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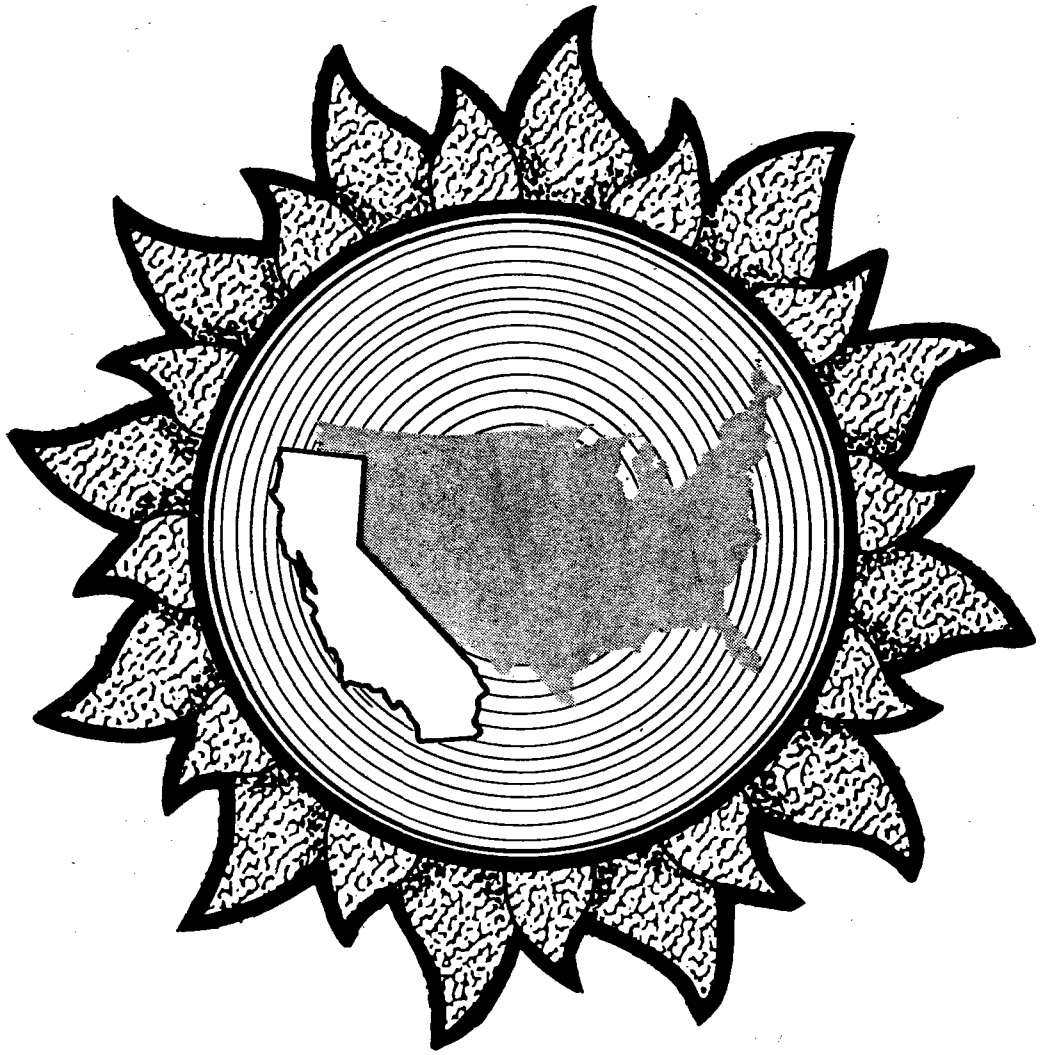
CENTRAL RECEIVER SOLAR 10-MEGAWATT PROPOSAL OF PARTNERSHIP



SCE Southern California Edison Company

Los Angeles Department of Water and Power
California Energy Resources Conservation and Development Commission

September 15, 1976

State of California
GOVERNOR'S OFFICE
SACRAMENTO 95814

EDMUND G. BROWN JR.
GOVERNOR

916/445-2843

Dr. Robert C. Seamans, Jr.
Administrator, Energy Research
and Development Administration
20 Massachusetts Avenue, N.W.
Washington, D.C. 20545

Dear Dr. Seamans:

I am pleased to endorse California's proposal for a site for the 10 megawatt central receiver solar thermal powerplant. California is strongly committed to solar energy development and wishes to contribute to the national effort to speed the use of the sun's energy.

The state's proposal represents a joint public/private effort. The California Energy Resources Conservation and Development Commission, Southern California Edison, and the Los Angeles Department of Water and Power have created a diversified team whose differing skills, experiences, and interests will help ensure a highly successful project. This cooperative venture will be an important step in setting up the institutional support necessary to help make solar generation of electricity an everyday reality.

I look forward to ERDA's review of this proposal and assure you of California's full cooperation in this matter.

Sincerely,

EDMUND G. BROWN JR.
Governor

Southern California Edison Company

P. O. BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770

JACK K. HORTON
CHAIRMAN OF THE BOARD

TELEPHONE
213-572-2262

September 15, 1976

Mr. D. Neely
Energy Research & Development
Administration
San Francisco Operations Office
1333 Broadway
Oakland, CA 94612

Dear Mr. Neely:

Southern California Edison Company, in partnership with the Los Angeles Department of Water and Power, and the California State Energy Resources Conservation, and Development Commission, is pleased to submit this proposal in response to Program Opportunity Notice DSE 76-1, Central Receiver Solar 10-Megawatt Pilot Plant Project Site Selection.

We are convinced that the 10-Megawatt Solar Power Pilot Plant is a major step toward harnessing energy of the sun to provide our nation with another badly needed alternative for electric power generation. All appropriate resources of Edison will be made available to support ERDA in carrying forth this program to a successful completion.

The Edison Company has been operating generating stations continuously for over 80 years. During that time it has designed, constructed, and operated numerous major facilities ranging from high voltage transmission systems and hydroelectric plants to nuclear and coal-fired generating stations. Edison's experience in effectively coordinating multi-ownership generation projects will contribute significantly to the successful design, construction, and operation of the Pilot Plant.

A thoroughly qualified management team has been selected for program direction. This team will have my personal support and the assistance of top management executives as required to assure timely project completion and satisfactory operation.

Sincerely,

City of Los Angeles

CITY HALL
LOS ANGELES, CALIFORNIA 90012
(213) 485-3311

OFFICE OF THE MAYOR

TOM BRADLEY
MAYOR

Energy Research and Development Administration
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Attention: D. Neely (PON DSE 76-1)

Greetings:

I am very pleased and proud to endorse this joint proposal in which the City of Los Angeles' Department of Water and Power has joined the Southern California Edison Company, and the California Energy Resources Conservation and Development Commission in response to your request for a partner in the development of an experimental 10 megawatt solar electric power plant.

