beneficial use of the heliostat support structure to further offset cost was excluded from the study.

- Approximately 250 thermal cycles on six Dynatherm heat pipes (tested under subcontract to the Bechtel combined-cycle follow-on) showed satisfactory performance and no failure; additional cycling, however, is required to verify 30-year life at a satisfactory confidence level.

C. FY80 Major Accomplishments

The principal accomplishment of FY80 under this task was the completion, publication and legislative endorsement of the recommendations of the jointly funded assessment study by WPRS of a 100-MWe solar thermal central receiver generating plant integrated into the existing, hydroelectric-dominated Lower Colorado regional grid.

D. FY81 Planned Accomplishments

- Publish Veda UHA Economic Analysis

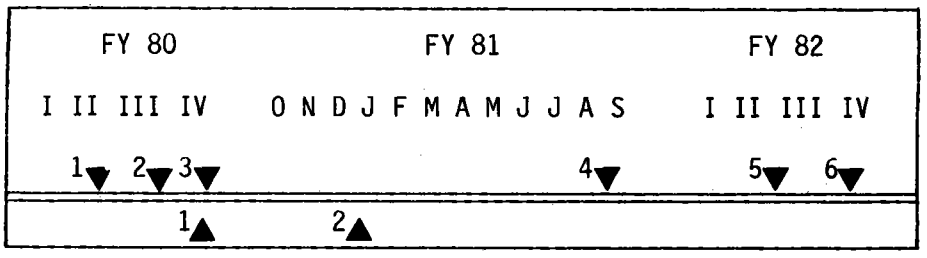
- Publish Westinghouse Advanced System Economic Assessment

Section II.

- (EPRI - Brayton cycle Full System Experiment DDR
- Publish Bechtel/Dynatherm combined-cycle heat pipe receiver analysis (deferred from Oct. 1980)
- Complete long-term heat pipe thermal life cycle tests

E. Controlled Milestones and Schedule[1]

2.4 Advanced Utility C. R. Systems




| Milestone | Pln. | Act. |
|---|---|---|
| 1. Publish WPRS Solar-Hydro Assessment | Feb. 80 | Sept. 80 [2] |
| 2. Publish Advanced System Econ. Assessment | May 80 | Dec. 80 [3] |
| 3. Start EPRI Full System Experiment Design | Jul. 80 | Jul. 80 [4] |
| 4. Complete Dynamic Dispatch Md. Concept Design | Sep. 81 | --- |
| 5. Start WPRS Solar-Hydro Prel. Design/Cost Est. | Oct. 81 | --- [5] |
| 6. Start EPRI Full System Expt. Tests at CRTF | Aug. 82 | --- [6] |

NOTES:

1. Milestones for this task were not in FY80 AOP
2. Publication deferred for DOI & Congressional review (WPR)
3. Publication deferred to incorporate DOE review comments
4. EPRI-controlled milestone
5. WPRS-controlled milestone - subject to Congressional appropriation
6. Joint DOE-EPRI controlled milestone

F. Resource Summary

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| 2.4 Adv. Utility C.R. Sys. | .5 | .5 | -- | -- |

Section II.

G. Major New or Continuing Procurements.

- DOE/EPRI Utility Cooperative Studies:
  Solar Thermal Dynamic Dispatch Model - Westinghouse - $215K - 3rdQ FY81

- Solar-Hydro Integration Study - Water & Power Res. Serv. - $0K - Cont.

- Advanced Systems and Applications - Veda, Dynatherm, TBD - $285K - 4thQ FY81

Section II.

## 3.0 Solar Thermal Energy Systems (STES) Environmental Studies

### A. Project Description and Goals

Project goals are to (1) develop an authoritative, quantitative, and uniform data base for environmental assessments of solar thermal energy systems and their applications; and (2) conduct that research necessary to identify, quantify, and resolve environmental factors impacting either design or deployment of Solar Thermal Energy Systems technologies.

Activities consist of several related but distinctly different studies encompassing occupational and public health and safety, ecological effects of releases of heat transfer and storage fluids, siting impacts of STES's and socioeconomic effects of STES deployment. Laboratory and field studies are undertaken within the UCLA Laboratory of Biomedical and Environmental Sciences (LBES).

### B. Project Status

The project received funding from both ASET and ASEV in FY79 and FY80. EV funding for FY81 will be limited to worker health and safety aspects.

All environmental concerns identified at inception of the 10 MWe Pilot Plant project have been addressed, but not resolved. Several studies represent multi-year efforts. These are associated with ecological effects of STES fluid releases and siting impacts of STES, and are closely coupled to environmental monitoring at the site of the 10 MWe plant. All defined activities are anticipated to be completed or reach major decision points by FY83.

### C. FY 80 Major Project Accomplishments

- Completed assessment study of toxicity and health implications of solar thermal process fluids.
- Completed study of environmental considerations in siting a hypothetical solar-hybrid facility in the desert. A Rockwell design was taken as representative of the technology, and the proposed location of the Sun Desert nuclear plant as the site.
- Completed first phase of laboratory experiments to test toxicity of selected STES fluids to plants as a function of soil type and fluid concentration.
- Completed study of institutional and social barriers to community utilization of small scale STES's.
- Continued environmental monitoring at the 10 MWe Plant site.
- Continued studies of vegetation management and recovery in disturbed desert environments; including landscaping of the 10 MWe Plant Visitor Center.

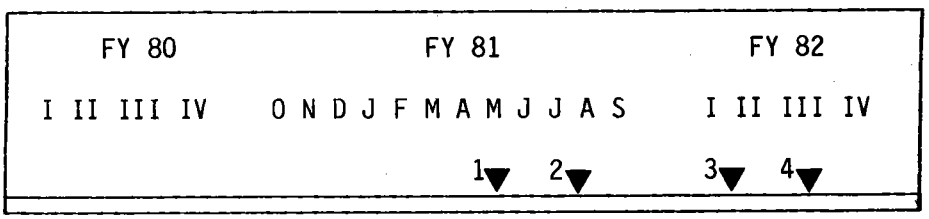
Section II.

- Completed studies of micro-ecological and micro-climatic changes within a simulated heliostat array.

D. FY 81 Planned Accomplishments

- Complete assessment of occupational health and safety in hybrid STES applications.
- Continue laboratory and field studies on the ecological effects of STES fluid releases.
- Develop strategy for using vegetation to stabilize disturbed soil surfaces within heliostat arrays; including definition of a plan for testing at the 10 MWe site.
- Preparation of uniform data base for environmental assessment of STES technologies and applications.

E. Controlled Milestones and Schedule




Env. Studies

1. Completion of currently defined health and safety activities. Anticipated to continue as STES technologies and applications evolve.
2. Issuance of first environmental assessment data base summary to be updated annually.
3. Coincident with completion of construction at 10 MWe site. Decisions as to whether continued environmental monitoring is warranted, and at what level, are dependent on planned operations at the facility.
4. Completion of ongoing laboratory and field studies of ecological consequences of fluid spills.

F. Resource Summary

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| Environmental Studies | 0.355 | 0.355 | -- | -- |

(Additional funds will be provided by EV.)

Section II.

G. Major New or Continuing Procurement

Work to be performed in-house at UCLA.

# Section III

# Program Summary

Section III. Program Summary

The Multiyear Program Plan for Solar Thermal Energy Systems (STES) shows that the goal for about 3 quad (3 quadrillion British thermal units) of energy annually from STES by the year 2000 is possible. This represents about 3% of the total national energy needs in the year 2000. The plan further suggests that "Central Receiver (CR)" plants using of the order of 5 million heliostats could produce one of these 3 quad of energy. Another 1 quad could be produced by 5 to 6 thousand "parabolic trough or bowl" facilities, while some 40 thousand "dish" plants using 1.7 million parabolic dishes could produce the remaining 1 quad of the STES total. The 3 quad of energy demand for STES in the year 2000 will come from both electric power generation (1.3 quad) and industrial process heat (IPH) markets (1.7 quad). The Multiyear Program Plan projects that central receivers will contribute equally to both electric power generation (.5 quad) and IPH (.5 quad). Parabolic troughs or bowls are expected to have a small electric applications (.1 quad) and significant IPH applications (.9 quad). Dishes on the other hand will have greater electric applications (.7 quad) than IPH (.3 quad). This FY 81 Annual Operating Plan (AOP) for Solar Thermal Systems and Applications addresses those activities necessary for central receivers and part of the activities necessary for parabolic troughs (line-focus troughs) in FY 81 that are essential for achieving the STES prescribed goals.

With the projected IPH and electric generation markets for central receiver and line-focus troughs, the Solar Thermal Systems and Applications covered in this AOP have concentrated on an IPH Systems and Applications Group and an Electric Systems and Applications Group. The balance of the work is being done in the supporting area of Environmental Studies.

To penetrate these projected markets for central receiver and line-focus trough technologies, phased activities are being pursued as a prerequisite to achieving technology commercialization. The phases to commercialization for a technology are Technical Feasibility Demonstrations, Operational Feasibility Demonstration, and Commercial Feasibility Demonstrations. At the present time the Solar Thermal Systems and Applications projects in the IPH and Electric Groups are in different phases toward commercialization.

The FY 81 IPH Systems and Applications Group consists of four major projects. These are:

1. IPH Line-Focus
2. IPH Central Receiver (CR) Retrofit
3. Solar Thermal Enhanced Oil Recovery (STEOR)
4. CR Cogeneration

Similarly, the FY 81 Electric Systems and Applications Groups also consist of four major projects which are:

1. Solar CR 10 MWe Pilot Plant
2. Utility CR Repowering
3. International Energy Agency (IEA) Small Solar Power Systems (SSPS)
4. Advanced Utility Central Receiver Systems

# Section IV

# Task Descriptions

Section IV.

## Solar Thermal Systems/Applications

## Task Descriptions

1.0 Industrial Process Heat Systems and Applications Group

- 1.1 IPH Line-Focus Projects
- 1.2 IPH Central Receiver Retrofit Projects
- 1.3 Solar Thermal Enhanced Oil Recovery Projects
- 1.4 CR Cogeneration Projects

2.0 Electric Systems and Applications Group

- 2.1 Solar CR 10 $MW_e$ Pilot Plant
- 2.2 Utility CR Repowering Projects
- 2.3 IEA Small Solar Power Systems (SSPS) Projects
- 2.4 Advanced Utility Central Receiver Systems

3.0 Solar Thermal Energy Systems Environmental Studies

Section IV.

## 1.1 Industrial Process Heat (IPH) Line Focus Projects

The IPH line focus projects are solar systems providing thermal energy which is used in the preparation, treatment, and processing of raw materials for many diverse products. The experimental and demonstration systems in this task deliver heat or steam in the intermediate temperature range 212°F to 550°F, in which fall most cost-effective IPH applications to date. The most promising system concepts employ a field of line focusing concentrating collectors, referred to as trough collectors, which trace the sun's position and focus solar radiation on a linear receiver. The receiver transfers the solar energy to a transfer medium, i.e. water or organic heat transfer fluid which circulates through collector loops in the field. For steam applications water may be flashed to steam in a low pressure chamber or a heat exchanger may be used. Systems may be ground or roof mounted.

The small-scale IPH systems are experimental, first-of-a-kind installations averaging 10,000 square feet of collector aperature.

From these successes the program has progressed to a large-scale system (50,000 $ft.^2$) cost-shared with industry. Cost reductions are expected to be realized in these projects through economics of scale. During FY81, eight of nine systems currently under construction are expected to be tested and begin an operations period of 1-2 years.

Several early generation field test systems will be upgraded to improve system performance and efficiencies. Lessons learned from successful experiments will be applied to these projects.

A. Objectives

- Demonstrate safe, reliable, commercially available solar systems.
- Obtain cost, operations and maintenance data and experience.
- Reduce system costs to effect cost competitiveness with fossil fuels.

B. Work Breakdown Structure

1.1.1 IPH Line-Focus Projects

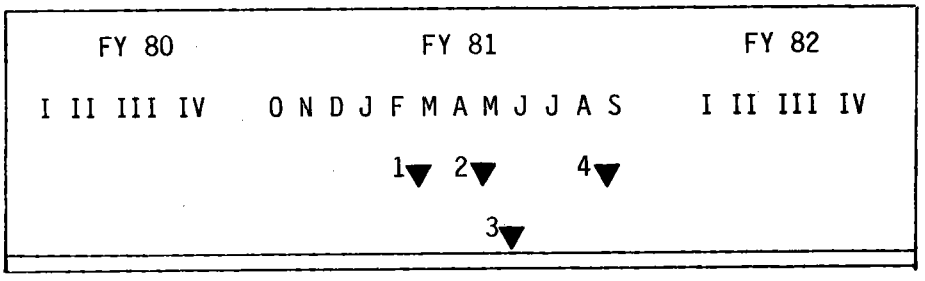
1.1.2 Upgrade Projects

1.1.3 Technical Support

C. Milestones and Schedule

1.1 Line Focus Projects

1.1.1 Projects
1.1.2 Upgrade
1.1.3 Tech. Support




1. March 1981 - Conduct Acceptance Testing of 3 small-scale systems

2. May 1981 - Conduct Acceptance Testing of 3 small-scale systems

3. June 1981 - Recommendation for Standardized Data Acquisition System Complete

4. September 1981 - Conduct Acceptance Testing of 2 large-scale demonstration systems.

D. Resource Requirements

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| 1.1 IPH Line Focus Projects | | | | |
| 1.1.1 Projects | 1.8 | 1.8 | -- | -- |
| 1.1.2 Upgrade | 1.0 | .5 | -- | -- |
| 1.1.3 Tech. Support | .3 | .3 | .01 | .01 |
| TOTAL | 3.1 | 2.6 | .01 | .01 |

E. Expected Accomplishments

- Complete construction, conduct acceptnce testing of six small scale and two large scale IPH systems.
- Initiate renovation of 4-5 small scale IPH field test systems.
- Establish standardized data acquisition system for commercial IPH solar systems.
- Initiate operations phase of tested and accepted systems.

F. Major New or Continuing Procurements

See Accompanying Upcoming Procurement Forms.

Section IV.