I simply want to underscore what will be apparent to you in reviewing this proposal: Here is an unusual broadly-based combination of expertise and commitment drawn from both the public and private sectors offering a strong probability of project success. Moreover, with the electric utilities serving 8.6 million households and places of business in southern California working with the state agency charged with overseeing the development of the state's energy resources, this project, it is no exaggeration to say, will involve every citizen of the state of California in some way.

As to grass roots community support and interest in the siting of this project in southern California, there can be no doubt. Last April, I publicly described this proposed project as one of a series of policies and programs my Administration is supporting for the promotion of solar energy in the Los Angeles region.

I said that it was my intention to do everything possible to promote Los Angeles as Solar City, and that part of this was to encourage the more technologically sophisticated applications of solar energy that will absorb some of our abundant aerospace technical capability now less in demand. Public and media response to this idea, and particularly the experimental solar electric plant, was extremely enthusiastic.

Two advisory bodies which I created will maintain a continuing interest in this project and will be invaluable in the public exposure of the pilot plant. These groups are the Commission Presidents' Task Force on Alternative Energy Sources, combining the heads of six Los Angeles City Commissions with policy responsibilities related to energy, and the Solar City Committee. The Solar City Committee consists of some 25 citizens knowledgeable as both researchers and business people in our budding solar energy industry. Most of these people are technically qualified individuals who will be extremely helpful in the dissemination of technological expertise and information to the public and industry resulting from the project.

Sincerely,

Tom Bradley

TOM BRADLEY
Mayor

TB:rw

STATE OF CALIFORNIA—THE RESOURCES AGENCY

EDMUND G. BROWN JR., Governor

ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION
1111 HOWE AVENUE
SACRAMENTO, CALIFORNIA 95825
(916) 322-6316

September 3, 1976

Energy Research and Development Administration
San Francisco Operations Office
1333 Broadway
Oakland, CA 94612

Attn: D. Neely

Dear Mr. Neely:

The Energy Commission is pleased to participate with Southern California Edison and the Los Angeles Department of Water and Power in this proposal to Energy Research and Development Administration to site the 10 MWw solar thermal pilot plant in California. California's is a unique proposal in that it combines an excellent site, two strong utilities--one municipally-owned, one privately held, and a State agency with broad regulatory and energy supply development powers.

The Commission will provide a public-agency focus for technology transfer activities to be carried out during the course of the Project. All of the Commission efforts will be undertaken towards achieving the goal of establishing an institutional framework which will enable California--and the nation as a whole to receive a portion of its electricity supply on a routine basis from the sun.

The Energy Commission looks forward to working on this Project in close cooperation with its partners and with the Federal Government.

Sincerely,

RICHARD L. MAULLIN
Chairman

RLM:mk

CENTRAL RECEIVER SOLAR 10-MEGAWATT PILOT PLANT PROJECT SITE SELECTION

PON DSE 76-1

PROPOSAL OF PARTNERSHIP TO THE

UNITED STATES ENERGY RESEARCH

AND

DEVELOPMENT ADMINISTRATION

BY

SOUTHERN CALIFORNIA EDISON COMPANY

LOS ANGELES DEPARTMENT OF WATER AND POWER

CALIFORNIA ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION

This proposal is valid until February 15, 1977.

Jack E. Moore, Vice President,
SOUTHERN CALIFORNIA EDISON COMPANY

Louis H. Winnard, General Manager and Chief Engineer
LOS ANGELES DEPARTMENT OF WATER AND POWER

Richard L. Maullin, Chairman,
CALIFORNIA ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION

FOREWORD

The Southern California Edison Company, Los Angeles Department of Water and Power, and the California Energy Resources Conservation and Development Commission are pleased to respond to ERDA's Program Opportunity Notice (PON) concerning the planned Solar 10MW Pilot Plant. This proposal reflects Edison's long standing commitment to the objectives of the ERDA solar thermal conversion program and a like commitment on the part of the State of California and the City of Los Angeles.

Through the PON, ERDA seeks to form a partnership with potential users of the new technology. An effective partnership will have two key features. First, the partners will share the same objectives. Second, their capabilities will be complementary. These features should be evaluated not only with reference to the success of the Pilot Plant but also relative to the long term objective which is large scale commercial application of the technology.

The proposed partnership offers the best possible combination of these features, consistent with our mutual desire to:

- Maximize utility technical input to the project
- Maximize the direct experience acquired by utilities dealing with all facets of the technology
- Place solar know-how derived from the project directly in the hands of the organizations able to make earliest and greatest use of it
- Establish an institutional structure to support implementation of this technology

FOREWORD

Capabilities of the California team of Program Participants support these mutual desires as follows:

- Southern California Edison Company is the fifth largest investor owned utility in the country and a recognized leader in the development and application of new technologies.
- Los Angeles Department of Water and Power is the largest municipal utility in the country and is totally self sufficient with respect to design and construction of its generation facilities.
- The California Energy Resources Conservation and Development Commission has broad regulatory and development responsibilities relative to the energy needs of 20 million Californians.

As evidence of their serious interest in this technology and the project's success, the Program Participants have brought their capabilities to bear in the development of this proposal. This is consistent with the active and direct role envisioned for the Program Participants in the project itself.

In summary, the Program Participants have the capability and the commitment to support the objectives of the Pilot Plant project and the objective of early implementation of commercial solar power technology. Not only does California provide the most favorable solar availability conditions for the new technology, but, among the states where the technology has good prospects, California has by far the largest potential need for the new technology and the state has assigned to solar energy development and utilization among its highest energy priorities. Additionally, it is judged that the Federal goal

of one percent of the nation's electrical energy being supplied from solar by 1990 can be achieved only if California utilities are among the first to initiate the central generation concept.