G. Funding Breakdown

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| Contracts | | | | |
| Lawrence Livermore National Lab | 1.8 | 1.8 | -- | -- |
| Energy Technology Engineering Center | .15 | .15 | .01 | .01 |
| TOTAL | 3.10 | 2.60 | .01 | .01 |

H. Deliverables

- As-built drawings and Construction Phase Final reports for systems completed (March through September, 1981)
- Operation and Maintenance manuals for operation (June through September, 1981).
- Final designs for upgrade systems.
- Final Report and recommendation on a Standardized Data Acquisition Systems, June, 1981.

## 1.2 IPH CR Retrofit Projects

"Retrofit is the integration of a solar central receiver system into an existing industrial facility to supply a substantial portion of the daytime process heat requirements with solar energy. Central Receivers can use heat transfer fluids such as water, molten salt, or sodium to provide industrial process steam or use air or other gases as a heat transfer for direct use of hot air or gases. The diversity of heat transfer fluids available and their corresponding ranges of operating temperatures (350°F to 2500°F) makes the Central Receiver System a prime candidate for supply the diverse energy needs of the Industrial Process Heat (IPH) market. CR Retrofit has the potential of displacing up to 0.5 quads of fossil fuel energy per year after 1990 in the Southwest alone.

### A. Objectives

Like Repowering, the objective of Retrofit is to transfer CR technology from its research and development phase into its first application phase. Industry will be prepared to receive the knowlede and experience accumulated through R&D at government labs and test facilities. To achieve this transition, DOE has supported development of engineering designs, detailed system specifications, economic and financial guidelines, and detailed construction and management plans for site specific applications. From this base of conceptual designs DOE will choose those projects which have the highest chance of success in terms of technology, economics, and potential for general market application.

### B. Work Breakdown Structure

See Section IV.2.2.B (Repowering)

### C. Milestones and Schedule

See Section IV.2.2.C (Repowering)

### D. Resource Requirements

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| Retrofit | 2.0 | 2.0 | -- | -- |

### E. Expected Accomplishments

See Section IV.2.2.E (Repowering)

F. Major New and Continuing Procurements

An RFP will be issued and contracts awarded for advanced conceptual designs in FY81.

G. Funding Breakdown - FY81 ($M)

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| CR Retrofit | 2.0 | 2.0 | -- | -- |

H. Deliverables

Final reports for advanced conceptual designs.

## 1.3 Solar Thermal Enhanced Oil Recovery Projects

The specific projects to be conducted in FY81 under the STEOR program come under two headings, those that are already underway and those to be defined as a result of DOE/oil industry interactions which have not yet been completed. Projects initiated in September and November of 1980 include the oil field data research and the opinion survey, as well as a review of potential financing arrangements for STEOR under the assumption of TIR-type incentives, of DOE direct subsidies, and of entirely private ventures utilizing only existing energy tax credits. The second class of projects will address specific concerns expressed by industry and prioritized on the basis of industry preference. Some of the requirements by industry for DOE project support of private STEOR ventures will have been provided in general terms by the opinion survey started in November and completed in February 1981. More specific requirements are to be obtained in an oil industry/DOE workshop to be conducted in April of 1981.

### A. Objectives

The STEOR program will aim to stimulate and to support private initiatives to develop the use of solar thermal energy in enhanced oil recovery so that this application may serve as the key application in initiating large scale utilization of solar thermal energy in industrial process heat. The specific objectives of the program will be formulated on the basis of oil industry input concerning their needs for support. This input will be obtained by several means. An opinion survey of heavy oil producers in California is currently underway and should be completed by the end of February 1981. In addition, a workshop will be organized by March 1981 to discuss industry support requirements, possibly to be followed by additional project needs as supplied by the oil industry:

Studies such as market and government policy analyses,

Design activities such as minimum cost STEOR systems capable of direct steam generation,

Data collection and exchange activities,

Stimulation of oil field service organizations to undertake STEOR purchase, operation and maintenance,

Development of means for assistance in obtaining front-end capital for STEOR installations,

Integration of the products of technology programs such as MISR into commercial STEOR installations,

Development of industry technology needs to guide DOE technology programs.

Industry priorities will be used to propose projects from this for execution.

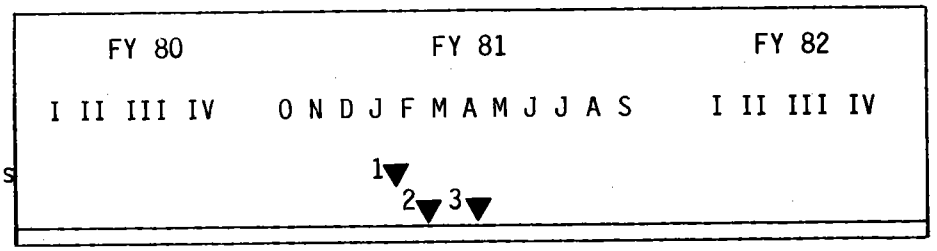
B. Work Breakdown Structure

1.3.1 Market Studies

1.3.2 Technical Support

1.3.3 Industry Support to be defined

C. Milestones and Schedule




1. February 1981 - Complete technical data collection and opinion survey analysis

2. March 1981 - Conduct workshop with industry

3. April 1981 - Complete revised STEOR program plans

D. Resource Requirements

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| 1.3 STEOR | | | | |
| 1.3.1 Market Studies | 0.010 | 0.010 | -- | -- |
| 1.3.2 Tech. Support | 0.050 | 0.050 | -- | -- |
| 1.3.3 Industry Supp. | 0.440 | 0.440 | -- | -- |
| TOTAL | 0.500 | 0.500 | | |

Note: Only WBS 1.3.1 and 1.3.2 will be funded. Authorization for WBS 1.3.3 will be determined after submission of revised program plan.

E. Expected Accomplishments

- The results of the data search are expected to yield better knowledge of the actual steam injection pressures currently used on California heavy crude fields, as well as projected to be used between now and 1990. These data will be important in designing STEOR systems which will satisfy the largest market segment, rather than small segments with extreme requirements. This project will also provide information on steam demand as a function of year out of 1990.

- The opinion survey to be completed in February 1981 will provide information on oil industry attitudes toward STEOR and on the specific features expected from such solar systems. It will also summarize industry feeling about the need for a diurnal steaming test which will determine whether high-solar fraction STEOR systems will be marketable.

- The economic analyses will show whether new government incentives or direct DOE subsidies will be required to allow STEOR to compete against fossil-fueled steam generators, or whether existing tax credits are sufficient to permit an acceptable rate of return to investors in STEOR. They will also show the financial structure of STEOR investment schemes which maximize investor return.

- The workshop to be sponsored in March of 1981 is expected to allow industry definition of the type of DOE projects related to STEOR that would best assist private STEOR ventures. It will also permit comparative-importance ranking of the several projects to be recommends by industry, to allow limited resources to be dedicated to the most valuable projects.

F. Major New and Continuing Procurements

Depending upon results of a DOE/oil industry workshop and STEOR studies, procurement action may be initiated after April 1981.

G. Funding Breakdown

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| 1.3 STEOR | | | | |
| 1.3.1 Market Studies | 0.010 | 0.01 | -- | -- |
| 1.3.2 Tech. Support | 0.050 | 0.05 | -- | -- |
| 1.3.3 Industry Supp. | 0.440 | 0.440 | -- | -- |
| TOTAL | 0.500 | 0.500 | | |

H. Deliverables

- Oil Field Data Search and Oil Industry Opinion Survey final reports to be issued in January and February, 1981.

- Revised STEOR Program Plan, April, 1981.

## 1.4 CR Cogeneration Projects (CRCP)

Cogeneration refers to those systems providing both electrical and/or mechanical energy and other useful thermal energy. More specifically under this task is the CR cogeneration concept which consists of a solar central receiver integrated into a new or existing cogeneration facility. In this concept a field of heliostats track the sun's position and focuses solar radiation on a central receiver. The receiver transfers the solar energy to a receiver fluid (i.e., gas, liquid, or light-vapor mixture). The energy charged fluid is either placed in storage or through a heat transfer system providing gas or steam to a turbine-generator set for electrical and/or mechanical energy generation. At some stage in the process part of the thermal energy will be used for industrial process heat or for space conditioning (space heating or cooling) and hot water. As such, CR cogeneration encompasses public utility power plants, industrial process plants and energy facilities that serve residential, institutional, commercial, or military complexes.

This task utilizes the technology and component development of both the Utility CR Repowering Projects and IPH CR Retrofit Projects, but extends applications to include district heat (i.e. space conditioning and domestic hot water) and optimum usage of collected energy.

Although in this task there is also emphasis on the identification of applications and their markets followed by the development and analysis of system designs tailored to best fit those applications, additional system design analysis is required to develop the most cost effective systems for cogeneration applications identified. Cogeneration techniques include energy flow through electrical or mechanical energy generating conversion equipment with useful thermal energy obtained from exhaust components (topping), energy flow through a useful thermal process with the exhaust components utilized in electrical or mechanical energy generating conversion equipment (bottoming), parallel energy flow to both electrical or mechanical energy conversion equipment and useful thermal energy applications, or other combinations that result in effective utilization of the thermal energy produced. CR cogeneration holds promise for effecting lower capital cost per unit energy consumed due to the nearly complete utilization of the solar energy collected.

### A. Objectives

The objectives of this task are to obtain design data, cost information, and operating experience, to determine the incentives necessary to make CR cogeneration economically attractive for commercialization and to reduce the amount of critical fossil fuels utilized for production of thermal and electrical energy.

Included in this task are the identification and characterization of cogeneration applications to assess the stand-alone and electric grid connected options for achieving the best match with applications deemed attractive. Also included is the determination of relative cost-effectiveness of water/steam, organic, molten salt, liquid sodium, and gas heat

transfer fluid central receiver subsystems for delivering steam to a Rankine electric conversion cycle and the associated industrial process heat or district heat requirements.

Emphasis in this task will be on military/residential district heating/ cooling with domestic hot water, and on high temperature (300°C) industrial applications.

To accelerate entry into the market the DOE has a CR Cogeneration program that is planned to provide the technical data, and the industrial user familiarity necessary to stimulate the application of solar thermal equipment in cogeneration facilities.

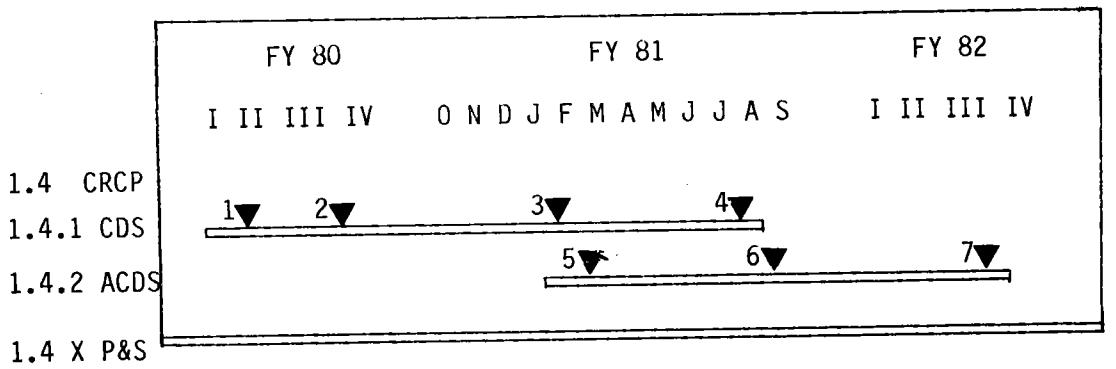
B. Work Breakdown Structure

1.4.1 Conceptual Design Studies (CDS)

1.4.2 Advanced Conceptual Design Studies (ACDS)

1.4.X Planning and Support (P&S)

C. Milestones and Schedule




1. February 1980 — Received approval to issue Request for Proposal (RFP) for CR cogeneration conceptual design studies

2. September 1980 — Negotiate and let contracts for selected proposals

3. February 1981 — Mid Term review of contractors conceptual design studies

4. August 1981 — Publish final reports for contractors conceptual design studies

5. March 1981 — Issue RFP for advanced conceptual design studies

6. August 1981 — Award contracts from RFP response. (Cogeneration Program merges with Repowering Program at this point.)

7. June 1982 — Complete advanced conceptual design studies

D. Resource Requirements

| | | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|---|
| | | Operating Exp | | Construction | |
| | | BA | BO | BA | BO |
| 1.4 CRCP | | | | | |
| 1.4.1 | CDS | 1.9 | 1.9 | -- | -- |
| 1.4.2 | P&S | .5 | .5 | -- | -- |

E. Expected Accomplishments

- Complete the seven conceptual design studies by August, 1981 for:

  -- Bechtel/AMFAC Sugar Co. -- system for sugar cane processing and electricity

  -- Black & Veatch/Central Telephone and Utilities - Western Power -- Steam for natural gas processing and electricity

  -- Exxon/Exxon -- steam for enhanced oil recovery and electricity

  -- General Electric/Texasgulf -- hot water for sulfur mining and electricity

  -- Gibbs & Hill/Phelps Dodge Corp. -- hot air for copper smelting and electricity

  -- McDonnell Douglas/US Army -- steam to produce electricity and space conditioning

  -- Westinghouse/US Air Force -- steam to produce electricity and space conditioning

- Issue PON for follow on commercial demonstration projects by September 1981.

F. Major New and Continuing Procurements

None currently planned from the FY 81 DOE program budget.

Note: Major new procurements for demonstration projects will be in the FY 82 DOE program budget.

G. Funding Breakdown

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| Conceptual Design Studies | 1.9 | 1.9 | -- | -- |
| Sandia National Lab | .35 | .35 | -- | -- |
| Aerospace | .15 | .15 | -- | -- |

H. Deliverables

Final reports for the seven conceptual design studies.

## 2.0 Electric systems and Applications Group

### 2.1 10 MWe Solar Thermal Central Receiver Pilot Plant

The Pilot Plant is sized to provide 10 MWe to the grid using water/steam as the working fluid. The tower mounted receiver is a once-through to superheat external type unit operating at approximately 1500 psig and 950°F. A dual admission turbine also accepts steam from the thermal storage system at approximately 400 psig and 550°F. The oil/rock thermal storage system operates on a thermocline principle and is sized to provide at least 28 MWe-hrs at a peak power of 7 MWe. The 1818 heliostats are glass/metal structures which continuously track the sun via computer control.

Preliminary design was completed on the plant in December 1979. All solar facility construction package designs have been completed. The turbine-generator construction designs are approximately 90% complete. Final control computer software preparation is underway. The master control system hardware and software will be checked out under laboratory conditions prior to shipment to the site in 1981. Field construction has been underway since late in fiscal year 1979. Site activities in fiscal year 1980 concentrated on earthwork, foundations, structural steel, and electrical wiring installation.

A. Objectives

a. Program Objectives

- Demonstrate system concept through actual hardware/software
  - Technical Feasibility
  - Economic Potential
  - Environmental Acceptability
- Get user industry and regulators involved
  - SCE and LADWP
  - Technology Transfer Committee
  - California Energy Commission
- Provide hard technical, cost, schedule and operational data
  - Repowering/Industrial Retrofit
  - Electrical/Process heat Commercialization
- Show Government commitment to expanded solar (renewable) energy option

b. Technical Performance Requirements

- Power to Grid from Receiver 10 MWe

- Hours at 10 MWe

  - Summer Solstice — 8 Hrs.
  - Winter Solstice — 4 Hrs.

- Thermal Storage Size — 28 MWe-Hrs.

- Power to Grid from Thermal Storage — 7 MWe

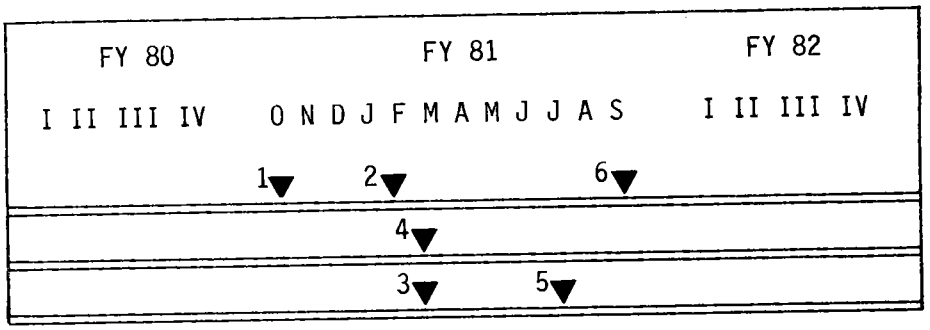
B. Work Breakdown Structure

2.1.1 Pilot Plant Construction (Line Item)

2.1.2 STMPO Operations (Operating Funds)

2.1.3 Operational Testing (Operating Funds)

C. Milestones and Schedule




1. October 1980 - Apportionment of $8M deferred from FY 80
2. February 1981 - Apportionment of $10M in FY 81 Funds
3. March 1981 - Approval of Operational Test Management Plan
4. March 1981 - Initiation of Startup Test Activities at Site
5. July 1981 - Completion of SCE Operator Training
6. September 1981 - Completion of Field Construction

D. Resource Requirements

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| 10 MWe | BA | BO | BA | BO |
| 2.1.1 | -- | -- | 18.0 | 68.0 |
| 2.1.2 | 3.13 | 3.13 | -- | -- |
| 2.1.3 | 2.47 | 2.47 | -- | -- |

E. Expected Accomplishments

- Confirm present facility TEC of $118M and implement "Test Facility" activities as agreed to by Congressional Committees
- Complete all site construction awards by DOE, T&B, and SCE
- Complete all hardware installation at construction site
- Complete SCE Operator Training Plan
- Update Startup Plan and Operational Test Plans
- Implement Plant Startup

F. Major New and Continuing Procurements

2.1.1 Construction

a. New

1. Townsend and Bottum, Construction Subcontracts for Electrical/I&C, Insulation/Lagging
2. SAN Primes for Painting and Final Road Work

b. Continuing

1. SAN Prime with Townsend and Bottum (Construction Manager)
2. SAN Prime with McDonnell Douglas (Solar Facility Design Integrator)
3. SAN Prime with Martin Marietta (Heliostats)

2.1.2 STMPO Operations

a. New

None

b. Continuing

1. ETEC Operating Contract
2. Aerospace Support Contract
3. SCE Cooperative Agreement

2.1.3 Operational Testing

a. New

None

b. Continuing

1. ETEC Operating Contract
2. Aerospace Support Contract and/or SNLL Operating Contract
3. McDonnell Douglas Prime with SAN
4. Martin Marietta Prime with SAN

G. Funding Breakdown

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| 2.1.1 Industrial and Construction Contractors | -- | -- | 18 | 68 |
| Small/Disadvantaged Business (Included in $18M total) | | | 1.29 | -- |
| 2.1.2 STMPO Oper. | | | | |
| ETEC | .5 | .5 | -- | -- |
| Aerospace | .5 | .5 | -- | -- |
| SNLL | .25 | .25 | -- | -- |
| SCE | 1.88 | 1.88 | -- | -- |
| 2.1.3 Oper Testing | | | | |
| ETEC | .2 | .2 | -- | -- |
| Aerospace/Sandia | .1 | .1 | -- | -- |
| Martin Marietta | .14 | .14 | -- | -- |
| McDonnell Douglas | 2.03 | 2.03 | -- | -- |

None

b. Continuing

1. ETEC Operating Contract
2. Aerospace Support Contract
3. SCE Cooperative Agreement

2.1.3 Operational Testing

a. New

None

b. Continuing

1. ETEC Operating Contract
2. Aerospace Support Contract and/or SNLL Operating Contract
3. McDonnell Douglas Prime with SAN
4. Martin Marietta Prime with SAN

G. Funding Breakdown

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| 2.1.1 Industrial and Construction Contractors | -- | -- | 18 | 68 |
| Small/Disadvantaged Business (Included in $18M total) | | | 1.29 | -- |
| 2.1.2 STMPO Oper. | | | | |
| ETEC | .5 | .5 | -- | -- |
| Aerospace | .5 | .5 | -- | -- |
| SNLL | .25 | .25 | -- | -- |
| SCE | 1.88 | 1.88 | -- | -- |
| 2.1.3 Oper Testing | | | | |
| ETEC | .2 | .2 | -- | -- |
| Aerospace/Sandia | .1 | .1 | -- | -- |
| Martin Marietta | .14 | .14 | -- | -- |
| McDonnell Douglas | 2.03 | 2.03 | -- | -- |

H. Deliverables

- STMPO Updated Line Item Revised Baseline Estimate - October 1980 and April 1981
- SFDI System Specification - October 1980
- SFDI Startup and Acceptance Test Plan - November 1980
- SCE Startup Manual - March 1981
- Test Contractor Operational Test Plan - March 1981

## 2.2 Utility CR Repowering Projects

"Repowering" is the integration of a Solar CR system into an existing utility facility to supply a substantial portion of the daytime peak electric power requirements with solar energy. Repowering is attractive because it saves fossil fuel and can be implemented in the next few years because the utilities' energy requirements are well defined and can be satisfied by CR technology in its present state of development and utilizing existing EPGS facilities.

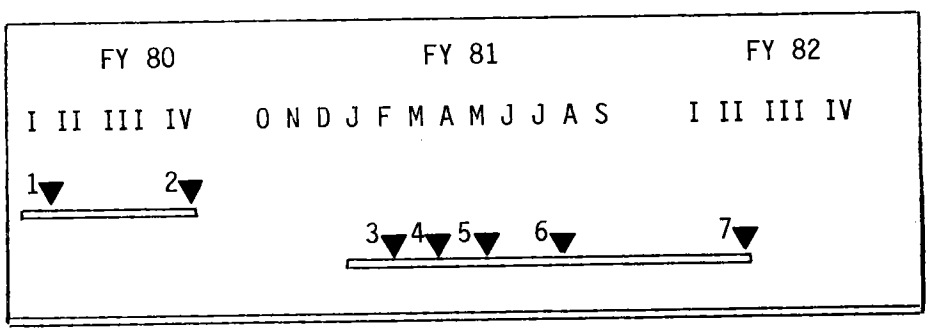
### A. Objectives

The objective of Repowering is to transfer CR technology from its research and development phase into its first application phase. Utility companies will be prepared to receive the knowledge and experience accumulated through R&D at government labs and test facilities. To achieve this transition, DOE has supported devleopment of engineering designs, detailed system specifications, economic and financial guidelines, and detailed construction and management plans for site specific applications. From this base of conceptual designs DOE will choose those projects which have the highest chances of success in terms of technology, economics, and potential for general market application.

### B. Work Breakdown Structure

1. Conceptual Design Studies (CDS)
2. Advanced Conceptual Design Studies (ACDS)
3. Planning and Support (P&S)

### C. Milestones and Schedule




1. October 1979 - Awarded 7 Repowering and 6 Retrofit conceptual design contracts
2. July 1980 - Completed and published 7 Repowering and Retrofit conceptual design studies

3. February 1981 - Complete the revised Program Element Plan for Repowering/ Retrofit/Cogeneration

4. March 1981 - Select proposals for negotiation for advanced conceptual design contracts

5. May 1981 - Select proposals for negotiation for advanced conceptual design contracts

6. August 1981 - Award contracts for advanced conceptual designs

7. April 1982 - Complete advanced conceptual designs.

D. Resource Requirements

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| Repowering | 4.2 | 4.2 | -- | -- |

E. Expected Accomplishments

A Program Element Plan will be completed February 1981 which will outline DOE strategy for supporting advanced design work and construction of repowering, retrofit, and cogeneration facilities. By July 1981 a CEB will award contracts for advanced repowering conceptual design studies (ACDS). The ACDS will prepare selected sites for the construction phase. The ACDS will (1) incorporating improved CR components into the baseline design and revising the baseine specifications which appropriate, (2) define tests and data required from the CR Test Facility to final the baseline design concept, (3) prepare data to obtain federal, state, and local regulatory permits and the environment impact statement, (4) gather detailed site meteorological data, and (5) prepare revised development and program management plans.

F. Major New and Continuing Procurements

An RFP will be issued and contracts awarded for advanced conceptual design work in FY81

G. Funding Breakdown - FY81 ($M)

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| Repowering | 4.2 | 4.2 | -- | -- |

H. Deliverables

Final reports for advanced conceptual designs.

## 2.3 IEA Small Solar Power Systems (SSPS)

The IEA SSPS projects consist of a Central Receiver System (CRS) plant and a Distributed Collector System (DCS) plant with similar 500 KWe outputs located adjacent to each other. These two plants are being built at a site in the province of Almeria, Spain.

The CRS uses liquid sodium as the primary heat transfer fluid in a north facing cavity type receiver. Ninety-three modified Barstow heliostats, 3715 $m^2$ total field reflective area, with four different focal lengths provide reflected solar energy to the receiver. Sodium at 270°C is drawn from a cold storage vessel as input to the receiver. Hot sodium at 530°C is returned from the receiver to a hot storage vessel. To produce superheated steam sodium is taken from the hot vessel to a steam generator and returned to the cold vessel. This steam is used to drive a five stage steam motor which powers the electric generator.

Two different types of line-focus collectors using oil as the primary heat transfer fluid make up the main loop of the DCS collector field, German two axis tracking collectors, total reflective area of 2685 $m^2$, and United States single axis tracking collectors, total reflective area of 2674 $m^2$, use inlet oil at 225°C from an oil thermocline storage and return oil at 295°C to the thermocline storage vessel. Hot oil from the storage vessel is used in a steam generator to produce steam for a steam turbine which drives the electric generator. A secondary loop consisting of 500 $m^2$ total reflective area of Italian two axis tracking collectors and an oil/solid thermocline storage (inlet 240°C/outlet 315°C) is planned to be connected to the main loop. Oil from the secondary loop will be used to charge the main loop storage vessel by using an oil to oil heat exchanger, thus keeping the main loop oil purity high, and operational independence of the loops.

### A. Objectives

- Demonstrate, within about two years from CY 1979, the construction of a Distributed Collector System (DCS) plant and a Central Receiver System (CRS) plant both with 500 KWe net output and located adjacent to one another.
  - emphasizing available line focus and central receiver technologies
  - minimizing research and development
  - providing for design flexibility (scaling potential, operational modes, geographically dispersed applications)
- Gain, over a subsequent period of two years from CY 1981, experience with such plants relative to operational reliability, investment and operating costs.
- Assess further technical and economical developments and applications of such plants.

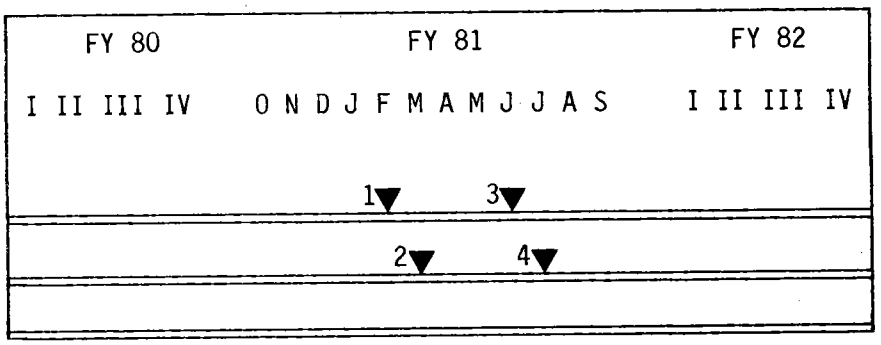
B. Work Breakdown Structure

2.3.1 - Central Receiver System (CRS)

2.3.2 - Distributed Collector System (DCS)

2.3.X - Planning and Support (P&S)

C. Milestones and Schedule




1. March 1981 - CRS plant completion review
2. April 1981 - DCS plant completion review
3. July 1981 - CRS plant acceptance complete and test and operations start
4. August 1981 - DCS plant acceptance complete and test and operations start

D. Resource Requirements

| | FY 81 (Million Dollars) Operating Exp | | Construction | |
|---|---|---|---|---|
| | BA | BO | BA | BO |
| 2.3 IEA SSPS Projects | | | | |
| 2.3.1 CRS | -- | -- | -- | -- |
| 2.3.2 DCS | -- | -- | -- | -- |
| 2.3.X Support | .25 | .25 | -- | -- |

Note: US/DOE contribution to the IEA project for FY 81 is 1.14 million Deutsche Marks (DM). Converted to dollars from DM using an exchange rate of $1 = 1.8 DM, this is equivalent to .6334 million dollars.