TABLE OF CONTENTS

		Page
	Foreword	i
CHAPTER I	Executive Summary	I-1
A.	Offering Team	I-1
B.	Site Information	I-3
1.	Location of Site	I-3
2.	Status of Ownership, Accessibility, Availability of Land	I-3
C.	Facilities and Services Offered	I-10
1.	Site	I-10
2.	Steam Turbine Generator and Electrical Network	I-10
3.	System Integration and Testing	I-11
4.	Operation and Maintenance	I-11
5.	Project Reviews and Technological Developments	I-11
6.	Consultation on Solar Concept	I-12
7.	Pilot Plant Operating Procedures	I-12
8.	Supplemental Site Related Services	I-12
9.	Control System Management and Control Building	I-12
10.	Startup Management	I-13
11.	Permits and Envi onmental Documents	I-13
12.	Solar Data Base	I-13
13.	Public Information/Technology Transfer	I-13
D.	Financial Arrangements and Ultimate Ownership	I-14
1.	Financial Arrangements	I-14
2.	Ultimate Ownership of Facilities	I-15
E.	Program Director	I-16
F.	Responsible Corporate Officer	I-16

TABLE OF CONTENTS (Continued)

		Page
CHAPTER II	Project Information and Requirements	II-1
A.	Site Characteristics	II-1
	1. Insolation	II-2
	2. Precipitation	II-18
	3. Wind	II-20
	4. Topography	II-21
	5. Geologic Stability	II-21
	a. Soil Conditions	II-21
	b. Regional Geological Setting	II-23
	c. Site Geology	II-24
	6. Seismologic Stability	II-24
	7. Hydrologic Conditions	II-27
	8. Accessibility	II-28
	9. Availability of Support	II-28
	10. Availability of Construction Materials	II-29
	11. Area	II-29
	12. Zoning and Land Use Restrictions	II-30
	13. Federal Airways	II-30
B.	Offeror/Government Participation	II-33
	1. Program Participants Proposed Participation	II-33
	a. Financial	II-33
	b. Manpower	II-34
	(1) Edison	II-34
	(2) Los Angeles	II-34
	(3) Energy Commission	II-35
	(4) Others	II-35
	c. Materials and Services	II-36
	(1) Site	II-36
	(2) Steam Turbine and Electrical Network	II-36

TABLE OF CONTENTS (Continued)

		Page
(3)	System Integration and Testing	II-37
(4)	Operation and Maintenance	II-40
(5)	Project Reviews and Technological Developments	II-40
(6)	Consultation on Solar Concept	II-40
(7)	Pilot Plant Operating Procedures	II-41
(8)	Supplemental Site Related Services	II-41
(9)	Control System Management and Control Building	II-42
(10)	Startup Management	II-42
(11)	Permits and Environmental Documents	II-42
	(a) Permits	II-42
	(b) Environmental Documents	II-43
(12)	Solar Data Base	II-44
(13)	Public Information/ Technology Transfer	II-44
2.	Proposed ERDA Participation	II-48
a.	Solar Portion of Plant	
b.	Public Information Building	II-48
c.	Federal Permits	II-49
d.	Federal Environmental Impact Statement	II-49
e.	California State Environmental Impact Report	II-49
f.	Special Testing	II-49
g.	California Property Tax	II-50
3.	Integration into Utility Network	II-50
4.	Technology Transfer	II-50
C.	Schedule	II-51
1.	Overall Schedule	II-51
2.	Design and Construction	II-54
3.	Startup and Operation	II-55

TABLE OF CONTENTS (Continued)

	Page
4. Test and Evaluation	II-57
5. Public Information/Technology Transfer	II-57
a. Publicity Schedule	II-57
b. Energy Commission Schedule	II-58
D. Organization and Management	II-62
1. Program Organization	II-62
2. Personnel Qualifications	II-67
3. Proposed Work Plan	II-81
a. Work Flow and Controls	II-81
b. Specific Activities	II-82
(1) Post-Site Selection Activities	II-82
(a) Permits	II-82
(b) Environmental Documents	II-82
(c) Preliminary Design Studies	II-83
(d) Solar Data Base Development	II-84
(2) Design and Construction - Non-Solar Plant Portion	II-84
(a) Design Approach	II-84
(b) Construction Approach	II-85
(c) Cost and Schedule Approach	II-86
(d) Procurement Approach	II-88
(e) Document Control Approach	II-89
(f) Other Services	II-89
(3) Startup, Operation and Testing and Evaluation	II-89
(4) Commission Performance Control	II-92
4. Power Generation and Transmission Experience	II-93
a. Southern California Edison Company	II-93

TABLE OF CONTENTS (Continued)

		Page
(1)	Mohave Generating Station	II-95
(2)	San Onofre Nuclear Generating Station, Units 2 and 3	II-95
(3)	Coolwater Generating Station	II-96
(4)	Long Beach Generating Station	II-96
(5)	Mohave SO_2 Scrubbers	II-97
(6)	Solar Energy Research and Development Activities at Edison	II-97
(a)	Overall Edison Solar Objectives	II-98
(b)	Edison Solar Electric Power Generation Program	II-99
b.	Los Angeles Department of Water and Power	II-102
c.	Energy Commission	II-105
E.	Environmental Evaluation	II-108
1.	Land Use	II-109
2.	Terrestrial Biology	II-110
3.	Archaeology	II-111
4.	Socio-economics	II-111
5.	Aesthetics	II-111
6.	Heliostat and Receiver Glare	II-112
7.	Water Quality	II-112
8.	Water Resources	II-113
F.	Cooperative Arrangements	II-114
G.	Financial	II-116
1.	Southern California Edison Company	II-116
2.	Los Angeles Department of Water and Power	II-118
3.	Energy Commission	II-119
H.	Public Information/Technology Transfer	II-120
1.	Public Information	II-120
a.	Public Information Policy	II-121
b.	Overall Public Information Objectives	II-121

TABLE OF CONTENTS (Continued)

	Page
c. Background - Current Climate of Opinion	II-121
d. Visitor Information Center	II-122
e. Organization	II-122
2. Technology Transfer Through the Electric Power Research Institute	II-123
3. Information Dissemination/Technology Transfer Through the California Energy Commission	II-123
a. Regulatory Mechanisms for Implementation	II-124
b. Non-regulatory Mechanisms for Implementation	II-127
c. Specific Mechanisms for Technology Transfer	II-131
I. Local Support	II-134
J. Labor Availability	II-144
1. Post Site Selection Work	II-144
2. Design and Construction	II-144
a. Design	II-144
b. Construction	II-144
K. Small Business Participation	II-146
CHAPTER III — COMMERCIAL INFORMATION	III-1
A. Cost Summary	III-1
1. Total Cost	III-1
2. Cost Sharing	III-1
B. Cost Detail	III-3
1. Cost Estimate	III-3
2. Design Assumptions as an Estimate Basis	III-6
a. Plant Size	III-6
b. Solar Portion Assumptions	III-7
c. Plant Cooling	III-7
d. Plant Auxiliary Power Requirements	III-8

TABLE OF CONTENTS (Continued)