E. Expected accomplishments

- Finalize the planning for the test and operations phase which starts in July/August 1981 by:
  - contract, if possible, with a Spanish utility for plant operators
  - establish an international team of experts from participating countries to plan and conduct Tests which will be in addition to the daily plant operations.
  - develop a reporting system which meets the data requirements of participating countries
- Complete the installation of all DCS and CRS equipment at the site and perform functional tests on components, subsystems, and systems.
- Conduct for one or two months extensive acceptance testing of both plants measuring plant performance and compare data to system requirements.
- After completion of the acceptance testing start the two year test and operations phase of the project.

F. Major New and Continuing Procurements
None planned for FY 81.

Note: Procurements are made from the IEA project budget which comes from contribution by participating countries.

G. Funding Breakdown

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| Sandia National Lab | .25 | .25 | -- | -- |

H. Deliverables

- Functional testing and acceptance testing reports
- Test and operations reports

Note: Dates and types of reports have not been established.

## 2.4 Advanced Utility Central Receiver Systems

This project task provides for

- Application of advanced solar thermal technology to utility electric power generation systems;
- Exploration of alternative applications or operational contexts for current solar thermal electric power generation systems;
- An entry point to the Solar Thermal Energy systems program for innovative, advanced or unique solar thermal electrical power generation system concepts, with emphasis on small business, small/disadvantaged business and university sources.

Because of the primary emphasis for FY81 on the application of known (or at least verified at the component/subsystem level) solar thermal technologies to identified, near-term markets (e.g., mid-temperature IPH, STEOR, utility repowering, only limited resources can be committed to these areas at the present time. In the first two areas, therefore, the approach is to seek opportunities for coopertive effort with other organizations pursuing related goals.

For generic (as opposed to site-specific, as in the case of repowering) utility applications, especially for Brayton (gas turbine) and combined-cycle systems, close coordination is maintained with the Electric Power Research Institute (EPRI). Thus, EPRI staff have participated as technical advisers to DOE selection and evaluation teams, and vice versa, in areas of common interest; DOE's Central Receiver Test Facility (CRTF) hosts tests of EPRI-developed components and systems; DOE and EPRI have funded separate tasks by a given contractor in areas of joint concern; and reports and technical and economic data are shared on a continuing basis. W.B.S 2.4.1 provides for these efforts.

Although electric utilities offer the primary and most accessible market for solar thermal electric power generation technology, other institutions are also potential users of such systems. The Water and Power Resources Service (WPRS) - of the Department of Commerce is a major producer of electrical energy. While most of this energy comes from hydroelectric installations, the WPRS has also found it necessary in recent years to develop fossil-fired plants to meet commitments; they have also actively sought solar and other alternative sources. Between February, 1979 and February, 1980, DOE and WPRS shared the cost of a WPRS assessment of the feasibility of incorporating one or more 100-MWe scale solar central receiver plants in their Lower Colorado (Hoover-Parker-Davis Dam) generation complex, with the long-term storage capacity of existing reservoirs utilized to match the insolation resource and load demand. The successful results (100 MWe can be accomodated with no impact on other system commitments, in the WPRS 2.25-GWe system) have led to authorization of site-specific design, expected to begin in FY82, and possible construction in the late 1980's. (Funds may be expected to flow from WPRS to DOE during these phases, for information transfer, technical support and analyses). Since several utility systems incorporate significant hydroelectric

capacity, these results may prove broadly applicable. WBS 2.4.2 addresses this effort.

While solar thermal central receiver concepts, subsystems and components have been explored in extensive detail and variety over the past several years, novel or unique new ideas may arise in the future. Additionally, certain concepts already studied cannot as yet be properly evaluated for lack of certain key data concerning technical or economic potential. Finally, it is essential to maintain a certain amount of flexibility with respect to further-term opportunities, involving solar-nonsolar hybrids, high capacity factors plants, and other future needs and capabilities. WBS 2.4.3 attempts to insure that nothing in the central receiver power generation area is allowed to "fall through the cracks." Because much innovation has come from them, and because of their often unique and flexible investigative capabilities, it is expected that such efforts will be largely conducted through small and small/disadvantaged businesses and universities.

A. Objectives

- Demonstrate, by the end of 1982, successful operation of a complete, 100-kWe scale solar-fossil hybrid Brayton electrical power generation system at the CRTF.
- Provide, by the end of 1985, utility plant operating personnel with:
  - Direct experience in operation of solar power plants;
  - Real-time computer-aided optimal dispatching of solar plants.
- Determine, by 1985, the comparative cost, performance and construction schedule for a solar central receiver power plant integrated with a hydroelectric grid.
- Identify, develop and evaluate technical and economic concepts for the application of solar thermal electrical power generation following the repowering "window" (i.e., post-1990).

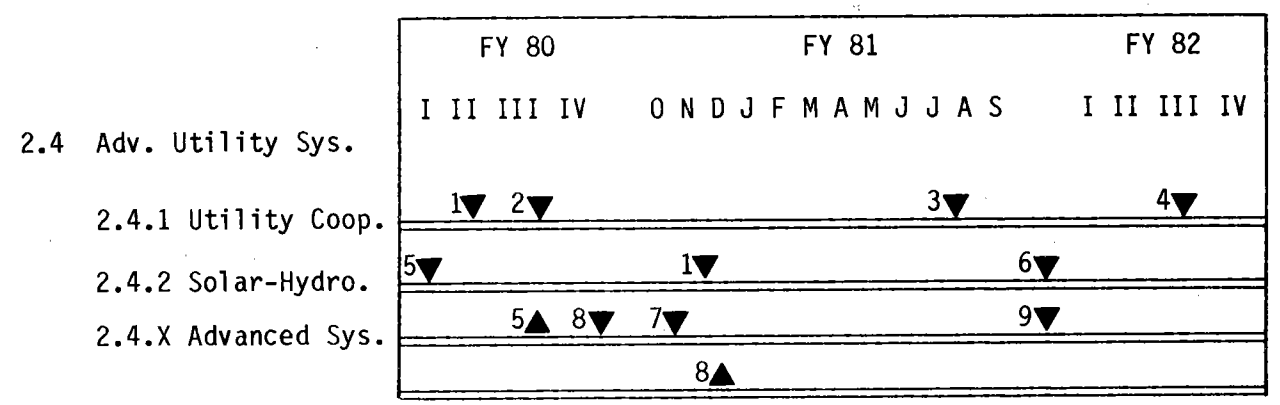
B. Work Breakdown Structure

2.4.1 - Generic Utility Cooperative Studies (with EPRI)

2.4.2 - Solar-Hydroelectric Grid Integration (with WPRS)

2.4.3 - Advanced Utility Systems and Applications

C. Milestones and Schedule




1. Dec. 1980 - Publish Advanced utility System Report
2. July 1980 - Start EPRI Full System Design
3. Sep. 1981 - Complete Conc. Des. of Solar Dynamic Dispatch Mdl.
4. Aug. 1982 - Start EPRI FSE Tests at CRTF
5. Sep. 1980 - Publish WPRS Solar-Hydro Plant Design
6. Oct. 1981 - Start WPRS Solar-Hydro Plant Design
7. Feb. 1981 - Publish Heat Pipe Receiver Analysis
8. Nov. 1980 - Publish Economic Analysis of Veda UHA
9. Dec. 1981 - Complete 1000-Cycle Heat Pipe Testing

D. Resource Requirements

| | FY 81 ($M) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| 2.4 Adv. Utility CR Sys | BA | BO | BA | BO |
| 2.4.1 Utility Coop. | .2 | .2 | -- | -- |
| 2.4.2 Solar Hydro* | -- | -- | -- | -- |
| 2.4.3 Adv. Systems | .3 | .3 | -- | -- |

*No transfer of funds between WPRS and DOE planned for FY81; $0.02M of FY80 obligations remain unbilled (for long-term insolation data base).

E. Exected Accomplishments

- Review and approve detail design of EPRI Full System Experiment and release for fabrication (Feb.); start component bench tests (Sept.).
- Start design of dynamic solar plant dispatch model (May); complete concept design and establish model specifications (Sept.).
- Continue data exchange and analysis support to WPRS solar-hydro project (Oct.-Sept.).
- Publish cost performance analysis of Veda Unified Heliostat Array (Nov.); assess with respect to conventional C.R. system (June).
- Publish analysis of heat-pipe 1500°F air receiver, based on results of 250-cycle testing (Feb. - rescheduled from Oct.); resume testing and extend to 1000 cycles (1Q FY82).
- Identify and support as appropriate other advanced/novel concepts and applications for utility electrical power generation.

F. Major New and Continuing Procurements

- (See Accompanying Upcoming Procurement Forms)

G. Funding Breakdown

| | | FY 81 ($M) | | | |
|---|---|---|---|---|---|
| | | Operating Exp | | Construction | |
| 2.4 | Adv. Utility C.R. Sys. | BA | BO | BA | BO |
| | In-House | -- | -- | -- | -- |
| | Out-of-House: | | | | |
| | Lge. Business | .3M | .3M | -- | -- |
| | Sm./Disadv. Business | .2M | .2M | -- | -- |

H. Deliverables

Boeing Eng'g. & Constr., FSE Detail Design Review - Feb. 1981 (to EPRI)

Westinghuse, Utility Solar/Non-Solar Dispatch Strategy Summary & Recommendations - (TBD) (to EPRI)*

Westinghouse, Utility Dynamic Dispatch Model Conceptual Design - Oct. 1981*

WPRS, Annual Technical Progress Report; Interim Site Assessment - Oct. 1981

Dynatherm, Inc., Heat Pipe 1500°F Thermal Life-Cycling Test Data (to 1000 Cycles or to Failure) - Jan. 1982*

(Others TBD upon Selection and Award)

*Subject to definition/redefinition upon award.

## 3.0 Solar Thermal Energy Systems Environmental Studies

Activities undertaken by this project include laboratory, field, and analytical studies partitioned into the following interrelated categories.

Group I studies address occupational and public health concerns associated with STES development, deployment, and applications.

Group II studies address the consequences of releases of heat transfer and storage fluids to the environment in terms of ecological impacts, plant toxicity, and water quality.

Group III studies address site specific environmental concerns associated with deployment of STE's. The principal focus is environmental assessment and monitoring of demonstration STES installations and includes concern for effects of their environment on the technologies and implementing the Safety Analysis Report System.

### A. Objectives

- Preparation and maintenance of a uniform data base for environmental assessment of STES technologies and applications.
- Identify and resolve environmental concerns in parallel with STES development to enhance early commercialization.
- Support DOE in resolving environmentally related concerns, particularly as they relate to deploying STES's in desert environments.

### B. Work Breakdown Structure

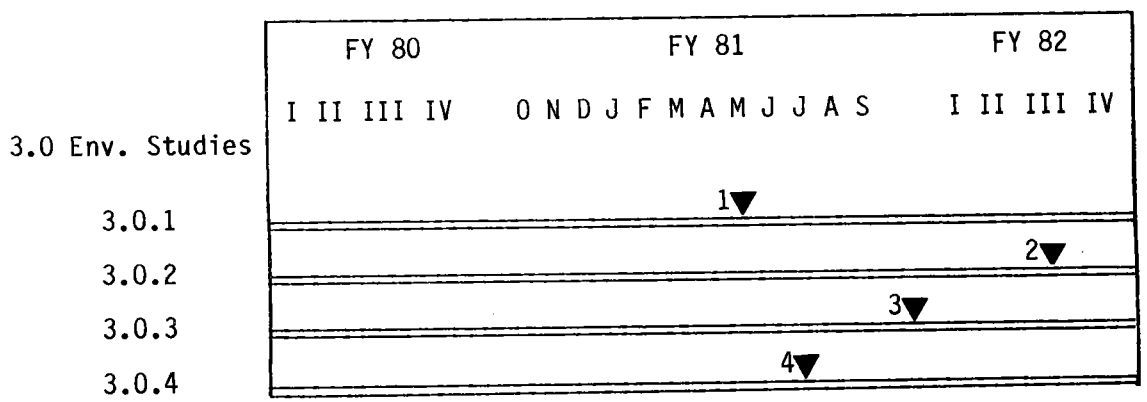
3.0.1 Occupational and Public Health and Safety

3.0.2 Ecological Effects of STES Fluid Releases

3.0.3 Siting Impacts of STES's

3.0.4 STES Environmental Effects Data Base and STES Program Support

### C. Milestone and Schedule



1. May 1981 - Completion of currently defined health and safety activities. Anticipated to continue as STES technologies and application evolve.

2. Completion on studies of ecological consequences of fluid spills.

3. Dec 1981 - Coincident with completion of construction of 10 MWe facility. Decisions as to whether to continue environmental monitoring is warranted and at what level depend on planned operation of facility.

4. July 1981 - Issuance of environmental assessment data base summary. To be updated annually.

D. Resource Requirements

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| 3.0 Env. Studies | 0.355 | 0.355 | -- | -- |

(Note: Additional funds will be provided by EV.)

E. Expected Accomplishments

- Complete assessment of occupational health and safety in hybrid STES applications

A possibility exists that the juxtapositioning of two energy technologies or simulatanious multiple applications of a single technology may introduce unexpected health and safety concerns. Following agreement with STES personnel on viable technology configurations, identification of potential problems and an evaluation of significance will be undertaken.

- Continue laboratory and field studies on the ecological effects of STES fluid releases.

Neubauer and related experiments will continue in the laboratory to quantify plant toxicity of selected fluids as functions of soil type and fluid concentration. Emphasis will shift from "fresh" fluids to "used" fluids which have undergone thermal cycling in prototype or operating systems. Field studies of controlled spills of selected fluids were initiated FY 80 and will be continued.

- Complete study of environmental impacts of construction at the 10 MWe Plant site.

Baseline environmental data were obtained prior to initiation of construction activities. Monitoring is continuing during construction.

Impacts of construction will be summarized with reference to the baseline data, and plans for continuing monitoring during facility operation will be defined.

- Develop strategy for using vegetation to stabilize soil surfaces within heliostat arrays.

Findings from the study on microclimatic and microecological changes within simulated heliostat arrays (completed FY 80); vegetation management and recovery (continuing); environmental monitoring at the 10 MWe Plant site (continuing); and the condition of the soil within the heliostat array following construction will be used to evaluate probable effectiveness of approach, select vegetation types, and develop test plan.

- Prepare uniform data base for environmental assessment of STES technologies and applications.

Organization of the data base will reflect three environmental perspectives: Environmental assessment related to siting of individual STES's (site-specific concerns); Environmental consequences of national deployment of STES's as projected to occur by the year 2000 (referenced to conventional energy sources); Effect of the environment on the technology.

F. Major New and Continuing Procurements

Work to be performed in-house at UCLA.

G. Funding Breakdown

| | FY 81 (Million Dollars) | | | |
|---|---|---|---|---|
| | Operating Exp | | Construction | |
| | BA | BO | BA | BO |
| LBES | .355 | .355 | -- | -- |

H. Deliverables

- Annual Reports of Progress
- Topical reports as appropriate
- Final Reports of individual studies

# V. Procurement Plan

# Section V

# Procurement Plan

Section V.

1.0 Procurement Strategy

A. The DOE Central Receiver Program is intended to be the catalyst in the formation of a self-sustaining private industry. Consistent with this goal, the Program's procurement policy is directed at developing to the maximum possible extent an active participation and broad consistency in the private sector -- including users, suppliers, designers and university/researchers. To this end, procurements are made on an open competitive selection basis whenever possible. Participation by small/disadvantage business and universities is actively sought, as are unsolicited proposals (see following sections).

B. Unsolicited Proposals

It is DOE policy to foster and encourage the submission of unsolicited proposals. The unsolicited proposal is a valuable means by which unique or innovative methods or approaches which have originated or developed outside the Government can be made available to Government agencies for use in the accomplishment of their missions.

Every unsolicited proposal document received by DOE pertaining to solar central receiver system shall be processed in accordance with RFP Subpart 1-4.9, "Unsolicited Proposals," and DOEPR Subpart 9-4.9, "Unsolicited Proposals," or, more specially insofar as applicable, under 42 US Code 5913 and 15 Code of Federal Regulations Part 270, "Procedures for the Evaluation of Energy-Related Inventions." Each such unsolicited proposal shall be subjected by DOE to a sequence comprising the following four discrete evalutions:

(1) Screening as to invention-related subject matter.

(2) Screening as to appropriateness and sufficiency of form.

(3) Screening as to substantive merit.

(4) Selection vis-a-vis availability of funds.

All unsolicited proposals exceeding $100,000 are approved in DOE Headquarters. The DOE San Francisco Operations Office (SAN), has been delegated the authority to review and approve unsolicited proposals pertaining to the solar central receiver program which do not exceed $100,000.

SAN's policy in regard to selection vis-a-vis availability of funds is as follows:

(1) divide that fiscal into three or more discrete periods

(2) designate the final day of each such period (i.e., its "closing date") and

(3) establish, and thereafter maintain, a budget projecting the manner in which the total funds allocated to funding such unsolicited proposals are to be aportioned among at least the following five categories of such matter:

(a) commercial demonstration

(b) overall system (other than commercial demonstrations)

(c) heliostats (other than commercial demonstrations)

(d) receivers (other than commercial demonstrations)

(e) other subsystems and components (other than commercial demonstrations) for each of such three or more time periods in that fiscal year.

As promptly as feasible after a "closing date," the aforesaid Screening shall be completed for all unsolicited proposals received during the time period just closed. Thereupon, all eligible proposals shall:

(i) each be placed in the appropriate one of the aforesaid five categories, and

(ii) be ranked, within each category, in descending order of discerned net value to the central receiver program within the preview of DOE, taking into account the commitment of dollar, time, management attention, and other resources which would have to be made by DOE in each case.

Thereupon, within each such category, SAN will select and commit funds for, one unsolicited proposal after another, starting with the highest ranked and progressing toward the lowest, so long as the remaining uncommitted fund balance standing in such budget will admit.

C. Small/Disadvantaged Business Participation

The San Francisco Operations Office is committed to the objective of maximizing the participation of Small/Disadvantage businesses in SAN and SAN contractor awards. A senior-level Small/Disadvantaged Business Team has been established at SAN to recommend appropriate goals, procedures and resonsibilities to achieve this objective. A full-time Small/Disadvantaged Business specialist coordinates the program activities, which include:

- Maintain a program designed to locate small/minority business sources for current and future procurements.

- Coordinate inquiries and requests for advice from small business concerns on procurement matters.

- Insure that small business concerns will receive adequate consideration during the solicitation process.

- Review procurement programs for possible breakout of items suitable for procurement from small business concerns.

- Advise small business concerns regarding financial assistance available under existing law.

- Evaluate prime contractor's subcontracting program.

- Assure that participation of small business concerns is accurately reported.

- Seek and develop information on the technical competence of small business concerns for research and development contracts.

- Screen/endorse all procurement requests originating from field organizations for feasibility of small/minority procurement action.

Standard language is included in all appropriate RFP's and other solicitations which require the contractor to:

- negotiate percentage to be subcontracted to small and minority business;

- submit a small/minority business plan for reaching that percentage;

- report quarterly regarding small and minority business subcontracting totals and percentages;

- permit government screening of contractor's proposed purchase orders and subcontracts if it appears he is failing to reach his goals; and

- report, at contract termination, additional costs incurred as a result of these requirements.

The Small/Disadvantaged Business Goal of 12.7% of total procurement dollars in FY81 for the Central Receiver program is considered achievable.

D. Upcoming Procurements - FY81

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- TROPICANA PLANT

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $275K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: April 1981

**Recommended Source of Procurement:** General Electric (continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- DOW CHEMICAL PLANT

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $275K

FY 82:

Beyond FY 82:

**Action Dates:**

Released: N/A

Response:

Evaluation Complete:

Anticipated Award Date: February 1982

**Recommended Source of Procurement:** Foster Wheeler Development Corporation (Continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**
Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**
SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- HOME LAUNDRY

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $175K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: April 1981

**Recommended Source of Procurement:** Jacobs Engineering (Continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- ORI-IDA PLANT

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $275K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response: N/A

Evaluation Complete:

Anticipated Award Date: March 1981

**Recommended Source of Procurement:** TRW (continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- SOUTHERN UNION OIL REFINERY
WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $200K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: January 1981

**Recommended Source of Procurement:** Energetics Corporation (continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- SOUTHERN UNION OIL REFINERY

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $250K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response: N/A

Evaluation Complete:

Anticipated Award Date: April 1981

**Recommended Source of Procurement:** ENERGETICS CORPORATION (Continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- SELECTED SITES
WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $1,000K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: February 1982

**Recommended Source of Procurement:** ENERGY TECHNOLOGY ENGINEERING CENTER (ETEC)

## STATEMENT OF WORK

A review of five first generation solar industrial process heat systems which are completed but operating at efficiencies less than 50% of the designed performance levels has been completed by ETEC and their subcontractor, Lockheed, for the purpose of advising DOE on the feasibility/desireability of renovating the present systems.

The scope of this effort includes implementation of DOE approved plans to redesign, construct, test and accept and operate the selected systems. ETEC will provide technical and administrative engineering expertise in monitoring each project. Subcontracting will be competitive where feasible.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

TECHNICAL SUPPORT FOR THE INDUSTRIAL PROCESS HEAT PROGRAM

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $150K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response:

Evaluation Complete:

Anticipated Award Date: January 1981

**Recommended Source of Procurement:** ETEC

## STATEMENT OF WORK

ETEC will provide engineering monitoring of industrial process heat projects managed by DOE/SAN during planning, design, construction and operation phases. ETEC's work will consist of technical, scheduling, and cost overviews, and reports on specific technical analyses. The scope of ETEC's engineering responsibilities wil be to (1) review work breakdown schedules and technical schedules, (2) review and maintain technical cost estimates, (3) assist in project control and reporting systems (4) eveluate designs and project plans for construction and operations, and (5) review plans for and assist in plant acceptance and start-up.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

INDUSTRIAL PROCESS HEAT SYSTEM - U. S. STEEL PLANT

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $175K

FY 82: $100K

Beyond FY 82:

**Action Dates:**

Released: N/A

Response:

Evaluation Complete:

Anticipated Award Date: August 1981

**Recommended Source of Procurement:** COLUMBIA GAS SERVICES CORPORATION

## STATEMENT OF WORK

This action is financial assistance to the participant on a cost-shared project to design, construct, and operate a medium scale line focusing solar system for industrial process steam. This phase of effort includes (1) operation of the system, (2) data collection and analysis; (3) system maintenance, and (4) final documentation of system performance and evaluation thereof. This effort will be incrementally funded over FY1981 - FY1983.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SUPPORT TO INDUSTRIAL PROCESS HEAT PROGRAM

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $150K (Operating) $10K (Capital)

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response: N/A

Evaluation Complete:

Anticipated Award Date: December 1980

**Recommended Source of Procurement:** LAWRENCE LIVERMORE NATIONAL LABORATORY

## STATEMENT OF WORK

Lawrence Livermore National Laboratory will perform work in the following task areas in support of the Industrial Process Heat Program:

1. Standardize Data systems Selection for IPH. This work includes identification of prototype specifications, selection of final prototypes, evaluation, testing and selection of Standardized Data Acquisition Systems (SDAS), and preparation of final report.

2. Assistance to Applications and Market Development Branch and the Solar Energy Research Institute. This effort includes economic evaluations of IPH projects, monitoring field test projects, participating in planning and organizing annual DOE IPH conference support to ASME and ASTM E-44 Solar Committees, and review of solicited and unsolicited proposals received by DOE/HQ.

# Section V

# Procurement Plan

Section V.

1.0 Procurement Strategy

A. The DOE Central Receiver Program is intended to be the catalyst in the formation of a self-sustaining private industry. Consistent with this goal, the Program's procurement policy is directed at developing to the maximum possible extent an active participation and broad consistency in the private sector -- including users, suppliers, designers and university/researchers. To this end, procurements are made on an open competitive selection basis whenever possible. Participation by small/disadvantage business and universities is actively sought, as are unsolicited proposals (see following sections).

B. Unsolicited Proposals

It is DOE policy to foster and encourage the submission of unsolicited proposals. The unsolicited proposal is a valuable means by which unique or innovative methods or approaches which have originated or developed outside the Government can be made available to Government agencies for use in the accomplishment of their missions.

Every unsolicited proposal document received by DOE pertaining to solar central receiver system shall be processed in accordance with RFP Subpart 1-4.9, "Unsolicited Proposals," and DOEPR Subpart 9-4.9, "Unsolicited Proposals," or, more specially insofar as applicable, under 42 US Code 5913 and 15 Code of Federal Regulations Part 270, "Procedures for the Evaluation of Energy-Related Inventions." Each such unsolicited proposal shall be subjected by DOE to a sequence comprising the following four discrete evalutions:

(1) Screening as to invention-related subject matter.

(2) Screening as to appropriateness and sufficiency of form.

(3) Screening as to substantive merit.

(4) Selection vis-a-vis availability of funds.

All unsolicited proposals exceeding $100,000 are approved in DOE Headquarters. The DOE San Francisco Operations Office (SAN), has been delegated the authority to review and approve unsolicited proposals pertaining to the solar central receiver program which do not exceed $100,000.

SAN's policy in regard to selection vis-a-vis availability of funds is as follows:

(1) divide that fiscal into three or more discrete periods

(2) designate the final day of each such period (i.e., its "closing date") and

(3) establish, and thereafter maintain, a budget projecting the manner in which the total funds allocated to funding such unsolicited proposals are to be aportioned among at least the following five categories of such matter:

(a) commercial demonstration

(b) overall system (other than commercial demonstrations)

(c) heliostats (other than commercial demonstrations)

(d) receivers (other than commercial demonstrations)

(e) other subsystems and components (other than commercial demonstrations) for each of such three or more time periods in that fiscal year.

As promptly as feasible after a "closing date," the aforesaid Screening shall be completed for all unsolicited proposals received during the time period just closed. Thereupon, all eligible proposals shall:

(i) each be placed in the appropriate one of the aforesaid five categories, and

(ii) be ranked, within each category, in descending order of discerned net value to the central receiver program within the preview of DOE, taking into account the commitment of dollar, time, management attention, and other resources which would have to be made by DOE in each case.

Thereupon, within each such category, SAN will select and commit funds for, one unsolicited proposal after another, starting with the highest ranked and progressing toward the lowest, so long as the remaining uncommitted fund balance standing in such budget will admit.

C. Small/Disadvantaged Business Participation

The San Francisco Operations Office is committed to the objective of maximizing the participation of Small/Disadvantage businesses in SAN and SAN contractor awards. A senior-level Small/Disadvantaged Business Team has been established at SAN to recommend appropriate goals, procedures and resonsibilities to achieve this objective. A full-time Small/Disadvantaged Business specialist coordinates the program activities, which include:

- Maintain a program designed to locate small/minority business sources for current and future procurements.

- Coordinate inquiries and requests for advice from small business concerns on procurement matters.

- Insure that small business concerns will receive adequate consideration during the solicitation process.

- Review procurement programs for possible breakout of items suitable for procurement from small business concerns.

- Advise small business concerns regarding financial assistance available under existing law.

- Evaluate prime contractor's subcontracting program.

- Assure that participation of small business concerns is accurately reported.

- Seek and develop information on the technical competence of small business concerns for research and development contracts.

- Screen/endorse all procurement requests originating from field organizations for feasibility of small/minority procurement action.

Standard language is included in all appropriate RFP's and other solicitations which require the contractor to:

- negotiate percentage to be subcontracted to small and minority business;

- submit a small/minority business plan for reaching that percentage;

- report quarterly regarding small and minority business subcontracting totals and percentages;

- permit government screening of contractor's proposed purchase orders and subcontracts if it appears he is failing to reach his goals; and

- report, at contract termination, additional costs incurred as a result of these requirements.