		Page
e.	Plant Orientation	III-8
f.	Plant Performance and Operating Modes	III-8
(1)	Normal Solar Operation	III-8
(2)	Low Solar Power Operation	III-9
(3)	Intermittent Cloudiness Operation	III-10
(4)	Extended Operation	III-10
(5)	Thermal Storage Charging Operation	III-11
g.	Water Treatment	III-11
h.	Turbine-Generator	III-12
i.	Condenser	III-13
j.	Cooling Tower	III-13
k.	Low Pressure Heater	III-14
l.	Deaerator	III-14
m.	High Pressure Heater	III-14
n.	Switching Substation	III-14
o.	Onsite Power System	III-16
p.	Miscellaneous Equipment and Materials	III-18
(1)	Sealing and Blanketing Steam	III-20
(2)	Turbine Turning Gear	III-21
C.	General Information	III-22
1.	Description of Program Participants	III-22
a.	Southern California Edison Company	III-23
b.	Los Angeles Department of Water and Power	III-24
c.	California Energy Resources Conservation and Development Commission	III-26
2.	Primary Contact	III-28
3.	Government Property Desired	III-28
4.	Purchase Price of Energy	III-28
5.	Commercialization Plans	III-28
6.	Plant Usage	III-29
7.	Decommissioning	III-30

LIST OF FIGURES

		Page
I-1	Location of Proposed California Site	I-4
I-2	General Site Plan	I-6
I-3	Aerial Photo of Proposed Coolwater Site (Regional View Looking Northeast)	I-7
I-4	Aerial Photo of Proposed Coolwater Site (Closeup Looking East)	I-8
II-1	Edison Solar Data Stations	II-4
II-2	Edison Solar Data Installation	II-5
II-3	Average Insolation Levels at Several Southern California Sites	II-7
II-4	Mean Daily Insolation - Barstow, California	II-8
II-5	Monthly Direct Insolation - Barstow, California	II-10
II-6	Number of Cases of Consecutive Hours of Insolation Greater than 0.8 KWh/m^2 - Barstow, California	II-11
II-7	Insolation Interruption Duration Curve	II-13
II-8	National Mean Annual Daily Insolation	II-16
II-9	National Mean Total Annual Hours of Sunshine	II-17
II-10	Regional Fault Patterns Around Barstow, California	II-26
II-11	Proposed Site – Property Layout	II-31
II-12	Southern California Electric Transmission System	II-38
II-13	Proposed Program Schedule	II-52
II-14	Non-Solar Plant Portion Equipment Procurement Schedule	II-56
II-15	Proposed Overall Pilot Plant Program Management Organization	II-63
II-16	Proposed Program Participant Organization	II-64

LIST OF FIGURES (Continued)

		Page
II-17	Non-Solar Plant Portion - Project Management Organization	II-66
II-18	Energy Commission Organization for Pilot Plant Activities	II-68
III-1	Contract Pricing Proposal Form 633	III-5
III-2	Electrical Substation Arrangement	III-15
III-3	Auxillilary Power Arrangement	III-17

LIST OF TABLES

		Page
I-1	Program Participant Cost Sharing	I-15
II-1	Mean Daily Solar Radiation at Various Locations in the Eastern Desert of California	II-6
II-2	Mean Daily Solar Radiation (kWh/m^2-day)	II-14
II-3	Sunfall Statistics for Three Areas - 5 Year Averages	II-18
II-4	Precipitation Summary, Barstow-Daggett Airport (1956-1970)	II-19
II-5	Wind Summary Barstow-Daggett Airport	II-22
II-6	Schedule of Energy Commission Activities	II-59
II-7	Task Force for Information Dissemination/ Technology Transfer	II-133
II-8	Craft Labor Pool For Site	II-145
III-1	Proposal Estimated Cost Summary	III-2
III-2	Edison Use and Cost of Energy Resources, 1975	III-23
III-3	Edison Source of Revenue, 1975	III-24
III-4	Los Angeles Use of Energy Resources	III-25
III-5	Los Angeles Sources of Revenue	III-25

CHAPTER I

EXECUTIVE SUMMARY

The purpose of this chapter is to provide a brief overview of the proposal being offered by the California team of proposing parties to the United States Energy Research and Development Administration for construction of a solar 10 MWe Pilot Plant. This proposal is submitted in response to Program Opportunity Notice DSE 76-1, Central Receiver Solar 10 MWe Pilot Plant Project Site Selection. Through the Program Opportunity Notice (PON), ERDA is seeking a partner who will provide a site, a transmission network, a steam turbine electric generator plant, and operation of the total plant. ERDA will provide the design, construction and installation of the solar portion of the plant.

The Program Participants have the capability and the commitment to support the objectives of the Pilot Plant project and the objective of early implementation of commercial solar power technology.

The following summary includes a brief description of the offering team, site description, facilities and services offered, financial arrangements, and principal officials.

A. Offering Team

The California team of Program Participants consists of key entities in the state concerned with the development and use of electric power. Included are an investor-owned

utility, a municipal utility, and the state agency responsible for electric power plant siting and for helping to develop alternate energy sources in California.

- Southern California Edison Company (Edison) is Program Director for the California team and will manage the work proposed herein. Edison is an investor-owned utility serving over 7.5 million people. The 1976 peak demand on the Edison system has reached 11,081 MW as of mid-August.
- Los Angeles Department of Water and Power (Los Angeles) is a municipal utility serving a population of 2.7 million in the City of Los Angeles. The 1976 peak demand on the Los Angeles system has reached 3809 MW as of mid-August.
- The California State Energy Resources Conservation and Development Commission (Commission) is a new state agency charged with developing state energy conservation regulations and with helping to accelerate the development of alternative electrical energy sources. The Commission is also the primary state agency in approving sites for thermal electric power plants above 50 MWe.

The above team of Edison, Los Angeles, and the Energy Commission will hereinafter be referred to as the Program Participants.