The Small/Disadvantaged Business Goal of 12.7% of total procurement dollars in FY81 for the Central Receiver program is considered achievable.

D. Upcoming Procurements - FY81

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- TROPICANA PLANT

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $275K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: April 1981

**Recommended Source of Procurement:** General Electric (continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- DOW CHEMICAL PLANT

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $275K

FY 82:

Beyond FY 82:

**Action Dates:**

Released: N/A

Response:

Evaluation Complete:

Anticipated Award Date: February 1982

**Recommended Source of Procurement:** Foster Wheeler Development Corporation (Continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**
Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**
SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- HOME LAUNDRY

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $175K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: April 1981

**Recommended Source of Procurement:** Jacobs Engineering (Continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- ORI-IDA PLANT

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $275K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response: N/A

Evaluation Complete:

Anticipated Award Date: March 1981

**Recommended Source of Procurement:** TRW (continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- SOUTHERN UNION OIL REFINERY
WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $200K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: January 1981

**Recommended Source of Procurement:** Energetics Corporation (continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- SOUTHERN UNION OIL REFINERY

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $250K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response: N/A

Evaluation Complete:

Anticipated Award Date: April 1981

**Recommended Source of Procurement:** ENERGETICS CORPORATION (Continuation)

## STATEMENT OF WORK

This effort is a continuation of scope to design, construct and operate a solar line-focusing system at the Tropicana Orange Juice Plant, Bradenton, Florida. The phase of work to be procured includes (1) operation of the system (2) data collection and analysis (3) system maintenance and (4) final documentation of system performance and evaluation thereof. Continuation into Phase III effort is an option exercised by the government.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SOLAR INDUSTRIAL PROCESS HEAT SYSTEM EXPERIMENT -- SELECTED SITES
WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $1,000K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: February 1982

**Recommended Source of Procurement:** ENERGY TECHNOLOGY ENGINEERING CENTER (ETEC)

## STATEMENT OF WORK

A review of five first generation solar industrial process heat systems which are completed but operating at efficiencies less than 50% of the designed performance levels has been completed by ETEC and their subcontractor, Lockheed, for the purpose of advising DOE on the feasibility/desireability of renovating the present systems.

The scope of this effort includes implementation of DOE approved plans to redesign, construct, test and accept and operate the selected systems. ETEC will provide technical and administrative engineering expertise in monitoring each project. Subcontracting will be competitive where feasible.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

TECHNICAL SUPPORT FOR THE INDUSTRIAL PROCESS HEAT PROGRAM

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $150K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response:

Evaluation Complete:

Anticipated Award Date: January 1981

**Recommended Source of Procurement:** ETEC

## STATEMENT OF WORK

ETEC will provide engineering monitoring of industrial process heat projects managed by DOE/SAN during planning, design, construction and operation phases. ETEC's work will consist of technical, scheduling, and cost overviews, and reports on specific technical analyses. The scope of ETEC's engineering responsibilities wil be to (1) review work breakdown schedules and technical schedules, (2) review and maintain technical cost estimates, (3) assist in project control and reporting systems (4) eveluate designs and project plans for construction and operations, and (5) review plans for and assist in plant acceptance and start-up.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

INDUSTRIAL PROCESS HEAT SYSTEM - U. S. STEEL PLANT

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $175K

FY 82: $100K

Beyond FY 82:

**Action Dates:**

Released: N/A

Response:

Evaluation Complete:

Anticipated Award Date: August 1981

**Recommended Source of Procurement:** COLUMBIA GAS SERVICES CORPORATION

## STATEMENT OF WORK

This action is financial assistance to the participant on a cost-shared project to design, construct, and operate a medium scale line focusing solar system for industrial process steam. This phase of effort includes (1) operation of the system, (2) data collection and analysis; (3) system maintenance, and (4) final documentation of system performance and evaluation thereof. This effort will be incrementally funded over FY1981 - FY1983.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

SUPPORT TO INDUSTRIAL PROCESS HEAT PROGRAM

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $150K (Operating) $10K (Capital)

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response: N/A

Evaluation Complete:

Anticipated Award Date: December 1980

**Recommended Source of Procurement:** LAWRENCE LIVERMORE NATIONAL LABORATORY

## STATEMENT OF WORK

Lawrence Livermore National Laboratory will perform work in the following task areas in support of the Industrial Process Heat Program:

1. Standardize Data systems Selection for IPH. This work includes identification of prototype specifications, selection of final prototypes, evaluation, testing and selection of Standardized Data Acquisition Systems (SDAS), and preparation of final report.

2. Assistance to Applications and Market Development Branch and the Solar Energy Research Institute. This effort includes economic evaluations of IPH projects, monitoring field test projects, participating in planning and organizing annual DOE IPH conference support to ASME and ASTM E-44 Solar Committees, and review of solicited and unsolicited proposals received by DOE/HQ.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective**

Provide linear-focusing solar thermal system experiments for industrial process heat applications which will validate the technology and promote its commercialization through industrial demonstration.

**Title**

INDUSTRAL PROCESS HEAT SYSTEM - BATES CONTAINER, INC.

WBS 1.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $175K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response: N/A

Evaluation Complete:

Anticipated Award Date: December 1980

**Recommended Source of Procurement:** Bates Container, Inc. (Incremental)

## STATEMENT OF WORK

This action provides the balance of financial assistance to the participant on a cost-shared project to design, construct; and operate medium scale line focusing solar system for industrial process steam.

# UPCOMING PROCUREMENT

SAN CONTACT: Larry Prince

**Objective**

Provide central receiver demonstration projects which will validate this technology and promote its commercialization through use by industry and utilities.

**Title**

Solar Repowering and Industrial Retrofit Central Receiver Applications Site Analyses
WBS 1.2 and 2.2

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: 5M
FY 82: TBD
Beyond FY 82: TBD

**Action Dates:**

Released: Feb 1981
Response: Mar 1981
Evaluation Complete: June 1981
Anticipated Award Date: Sep 1981

**Recommended Source of Procurement:** Open Procurement

## STATEMENT OF WORK

The contractors will provide a basic application design description in their proposal for work to accomplish the following:

a. Evaluation of advanced heliostat designs at the identified site, definition of the heliostat field configuration, determination of a procurement approach for heliostats for the selected application.

b. Definition of all requirements (technical, financial, etc.) for detailing an exemption to the Fuel Use Act of 1978.

c. Review of local and state permits for the site application (including PUC requirements as appropriate).

d. Measurement of solar insolation at the site.

e. Evaluation and presentation of the site requirement for Environmental Impact Assessment.

# UPCOMING PROCUREMENT

SAN CONTACT: Larry Prince

**Objective**

Provide central receiver demonstration projects which will validate this technology and promote its commercialization through use by industry and utilities.

**Title**

Technical Support for the Solar Repowering Program

WBS 1.2 and 2.2

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $300K

FY 82:

Beyond FY 82:

**Action Dates:**

Released: N/A

Response:

Evaluation Complete:

Anticipated Award Date: December 1980

**Recommended Source of Procurement:** Sandia National Laboratory, Livermore

## STATEMENT OF WORK

DOE's goal is to commercialize solar central receiver technology by the mid 1990's. The first phase of the Repowering Program is the design phase. Contrators will complete all detailed facillty designs, determine system theoretical performance, obtain firm estimate costs, and establish a construction and operation schedule.

Sandia Labs, Livermore will perform the following tasks for DOE:

1. Technically analyze the conceptual repowering designs submitted to DOE by utilities and industry. Evaluate the relative reliability and assess the development necessary to promote a conceptual design to the commercial operation stage.

2. Evaluate designs studies submitted to DOE under Repowering. Evaluate the technical soundness and economic feasibility of proposals and rank proposals for the purpose of selection for funding.

3. Prepare reports describing the technical aspects of the Repowering Program and program strategy for use in the Program Element and the Multiyear Program Plan.

# UPCOMING PROCUREMENT

SAN CONTACT: Larry Prince

**Objective**
Provide central receiver demonstration projects which will validate this technology and promote its commercialization through use by industry and utilities.

**Title**
Technical Support for the Solar Repowering Program

WBS 1.2 and 2.2

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $100K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: January 1981

**Recommended Source of Procurement:** Aerospace Corporation

## STATEMENT OF WORK

The Aerospace Industry has considerable experience in industrial energy technology and has been directly involved in reviewing the conceptual designs submitted to DOE under the Repowering Program. Aerospace will perform the following tasks for DOE.

1. General support to review, organize, and edit documents prepared by the Solar Energy Division. These documents include the Repowering solicitation Multiyear Program Plan, and the Program Element Plan.

2. Review and evaluate the preliminary designs submitted to DOE under the Repowering solicitation. Emphasis will be placed on review of construction schedules and management organization of the offering contractor. Preliminary designs will be ranked for DOE funding selection.

# UPCOMING PROCUREMENT

SAN CONTACT: KEITH ROSE

**Objective**

Market survey to determine potential applications of solar central receiver systems in industry and utilities in the Southwest in support of the Solar Repowering program.

**Title**

Market Survey of Industrial Applications of Solar Thermal Central Receiver Technology

WBS 1.2 &2.2

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $200K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response: N/A

Evaluation Complete:

Anticipated Award Date: December 1980

**Recommended Source of Procurement:** Booz, Allen and Hamilton

## STATEMENT OF WORK

Booz Allen is presently under contract with DOE and has completed several studies on market potential of energy technologies. For this task Booz Allen will survey industry and utilities for applications of solar central reciever technology in the production of electricity , process heat, and cogeneration. Also included in this task will be the definition of financial incentives and types of demonstration projects needed to convince industry and utilities to invest in central receiver technology. To accomplish the above, the contractor must perform an intensive interview procedure which includes prospective buyers and suppliers of central receiver systems and components.

# UPCOMING PROCUREMENT

SAN CONTACT: Larry Prince

**Objective**
Provide central receiver demonstration projects which will validate this technology and promote its commercialization through use by industry and utilities.

**Title**
Technical Support for the Solar Repowering Program

WBS 1.2 and 2.2

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
Solar Energy Division, SAN

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $600K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: January 1981

**Recommended Source of Procurement:** Energy Technology Engineering Center (ETEC)

## STATEMENT OF WORK

This project provides engineering services to DOE in support of the Solar Repowering/Industrial Retrofit program. ETEC will perform technical evaluations of repowering concepts and designs, including system, sub-system, and component designs. Assistance and advice will be provided to DOE in planning and organizing the work performed under this program and in setting up and implementing appropriate management systems to control resource allocation budgets and schedules. This effort consists of the following tasks:

Task A: Programmatic Studies

Task B: Evaluation of Conceptual Design Activities

Task C: Design Technical Monitoring

Task D: Development of Technical Standards for Central Receiver Systems

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective** Provide support to industry sponsored large scale solar steam generation projects for enhanced oil recovery applications which will initiate mass production capability for solar manufacturers and penetrate new process heat markets.

**Title**
Technical Support to the Solar Thermal Enhanced Oil Recovery (STEOR) Program
WBS 1.3

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
SAN Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $50K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response:
Evaluation Complete:
Anticipated Award Date: January 1981

**Recommended Source of Procurement:** Aerospace Corporation

## STATEMENT OF WORK

The Aerospace Corp. will provide technical and administrative support to DOE/SAN management of the STEOR program through the following tasks:

1. Assist in planning technical requirements, reviewing statements of work, solicitations, and evaluating proposal.

2. Assist in providing contractors with technical guidance, evaluation and assessment in project work. Some in-house analysis will be performed.

3. Assist in facilitating technical information exchange including program summaries, conferences, workshops, etc.

# UPCOMING PROCUREMENT

SAN CONTACT: JANET NEVILLE

**Objective** Provide support to industry sponsored large scale solar steam generation projects for enhanced oil recovery applications which will initiate mass production capability for solar manufacturers and penetrate new process heat markets.

**Title**
Solar Thermal Enhanced Oil Recovery (STEOR) Program
WBS 1.3

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
SAN Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $450K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response: TBD
Evaluation Complete:
Anticipated Award Date: TBD

**Recommended Source of Procurement:** Open Procurement/Financial Assistance

## STATEMENT OF WORK

The Solar Thermal Enhanced Oil Recovery (STEOR) Program is currently working with industry to identify and establish mechanisms (i.e., competitive procurements/financial assistance) to enhance DOE's programmatic value of privately committed and funded STEOR applications Scope may include Market analysis, policy analysis and financial incentives. Specific activities will be identified after announcement of privately funded projects and initial working sessions with industry.

# UPCOMING PROCUREMENT

SAN CONTACT: LARRY PRINCE

**Objective**

Develop Solar Cogeneration conceptual designs in preparation for preliminary designs to construct solar cogeneration plants.

**Title**

Technical Management of Solar Cogeneration Conceptual Designs

WBS 1.4

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $150K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: November 1980

**Recommended Source of Procurement:** Aerospace Corporation

## STATEMENT OF WORK

This task will be technical support services for the Solar Cogeneration Conceptual Designs. Aerospace will act as technical consultant and advisor to DOE for development of conceptual designs. Aerospace will also help DOE select the best conceptual designs for cost-share construction.

# UPCOMING PROCUREMENT

SAN CONTACT: LARRY PRINCE, KEITH ROSE

**Objective**
Develop Solar Central Receiver technology and demonstrate this technology through near term solar cogeneration applications.

**Title**
Conceptual Design of a Solar Cogeneration Facility
WBS 1.4

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total: $3.2M
FY 81: $1.9M
FY 82: TBD
Beyond FY 82: TBD

**Action Dates:**
RFP Released: February 1980
Response: May 1980
Evaluation Complete: June 1980
Anticipated Award Date: See below

**Recommended Source of Procurement:** See below

## STATEMENT OF WORK

NOTE: Seven contractors were selected in June 1980; three awards were made in FY80 and four awards were made in FY81.

General Electric -- 09/01/80
Exxon Research and Engineering Co. -- 10/01/80
Bechtel National, Inc. -- 10/01/80
Black and Veatch Consulting Engineers -- 11/10/80
Westinghouse Electric Corporation -- 12/01/80
McDonnell Douglas Corporation -- 12/01/80
Gibbs and Hill, Incorporated -- 12/30/80

STATEMENT OF WORK: Preparation of System specification
Selection of site-specific configuration
Facility Conceptual Design
Facility Cost Estimates and Economic Analysis
Development Plan
Program Management

# UPCOMING PROCUREMENT

SAN CONTACT: LARRY PRINCE

**Objective**
Develop Solar Cogeneration conceptual designs in preparation for preliminary designs to construct solar cogeneration plants.

**Title**
Technical Management of Solar Cogeneration Conceptual Designs

WBS 1.4

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $350K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date: November 1980

**Recommended Source of Procurement:** Sandia National Laboratory Livermore

## STATEMENT OF WORK

This task will be technical support services for the Solar Cogeneration Conceptual Designs. Sandia will act as technical consultant and advisor to DOE for developme of conceptual designs. Sandia will later rate the designs on their merits for the of allowing DOE to select the best designs for cost-share construction.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

To provide adequate spare parts for the initiation of operation.

**Title**
Operational Spares

WBS 2.1

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $140K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response:
Evaluation Complete:
Anticipated Award Date:

**Recommended Source of Procurement:** Martin Marietta Corporation

## STATEMENT OF WORK

MMC will furnish 2 years of operational spares to the plant site for use following the acceptance test period.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

Provide Utility Oerators to Startup the Pilot Plant and Complete Acceptance Testing

**Title**
Plant Startup

WBS 2.1

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: 1.71
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response:
Evaluation Complete:
Anticipated Award Date: Feb. 15, 1981

**Recommended Source of Procurement:** Southern California Edison

## STATEMENT OF WORK

The Cooperative Agreement between DOE and the Utility partner calls out the Utility as responsible for startup of the Plant. Cost sharing of this phase assigns the first $200K to the Utility and the open end to DOE. SCE's limit is expected to be reached in the first quarter fo FY81, afterwhich DOE will reimburse SCE. This funding request is based on SCE's most recent estimate of February 1980.

SCE has selected the operating personnel and is proceeding to provide solar plant training prior to onsite activities starting in the second Quarter of FY81.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

Provide technical monitoring to assure that Pilot Plant Project implementation adheres to Central Receiver Program Objectives

**Title**
Startup Preparation

WBS 2.1

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $250K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response:
Evaluation Complete:
Anticipated Award Date: Oct 1, 1980

**Recommended Source of Procurement:** Energy Technology Engineering Center (ETEC)

## STATEMENT OF WORK

ETEC will evaluate the SFDI developed Pilot Plant Acceptance Criteria, review plans and procedures for acceptance testing, monitor startup and acceptance testing, assist in evaluating pilot plant acceptability, and determine the impact on operation testing.

A smooth transition between acceptance testing and operational testing is necessary for schedule reasons. Elimination of duplicate tests can save both time and funding. Since ETEC, as the acting test contractor, is preparing the operational test plan, being familiar with the acceptance testing and having personnel in the field prior to operational testing will assure that the early operation phase will be well managed.

# UPCOMING PROCUREMENT

SAN CONTACT: LARRY PRINCE

**Objective**

Provide technical monitoring to assure that Pilot Plant Project Implementation adheres to Central Receiver Program Objectives

| Title | Organization Responsible: |
|---|---|
| Test Planning<br>WBS 2.1 | SAN FRANCISCO OPERATIONS OFFICE |
| **Field Office**<br>San Francisco Operations Office | **Type of Procurement:** PRDA RFP OTHER |
| **Anticipated Level of Funding:**<br>Total:<br>FY 81: $200K<br>FY 82:<br>Beyond FY 82: | **Action Dates:**<br>Released:<br>Response:<br>Evaluation Complete:<br>Anticipated Award Date: Oct 1, 1980 |
| **Recommended Source of Procurement:** | Energy Technology Engineering Center (ETEC) |

## STATEMENT OF WORK

ETEC, as acting test contractor, will continue to prepare the Operational Test Plan. The principal activity will be to complete the detailed Test Specifications to be included as an appencix to the Test Plan. In addition ETEC will initiate Test Coordination and Management of the interface between DOE and SCE for preparing test procedures for the operational testing phase.

In addition ETEC will specify and obtain the data reduction and data analysis methods, including computer software and hardware for on-line and off-line data reduction as well as for on-line data display to guide the conduct of a test.

# UPCOMING PROCUREMENT

SAN CONTACT: LARRY PRINCE

**Objective**
Provide technical monitoring to assure that Pilot Plant Project Implementation adheres to Central Receiver Program Objectives

| Title | Organization Responsible: |
|---|---|
| Test Planning<br>WBS 2.1 | SAN FRANCISCO OPERATIONS OFFICE |

| Field Office | Type of Procurement: PRDA RFP OTHER |
|---|---|
| San Francisco Operations Office | |

| Anticipated Level of Funding: | Action Dates: |
|---|---|
| Total:<br>FY 81: $100K<br>FY 82:<br>Beyond FY 82: | Released:<br>Response:<br>Evaluation Complete:<br>Anticipated Award Date: 2nd Quarter FY81 |

**Recommended Source of Procurement:** Sandia National Laboratory, Livermore and/or Aerospace Corporation

## STATEMENT OF WORK

These funds are initially planned to be retained within SAN. As the Operational phase becomes better defined, these funds may be assigned to SNLL or Aerospace for support activities. These funds are also invisioned to act as SAN management reserved to assure that new and unexpected fabrication or construction problems can be dealt with expeditiously.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

Operate a Visitor Center at the Plant Site in Daggett, CA.

**Title**

Visitor Center Operations

WBS 2.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $170K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response:

Evaluation Complete:

Anticipated Award Date: Oct 1, 1980

**Recommended Source of Procurement:** Southern California Edison

## STATEMENT OF WORK

The Cooperative Agreement between DOE and the Utility partner calls out that SCE will operate the Center, but DOE will be responsible for Center costs. The Center was opened on July 18, 1980, and is operating on a seven day a week basis.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

To provide adequate spare parts for the initiation of Operations and to train SCE Operators in control and maintenance of solar hardware.

**Title**

Operational Spares/Training

WBS 2.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $2,030K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response:
Evaluation Complete:
Anticipated Award Date: 2nd Quarter FY81

**Recommended Source of Procurement:** McDonnell-Douglas Astronautics Company

## STATEMENT OF WORK

The SFDI will train SCE operation personnel to operate and maintain the government furnished equipment at the Pilot Plant.

In addition, the SFDI will furnish 2 years of operational spares to the plant site for use following the acceptance test period.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

Continue Pilot Plant Project Design, Construction and Startup.

**Title**

Construction

WBS 2.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total: $118M
FY 81: $ 18M
FY 82: 0
Beyond FY 82: 0

**Action Dates:**

Released:
Response:
Evaluation Complete:
Anticipated Award Date:

**Recommended Source of Procurement:** McDonnell-Douglas Astronautics Company, Martin Marietta Corporation, and Townsend and Bottum, Small Business Administration (8A set-aside)

## STATEMENT OF WORK

The 10MWe Solar Thermal Central Receiver Pilot Plant Project will continue to be designed and constructed towards a major milestone date of December 1981 for Turbine Roll. Final plant acceptance is targeted for June 1982.

Procurements have previously been placed with MDAC, MMC, T&B and SBA for services and plant hardware. The only new DOE procurements in FY81 will be two SBA-8A construction contracts.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

Provide technical monitoring to assure that Pilot Plant Project Implementation adheres to Central Receiver Program Objectives.

**Title**

STMPO Engineering Support

WBS 2.1

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:

FY 81: $250K

FY 82:

Beyond FY 82:

**Action Dates:**

Released:

Response:

Evaluation Complete:

Anticipated Award Date: Oct 1, 1980

**Recommended Source of Procurement:** Energy Technology Engineering Center (ETEC)

## STATEMENT OF WORK

ETEC is to provide two technnical monitors for the pilot plant office along with technical home office support. The areas of technical cognizance are the Receiver Subsystem, the Thermal Storage Subsystem, the Plant Support Subsystem, and preparation by Stearns-Roger of all construction packages.

The primary effort is to monitor fabrication progress/problems on the receiver panels and thermal storage skids, and to evaluate engineering associated with changes to the construction packages.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

Provide technical monitoring to assure that Pilot Plant Project Implementation adheres to Central Receiver Program Objectives.

| Title | Organization Responsible: |
|---|---|
| STMPO Engineering Support<br>WBS 2.1 | SAN FRANCISCO OPERATIONS OFFICE |

| Field Office | Type of Procurement: PRDA RFP OTHER |
|---|---|
| San Francisco Operations Office | |

| Anticipated Level of Funding: | Action Dates: |
|---|---|
| Total: | Released: |
| FY 81: $250K | Response: |
| FY 82: | Evaluation Complete: |
| Beyond FY 82: | Anticipated Award Date: Oct 1, 1980 |

**Recommended Source of Procurement:** Sandia National Laboratory, Livermore

## STATEMENT OF WORK

SNLL is to provide one technical monitor for the pilot plant office along with technical home office support.

Technical support is required in the following areas to assure that a high quality product is delivered according to schedule milestones:

1. Testing and evaluation of mirror modules at SNLL. This is required prior to DOE release to MMC for mirror module fabrication.

2. Periodic quality assurance audits of component production.

3. Technical evaluation on the subsystem with emphasis on the mirror module and controls systems design change.

4. Evaluation and quality assurance audits on the heliostat assembly, installation, and performance.

5. Testing and maintenance of the MMC heliostats at CRTF. This testing will provide the earliest test feedback on a complete heliostat unit.

# UPCOMING PROCUREMENT

SAN CONTACT: RICHARD SCHWEINBERG

**Objective**

Provide technical monitoring to assure that Pilot Plant Project Implementation adheres to Central Receiver Program Objectives.

| Title | Organization Responsible: |
|---|---|
| STMPO Engineering Support<br>WBS 2.1 | SAN FRANCISCO OPERATIONS OFFICE |

| Field Office | Type of Procurement: PRDA RFP OTHER |
|---|---|
| San Francisco Operations Office | |

| Anticipated Level of Funding: | Action Dates: |
|---|---|
| Total:<br>FY 81: $500K<br>FY 82:<br>Beyond FY 82: | Released:<br>Response:<br>Evaluation Complete:<br>Anticipated Award Date: January 1, 1981 |

**Recommended Source of Procurement:** Aerospace Corporation

## STATEMENT OF WORK

Aerospace provides two technical monitors for the pilot plant office along with technical home office suport. Technical suport activities encompass the definition of plant objecties and requirements, review and corrections to plans and other documentation, technical monitoring of contractor activities, verification of analysis and simulations using computer modeling and participation in technical interchanges and reviews.

Specific area include monitoring of the development of the plant system and subsystem computerized controls, displays, software development, safety interlocks and operator interfaces. This SFDI activity includes a detailed control anlaysis, a major mathematical modeling effort and digital and hybrid simulations.

Aerospace is also monitoring the System Integration effort and the overall pilot plant design. Minor modifications to the design of the plant will be reviewed in order to resolve construction problems and to meet the interface requirements of the Southern California Edison portion of the plant. Process and heat flow analysis, P&ID review and configuration changes will be verified by Aerospace in detail to guarantee that the operational performance requirements and technical feasibility of the plant will not be impacted by these changes. Beam safety will be closely monitored since the pilot plant represents the first scaled application of the central receiver technology with its inherent eye hazards. The Aerospace technical analysis, support and monitoring includes determining the requirements and application for meteorology, environmental impact, performance efficiency, and safety related measurements, cloud measurements and failure analysis. It is also anticipated that Aerospace will continue to play a key role for DOE in verifying not only that overall performance requirements for the plant can be met but to evaluate the impact of any changes to the design in support of repowering objectives.

# UPCOMING PROCUREMENT

| | |
|---|---|
| Objective | |
| Title<br>Utility CR Repowering Projects<br>WBS 2.2 | Organization Responsible: |
| Field Office | Type of Procurement: PRDA RFP OTHER |
| Anticipated Level of Funding:<br>Total:<br>FY 81:<br>FY 82:<br>Beyond FY 82: | Action Dates:<br>Released:<br>Response:<br>Evaluation Complete:<br>Anticipated Award Date: |
| Recommended Source of Procurement: | |

STATEMENT OF WORK

See WBS 1.2 (The upcoming procurements for WPS Tasks 1.2 and 2.2 are combined.)

# UPCOMING PROCUREMENT

SAN CONTACT: DOUG ELLIOTT

**Objective**

Provide technical monitoring to assure that IEA Small Solar Systems Project implementation supports the goals of the U.S. Central Receiver and Distributed Collector programs.

**Title**
Technical Support for the International Energy Agency (IEA) Small Solar Power Systems Project
WBS 2.3

**Organization Responsible:** SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**
Total:
FY 81: $250K
FY 82:
Beyond FY 82:

**Action Dates:**
Released:
Response: N/A
Evaluation Complete:
Anticipated Award Date:

**Recommended Source of Procurement:** Sandia National laboratory, Livermore

## STATEMENT OF WORK

SNLL is to provide technical support for the IEA Small Solar Power Systems (SSPS) project being built in Almeria, Spain. This support is provided in the following areas to assure that the U.S. DOE program objectives are met:

1. When requested, represent the interest of the U. S. DOE at the IEA/SSPS Test and Operations Advisory Board meetings and Executive Committee meetings.
2. Review and provide imput to the Test and Operation program plan.
3. Coordinate the data neesds of U.S. industy, utilities, and laboratories on the IEA/SSPA projects.
4. Provide on site representation during plant start-up and acceptance testing.