Any questions concerning the proposal may be directed to:

Mr. J. Lynn Rasband, Program Director
Southern California Edison Company
P.O. Box 800
Rosemead, California 91770
Telephone: (213) 572-1096

Addresses of the other Program Participants are as follows:

Department of Water and Power
City of Los Angeles
P.O. Box 111
Los Angeles, California 90051

Energy Resources Conservation & Development Commission
State of California
1111 Howe Street
Sacramento, California 95825

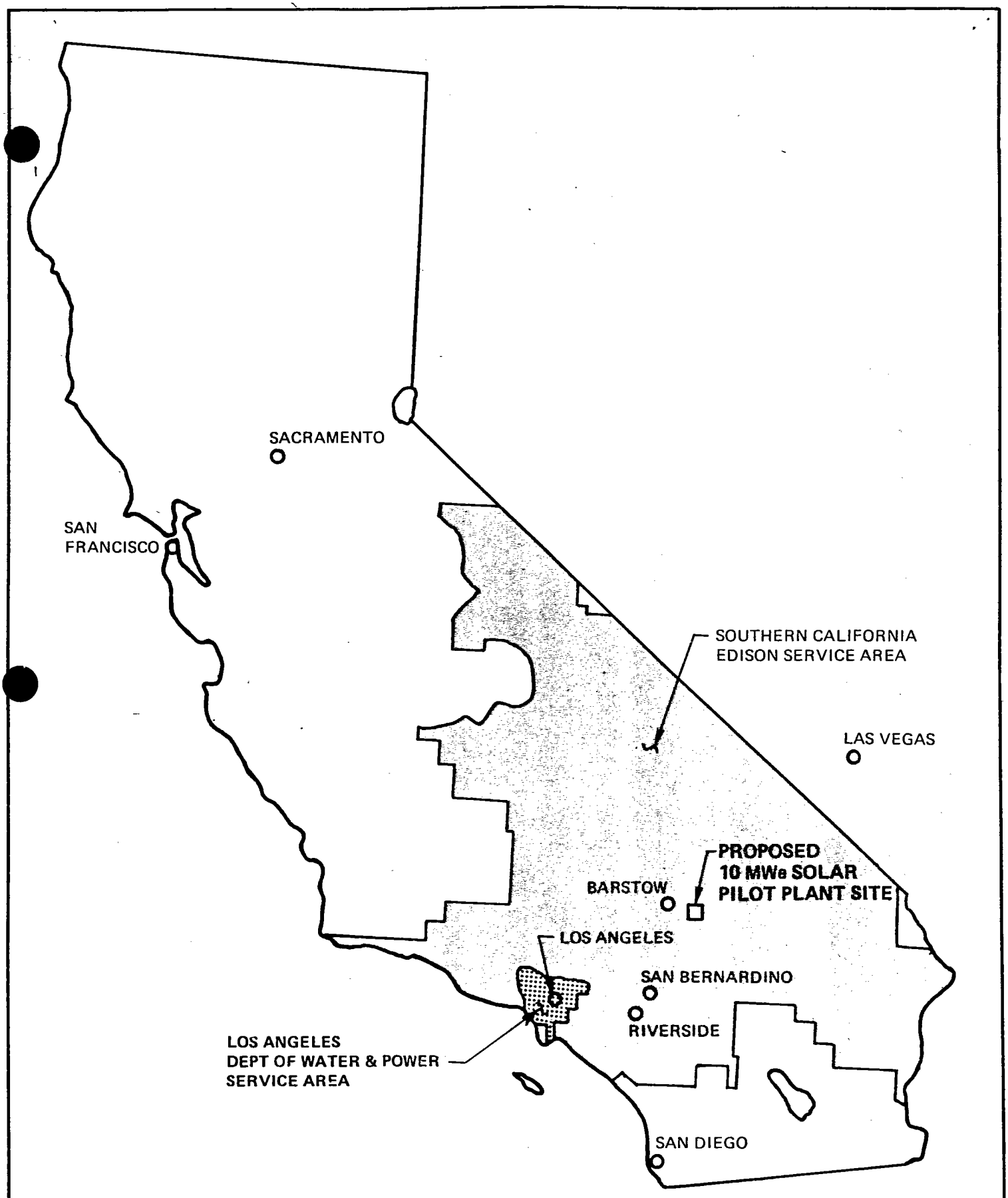
B. Site Information

1. Location of Site

A site adjacent to Southern California Edison Company's Coolwater Generating Station has been selected as the preferred site in California. Figure I-1 shows the general location of the site in southern California. Coolwater is situated in the Mojave Desert in northwestern San Bernardino County, twelve miles southeast of the City of Barstow, and 120 miles northeast of Los Angeles.

2. Status of Ownership, Accessibility, Availability of Land

The entire 2,337 acre site at Coolwater is owned by Edison.



10 MWe SOLAR PILOT PLANT

LOCATION OF PROPOSED
CALIFORNIA SITE
FIGURE I-1

The site is accessible from either Interstate 15, two miles north, or Interstate 40, just south, of the property. Access from either Interstate Highway is via paved roads through the town of Daggett, two miles west of the site.

Land use at the site consists of an existing two unit 146 MW generating station, two additional units under construction to generate an additional 472 MW, transmission and substation facilities, evaporation ponds, irrigated alfalfa fields and open land area.

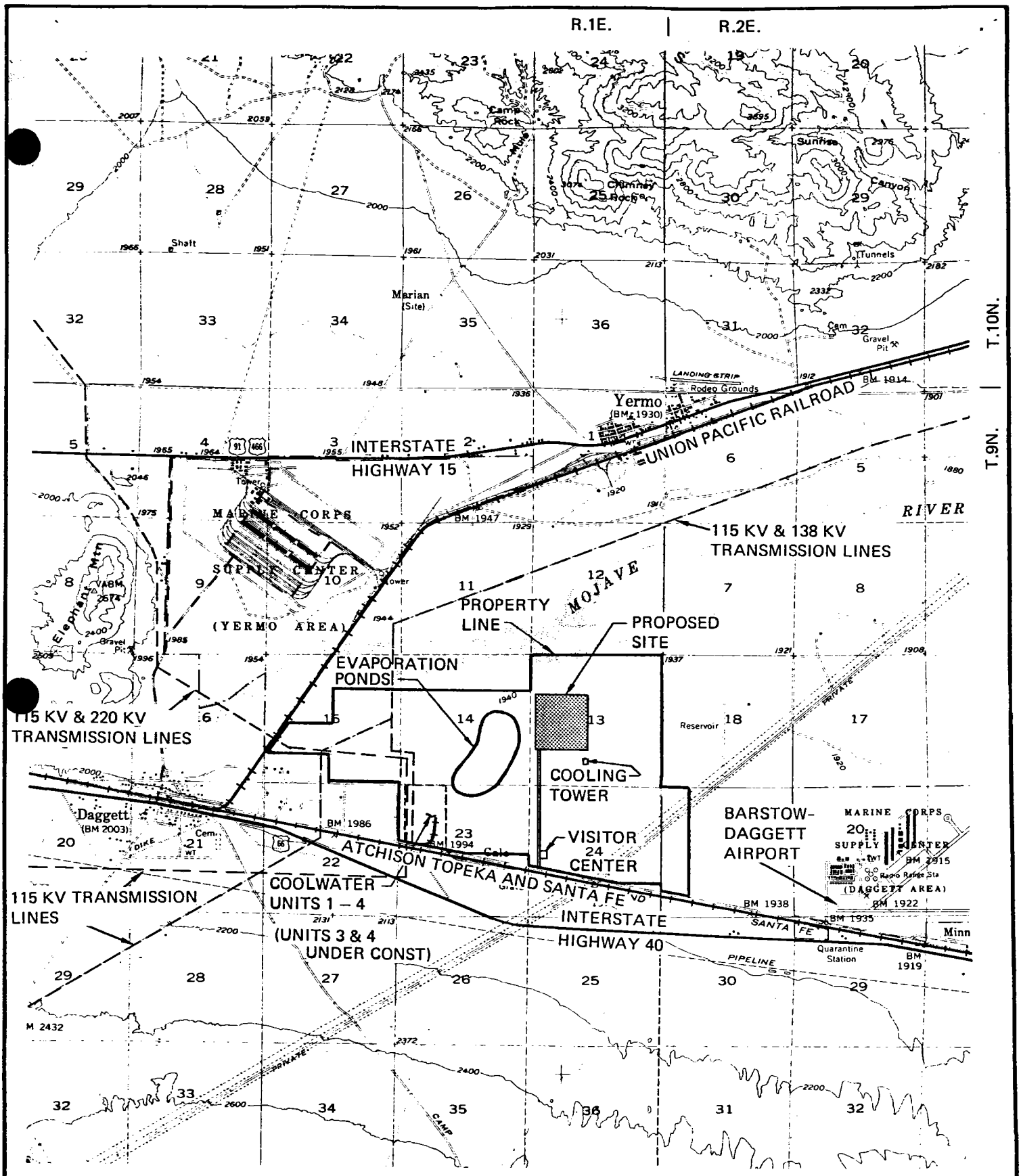
The portion of the site being proposed for the Pilot Plant is in the northern portion of the property, illustrated in the map of Figure I-2 and the aerial photos of Figures I-3 and I-4. The proposed 130 acre portion of the site is currently unused.