# UPCOMING PROCUREMENT

SAN CONTACT: DOUG ELLIOTT

**Objective**

Provide utility plant operating personnel (by 1985) with:
- Direct experience in the operation of solar central receiver power plants;
- Real-time, computer-aided optimal dispatching of solar plants in a utility system

**Title**

ADVANCED UTILITY CENTRAL RECEIVER SYSTEMS
DOE/EPRI Utility Cooperative Studies:
Solar Thermal Plant Dynamic Model Dispatch
WBS 2.4

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP [OTHER]

**Anticipated Level of Funding:** (DOE share)

| | |
|---|---|
| Total: | $705K |
| FY 81: | $215K |
| FY 82: | $400K |
| Beyond FY 82: | $ 90K |

**Action Dates:**

Released:
Response:
Evaluation Complete:
Anticipated Award Date: May, 1981

**Recommended Source of Procurement:** Westinghouse Electric Corporation (Continuation of DE-AC03-79SF10601)

## STATEMENT OF WORK

1) DOE will continue to cooperate with the Electric Power Research Institute in areas of mutual interest on a no-fund-exchange basis. Current activity includes DOE participation in review of EPRI 100-kWe scale Brayton cycle Full System Experiment, in preparation for testing in late FY82 at the DOE Central Receiver Test Facility, and in plans to provide opportunities for training and hands-on experience in operation of central receiver systems and subsystems to EPRI-coordinated utility operator teams. EPRI will review potential for retrofit of DOE Central Receiver Pilot Plant with Brayton cycle receiver and turbine

2) DOE and EPRI will fund complementary model development activities by Westinghouse, applying techniques and capabilities developed under prior contracts (DOE DE-AC03-79SF10601 and EPRI RP-648-I, respectively) to a real-time, dynamic, optimal dispatching computer aid program for utility operators in a mixed solar/non-solar system. In FY81, Westinghouse will investigate possible dispatch strategies (EPRI), and produce a conceptual dispatch model (DOE); in subsequent years, the model will be refined, verified in ongoing tests at the CRTF and the Pilot Plant, and adapted to individual utility requirements in subsequent repowered, hybrid and stand-alone solar central receiver power plants.

# UPCOMING PROCUREMENT

SAN CONTACT: DOUG ELLIOTT

**Objective**

Determine (by 1985) the comparative cost, performance and construction schedule for a solar central receiver power plant integrated with a hydroelectric grid.

**Title**

ADVANCED UTILITY CENTRAL RECEIVER SYSTEMS
Solar/Hydro Integration Study
WBS 2.4

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP [OTHER]

**Anticipated Level of Funding:** (DOE Share)

| | | |
|---|---|---|
| Total: | NIL* | * DOE support of $100K in FY79 and $25K in '80 offset by WPRS funds for DOE support in '82+ |
| FY 81: | $ OK | |
| FY 82: | ($20K) | |
| Beyond FY 82: | TBD | |

**Action Dates:**

Released:
Response:
Evaluation Complete:
Anticipated Award Date: N/A

**Recommended Source of Procurement:** Water & Power Resources Service, DOI
(Continuation of DE-AI03-79SF10505)

## STATEMENT OF WORK

Pending appropriation of funds for authorized Feasibility Study (preliminary design and cost estimates), continue monitoring of insolation and meteorological parameters at selected solar central receiver plant site near Yuma, AZ (WPRS); continue to provide documentation, access to data, and site data analysis and review (DOE/Sandia).

# UPCOMING PROCUREMENT

SAN CONTACT: DOUG ELLIOTT

**Objective**
Identify, develop and evaluate technical and economic concepts for the application of solar thermal central receiver electrical power generation in the post-1990 time period.

**Title**
ADVANCED UTILITY CENTRAL RECEIVER SYSTEMS
Advanced Systems and Applications
WBS 2.4

**Organization Responsible:**
SAN FRANCISCO OPERATIONS OFFICE

**Field Office**
San Francisco Operations Office

**Type of Procurement:** PRDA RFP (Various) OTHER

**Anticipated Level of Funding:**
Total: N/A
FY 81: $285K
FY 82: TBD
Beyond FY 82: TBD

**Action Dates:**
Released:
Response:
Evaluation Complete:
Anticipated Award Date: Sept. 81

**Recommended Source of Procurement:** TBD

## STATEMENT OF WORK

1) Identify system, subsystem and component concepts offering potential for solar thermal central receiver applications following the repowering/industrial retrofit "window", including advanced thermodynamic cycles, hybrid and storage coupled systems, and unique applications offering significant market potential.

2) Where critical technology issues exist, conduct limited analysis and testing to resolve them.*

3) Establish data base and assess advanced utility central receiver system concepts on a comparable basis with current systems.

4) To the maximum extent feasible, make use of small and small/disadvantaged business capabilities and cost effective sharing of resources with other public and private institutions.**

* As an example, long-term thermal cycling of sodium heat pipes designed for use in a 1500°F hot-air receiver by a small business, Dynatherm, inc., is under evaluation ($50-75K).

** This category offers opportunities for consideration of unsolicited proposals, cost-share offers, and set-aside solicitations.

# UPCOMING PROCUREMENT

SAN CONTACT: LOWELL MILLER

**Objective**

Provide analysis of environmental effects of Solar Thermal Energy Systems.

**Title**

Environmental Effects of Solar Thermal Energy Systems

WBS 3.0

**Organization Responsible:**

SAN FRANCISCO OPERATIONS OFFICE

**Field Office**

San Francisco Operations Office

**Type of Procurement:** PRDA RFP OTHER

**Anticipated Level of Funding:**

Total:
FY 81: $355K
FY 82:
Beyond FY 82:

**Action Dates:**

Released:
Response:
Evaluation Complete:
Anticipated Award Date:

**Recommended Source of Procurement:** Laboratory of Biomedical and Environmental Sciences, UCLA

## STATEMENT OF WORK

- Siting Impacts of STERS
  - o Vegetation management and recovery:
  - o Environmental monitioring at 10MWe Pilot Plant site:
- STES Environmental Support
  - o Support as required for:
    - Preparation and/or review of NEPA type documents
    - Development of environmental central technologies
    - Safety Analysis Report Systems (SARS)
  - o Project Management

## SECTION VI

## Technology Transfer

A technology transfer plan is a key to the commercialization of any technology. Technology transfer in Central Receiver Systems/Applications is achieved through the sponsorship of workshops and conferences and through the technical reports generated by DOE contracts.

Workshop and Conferences serve as a forum for the active interchange of information between DOE and private industry. For instance, on December 3-4, 1980, there was a workshop on 10 MWe Pilot Plant Modification Options to support Repowering Program Objectives that was attended by numerous industry and utility representatives connected with the repowering program. Semi-annual reviews of the Central Receiver Program are held so that the technical progress of the program is accessible to interested organizations. For example, Semi-Annual Reviews were held in March 1980 at Albuquerque and in October 1980 at San Francisco.

In addition, preproposal meetings are held after RFP's are released so that potential bidders can become better acquainted with the state-of-the-art technology.

In the 10MWe Pilot Plant Program two technology transfer committees have been established with industry. The Project Advisory Committee meets quarterly and the Project Review Committee meets annually. These committees will participate during the design, construction and operation phases of the project. For FY81 the following Pilot Plant meetings have been scheduled:

November 1980, Heliostat Fabrication

February 1981, Site Construction and Start-up

May 1981, Third Annual Meeting

August 1981, Site Construction and Start-up

During the fourth quarter of FY81 there will be a workshop on the environmental effects of Solar Thermal Energy Systems hosted by UCLA.

A listing of additional meetings and conferences for FY80 and FY81 follows:

- "Thermal Storage Systems of STPS," Energy Technology Conference, February 1980, New Orleans, Bart B. Sokolow.
- "Environmental Concerns for Off-Normal Events with Solar Thermal Power Systems," 2nd DOE Environmental Control Symposium, March 17-19, 1980, Reston, VA, Richard Perrine.
- "Environmental Effects of Thermal Energy Storage Subsystems," 2nd DOE Environmental Control Symposia, March 17-19, 1980, Reston, VA, Alan Z. Ulman, Bart B. Sokolow.

- "Environmental Issues and Solar Thermal Power Systems," 26th Annual Meeting of the Institute of Environmental Sciences, May 11-14, 1980, Philadelphia, Frederick B. Turner.

- "Potential Environmental Interactions of Trace Elements Associated with Photovoltaics," Workshop on Environmental Effects of Photovoltaics Energy Technology, Development and Use, June 18-19, 1980, Brookhaven National Laboratory, New York, Wade L. Berry.

- "Land Availability and Effects of Construction of Large Central Solar Systems," Workshop on Environmental Effects of Photovoltaic Energy Technology, Development and Use, June 18-19, 1980, Brookhaven National Laboratory, New York, Frederick B. Turner.

- "Effects of Shafting on Gas Exchange Patterns and Morphology of Two Sonoran Desert Shrubs," 1980 Annual Meeting of the Ecological Society of America, August 3-8, 1980, Tucson, AZ, Stanley D. Smith and Duncan T. Patten.

- October 1979, CRTF Testing - 10 MWe Pilot Plant

- February 1980, Site Construction - 10 MWe Pilot Plant

- May 1980, Second Annual Meeting - 10 MWe Pilot Plant

Reports

The primary means for the mass dissemination of information is the publication of reports through the DOE Technical Information Center (TIC) and through the National Technical Information Service (NTIS). Reports distributed through TIC reach the DOE contractor community. Reports sold by NTIS make solar thermal information available to other interested researchers and to the general public. Final reports and other significant reports are routinely sent through the TIC/NTIS system so as to reach the broadest spectrum of people possible.

Reports issued during FY80-81 are:

- Guidelines for Community Applications of Small Scale Solar Thermal Energy Systems, UCLA 12/1266, 2 Vol. UC 13.

- Environmental Considerations in Siting a Hypothetical Solar Hybrid Facility in the Desert, UCLA 12/1267, 2 Vol. UC 62.

- Ecological and Microclimatic Effects Within Simulated Heliostat Arrays, UCLA 12/1268, UC 11.

- An Evaluation of Cooling Water Requirements and Availability for Solar Power Plants in the Southwestern United States, UCLA, 12/1247 - Special Distribution.

- The Toxicological and Health Implications of Solar Thermal Process Fluids, UCLA, 12/1265. UC 11, UC 41.

- "Saguaro Power Plant Solar Repowering Project," Arizona Public Service.

  DOE/SF/10739-1 (Executive Summary)

  DOE/SF/10739-2

  DOE/SF/10739-3

  DOE/SF/10739-4

- "Newman Unit 1 Solar Repowering," El Paso Electric Company.

  DOE/SF/10739-1/Vol. I (Executive Summary)

  DOE/SF/10739-1/Vol. I

  DOE/SF/10739-1/Vol. II

  DOE/SF/10739-1/Vol. III

- "Solar Repowering for Electric Generation Northeastern Station Unit 1 Public Service Oklahoma," Black and Veatch.

  DOE/SF/10738-1/Vol. I (Executive Summary)

  DOE/SF/10738-1/Vol. II

  DOE/SF/10738-1/Vol. III

- "Sierra Pacific Utility Repowering," McDonnell Douglas.

  DOE/SF/10709-1 (Executive Summary)

  DOE/SF/10609-1

- "Southwestern Public Service Company Solar Repowering Program," General Electric.

  DOE/SF/10741-1 (Executive Summary)

  DOE/SF/10741-1/Vol. I

  DOE/SF/10741-1/Vol. II

- "Conceptual Design of the Solar Repowering System for West Texas Utilities Company, Paint Creek Power Station No. 4," Rockwell International-ESG.

  DOE/SF/11065-1 (Executive Summary)

  DOE/SF/11065-1

- "Solar Repowering System for Texas Electric Service Company Permian Basin Steam Electric Station Unit No. 5," Rockwell International-ESG.

  DOE/SF/10607-1/Vol. I (Executive Summary)

  DOE/SF/10607-1/Vol. II

- "Solar Industrial Retrofit System North Coles Levee National Gas Processing Plant," Northrup, Inc./Arco Oil and Gas Co.

  DOE/SF/10736-1/Vol. I (Executive Summary)

  DOE/SF/10736-1/Vol. II

  DOE/SF/10736-1/Vol. III

- "Solar Repowering Industrial Retrofit Systems Category B Solar Thermal-Enhanced Oil Recovery Systems," Martin Marietta/Exxon Corporation.

  DOE/SF/10737-1 (Executive Summary)

  DOE/SF/10737-1

- "Gulf Mt. Taylor Uranium Mill Solar Retrofit Solar Repowering Industrial Retrofit Systems Study," McDonnell Douglas/Gulf Research.

  DOE/SF/10608-1 (Executive Summary)

  DOE/SF/10608-1

- "Solar Industrial Retrofit System for the Provident Energy Company Refinery," Foster Wheeler.

  DOE/SF/10606-1/Vol. I (Executive Summary)

  DOE/SF/10606-1/Vol. II

  DOE/SF/10606-1/Appendices

- "Solar Energy Systems United States Gypsum Plant Solar Retrofit," Boeing Engineering and Construction.

  DOE/SF/10742-1 (Executive Summary)

  DOE/SF/10742-1

  DOE/SF/10742-2

- "Solar Central Receiver Reformer System for Ammonia Plants," PFR Engineering Systems, Inc./Valley Nitrogen Producers.

  DOE/SF/10735-1 (Executive Summary)

  DOE/SF/10735-1/Vol. II

10 MWe Pilot Plant Studies

- November 1979: Environmental Impact Report

  Project Management Plan

  Overall Plant Design Description

  Turbine-Generator Facility Drawings

- January 1980: Third SFDI Design Review

  System Specification

  Start-up Test Plan

  Beam Characterization Documentation

- March 1980: Collector Field Layout

  Heat and Mass Balance Analysis

- May 1980: Plant Cost Estimates

  Control Building Requirements

  Fourth SFDI Design Review

- July 1980: System Description

  Control Simulation Laboratory Description

  Daggett Insolation Variations

System Description, October 1980

System Specification, October 1980

MCS Design Requirements, March 1981

Subsystem Interfaces, December 1980

Operations and Maintenance Training Plan, February 1981

Plant Start-up Test Plan, November 1980

Operational Test Plan, February 1981

Cogenerational Conceptual Design

June 30 -- Bechtel/AMFAC Sugar Co., Final

June 30 -- Black & Veatch/Central Telephone and Utilities-Western Power, Final Report

June 30 -- Exxon/Exxon, Final Report

June 30 -- G.E./Texasgulf, Final Report

June 30 -- Gibbs & Hill/Phelps Dodge Corp., Final Report

June 30 -- MDAC/US Army, Final Report

June 30 -- Westinghouse/US Air Force, Final Report