This site was selected as the preferred in California based on a critical review of nine sites using 18 criteria considered important for this project. The criteria were developed based primarily on site characteristics determined by ERDA to be critical.

Coolwater is considered best because it satisfies all of the criteria considered important both by ERDA and Edison, who will operate the facility. These attributes include the following:

1. The site receives high average annual total insolation at 5.8 kWh/sq.m./day, which is well in excess of the 5 kWh/sq.m./day required in the PON.

2. An adequate supply of good quality ground water is available from currently developed resources. It is estimated that about 500 acre-feet will be needed annually for Pilot Plant uses.

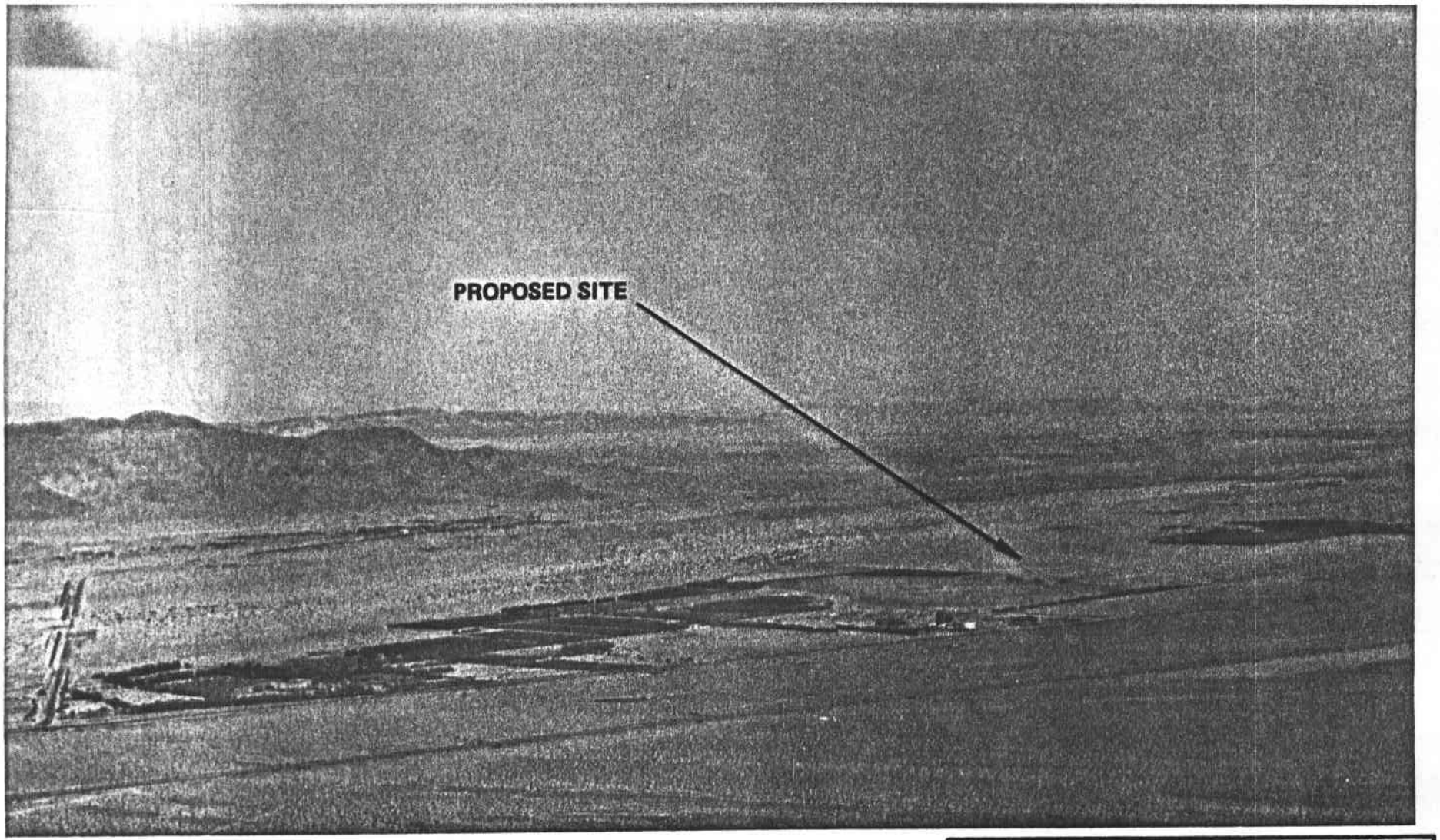


PORTION OF U.S.G.S. TOPOGRAPHIC MAP
DAGGETT, CALIFORNIA QUADRANGLE

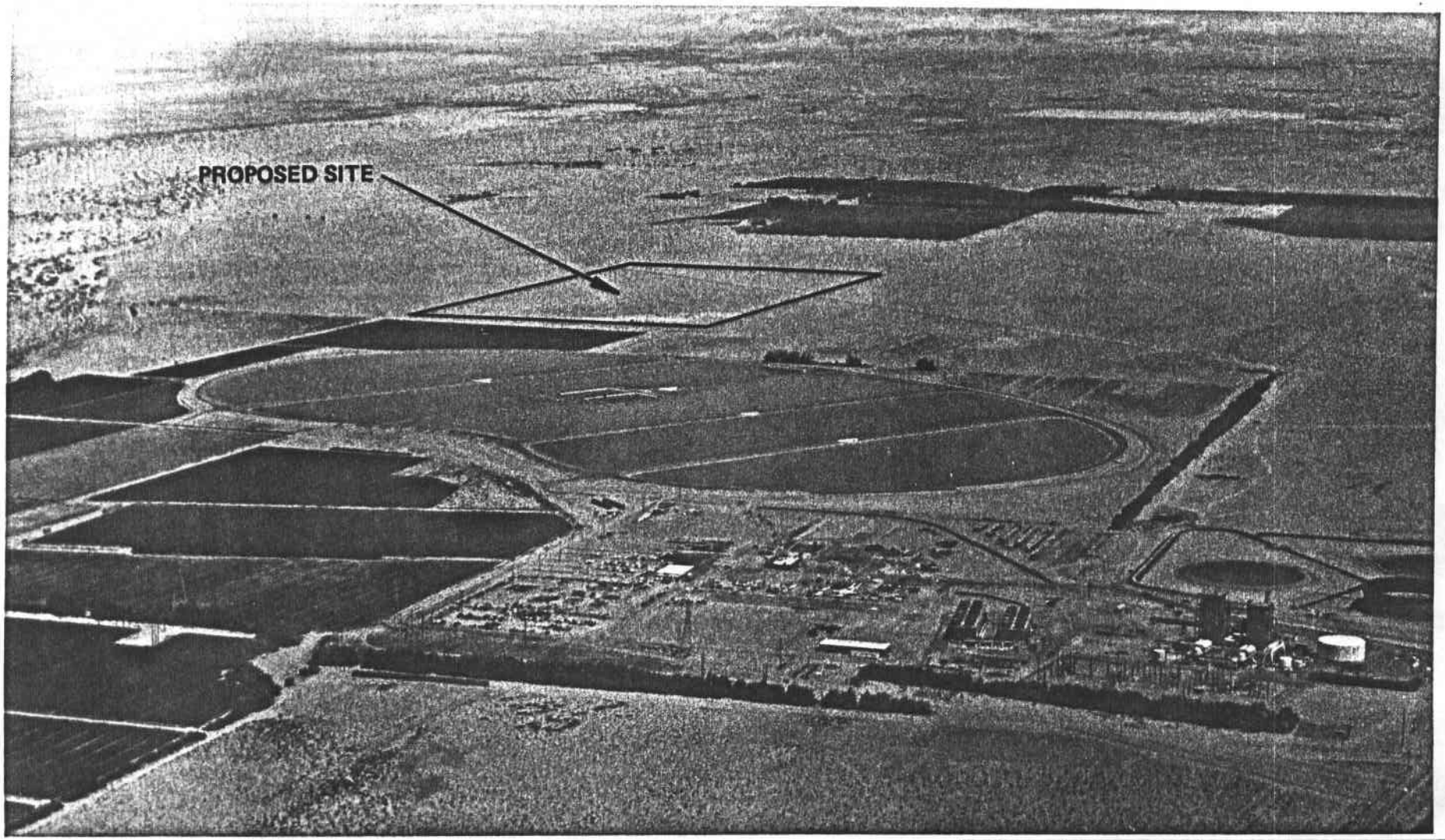
10 MWe SOLAR PILOT PLANT

GENERAL SITE PLAN

FIGURE I-2



SOLAR 10 WMe PILOT PLANT
AERIAL PHOTOGRAPH OF PROPOSED COOLWATER SITE (REGIONAL VIEW LOOKING NORTHEAST)
FIGURE I–3



SOLAR 10 WMe PILOT PLANT
AERIAL PHOTOGRAPH OF PROPOSED COOLWATER SITE (CLOSE–UP VIEW LOOKING EAST)
FIGURE I–4

3. Access to the site is excellent with two Interstate highways within four miles and paved roads adjacent. There are also several railroads in the immediate vicinity, including a spur onto the site for equipment and material unloading. Additionally, a heliport will be provided to complete the means of access.

4. The site is ideally located for public exposure and is 12 miles from the City of Barstow which has excellent visitor facilities.

5. Site topography and seismicity are such that design and construction will require only normal considerations.

6. Electrical system access will be available at the site through existing substation facilities.

7. A more than adequate amount of land is available at the site owned by Edison.

8. Environmental impacts are minimized by the fact that the site has very limited vegetation and wildlife with no apparent rare and endangered species. Also, environmental features of the site have been extensively studied in the development of existing facilities and little new information will be required for the state Environmental Impact Report and the Federal Environmental Impact Statement.

9. The site is not within the control zone of any airport, though it is about 2-1/2 miles from the Barstow-Daggett Airport.

10. Wind velocities are considered acceptable with 30 mph exceeded only 2-3 percent of the time and 40 mph exceeded one percent or less of the time.

C. Facilities and Services Offered

The Program Participants propose to provide more than the seven basic activities requested in the PON. For clarity, the following listing begins with the seven requested activities and extends to discuss additional services proposed. These items are discussed in greater detail in Section B of Chapter II.

1. Site

The site, described briefly in Section B of this chapter and extensively in Section A of Chapter II, will be made available for at least two and up to five years following completion of construction and startup.

2. Steam Turbine Generator and Electrical Network

A complete turbine generator will be provided with all associated mechanical and electrical equipment and controls needed to transform energy available in the steam from the solar portion into electrical energy.

The output from this turbine generator will be fed into the Edison transmission system which is interconnected with utilities in Arizona, New Mexico, Nevada, throughout California and the Pacific Northwest. Edison owns 10,764 miles of AC transmission lines, including 882 miles of 500 kV and

3185 miles of 230 kV lines. The 500 kV lines include a 1000 MW tie east through Arizona into New Mexico and a 3000 MW tie into northern California and the Pacific Northwest. Edison also owns 50% of the capacity of an 850 mile-long 800 kV DC transmission line to Oregon.

The Pilot Plant will be connected to this system through existing substation facilities at the Coolwater site.

The Edison system is also interconnected at four points with the Los Angeles system. The Los Angeles distribution system consists of 2,566 miles of transmission lines (above 34.5 kV).

3. System Integration and Testing

Output from the Pilot Plant will be distributed through the system described above when electricity is generated. A comprehensive testing program will be developed and carried out in cooperation with ERDA. Environmental factors will also be included in this program.

4. Operation and Maintenance

The entire Pilot Plant will be operated and maintained for two to five years following successful startup and acceptance.

5. Project Reviews and Technological Developments

The Program Participants will work closely with ERDA in reviews and surveillance of project activities to assure an integrated team effort. Also, an up-to-date awareness will be

maintained of technological developments consistent with Edison's past contribution to the Solar Thermal Conversion Program.

6. Consultation on Solar Concept

Assistance will be provided to ERDA in the selection of a technological concept and equipment to be installed in the solar portion of the plant.

7. Pilot Plant Operating Procedures

Operating procedures and manuals will be prepared for the non-solar portion and integrated in a cooperative effort with ERDA into manuals for the entire Pilot Plant.

8. Supplemental Site Related Services

In support of the overall Pilot Plant, (1) the entire site will be cleared and fenced and round-the-clock security will be provided, (2) an estimated 500 acre feet of water per year will be provided for solar steam supply makeup, heliostat washing, cooling, and general plant uses, (3) provision will be made for disposal of waste water, (4) overall coordination of activities at the site will be provided such that an integrated effort is carried out, (5) in order to assure a full range of access means, a heliport will be provided on Edison property.

9. Control System Management and Control Building

In order to assure that the solar and non-solar portions are properly integrated as a system, overall controls management services and a control building will be provided.

The Program Participants will provide space in a central control building for all controls and will provide non-solar controls.

10. Startup Management

To assure sequential and smooth Plant startup, overall startup management services will be provided. This is based on the expectation that ERDA will provide manpower and materials for solar portion startup activities.

11. Permits and Environmental Documents

Efforts will be undertaken to obtain all necessary permits and licenses. An Environmental Data Statement will be prepared as input to ERDA and the County of San Bernardino for the preparation of required environmental documents.

12. Solar Data Base

Edison is currently developing a solar data base for southern California. This effort will provide highly accurate and detailed solar radiation data especially suited to the Pilot Plant design. Data of comparable quality and suitability is not believed to be available for sites in other states.

13. Public Information/Technology Transfer

The Program Participants will undertake a complete information dissemination and technology transfer program. They will provide the public, potential users and government agencies with timely and useful information about the project

and about the potentialities of solar thermal technology. Mechanisms will be established by which these groups can raise both policy and technical issues of concern to them in such a manner that these issues can be resolved either through debate or through the research work undertaken as part of the Pilot Plant operation. Through these processes and others described later in this proposal, the Program Participants will establish the institutional framework which will support the development of solar thermal technology.

Included in this element is construction of a public information center at the Pilot Plant site.

It is believed that the above facilities and services are adequate to result in a completed project. However, the Proposing Parties are willing to negotiate additional elements deemed necessary by ERDA.

D. Financial Arrangements and Ultimate Ownership

1. Financial Arrangements

The Program Participants will supply the facilities and services described in Section C of this chapter and elaborated in Section B of Chapter II with an estimated total value of Table I-1 presents a breakdown of this amount to show the cost sharing among the Program Participants. The cost of providing the non-solar portion and the Program Participant share of operation and maintenance will be shared between Edison and Los Angeles at 80 percent and 20 percent respectively.

Table I-1

Program Participant Cost Sharing

Item	Total Value	Edison	Los Angeles	Energy Commission
Non-Solar Portion of Plant and Participation in Solar Portion				
Operation and Maintenance (maximum) 5 Years				
Other Program Costs				
Land				
Total				

2. Ultimate Ownership of Facilities

The agreement between the Program Participants provides that Edison will dispose of the non-solar portion of the plant after the test and evaluation period. It is proposed that ERDA dispose of the solar portion.

If the test and evaluation period proves the Pilot Plant to be a reliable and efficient source of electrical power, and its placement is consistent with Edison plans for the site,

Edison proposes to reserve the right to negotiate a purchase of the solar portion from ERDA.

E. Program Director

Mr. J. Lynn Rasband has been designated as the Program Director for the proposed work. All questions regarding the proposal should be addressed to:

Mr. J. Lynn Rasband, Program Director
Southern California Edison Company
P.O. Box 800
Rosemead, California 91770
Telephone (213) 572-1096

F. Responsible Corporate Officer

Mr. Jack B. Moore is Edison's corporate Vice President with responsibility for research and development. He is authorized to obligate the Program Participants in matters related to this proposal. Mr. Moore's address and telephone number are:

Mr. Jack B. Moore
Vice President
Southern California Edison Company
P.O. Box 800
Rosemead, California 91770
Telephone (213) 572-2292

CHAPTER II
PROJECT INFORMATION AND REQUIREMENTS

The purpose of this chapter is to describe in detail the proposal being offered by the California team of Program Participants. This chapter provides a detailed discussion of

- Site characteristics
- Proposed participation
- Schedule
- Organization and management
- Environmental evaluation
- Cooperative arrangements
- Financial
- Public information/technology transfer
- Local support
- Labor availability
- Small business participation

A. Site Characteristics

A study of nine sites was carried out in selecting the site near the Coolwater Generating Station. Criteria used in the siting study included the 13 site characteristics required by the PON plus five additional aspects including the effect of air quality on plant operation, utility system interface and impacts on biology, archaeology and aesthetics.

The following discussion covers the 13 specific site characteristics required by the PON. Other characteristics of the Coolwater site are discussed as appropriate in other sections of this chapter.

1. Insolation -

The following conclusions are offered relative to the proposed Coolwater site:

- The site has an estimated mean total daily insolation of 5.8 Kwh/m^2, which is well in excess of the 5 Kwh/m^2 required by the PON. The general insolation conditions at the site are considered typical of sites in a 50,000 square mile area that would likely provide solar plant sites in California.
- California sites appear to be superior to those in other states because of a minimum of major insolation interruptions from cloud cover.
- Data from a close network of monitoring stations established by Edison will be extremely valuable in designing the Pilot Plant. This data base is believed to be superior to that available for any other site in the country.

To provide a background for the evaluation of these points, the following paragraphs discuss the relative solar energy availability for sites within California and the detailed solar characteristics of the proposed site.

The solar data base available to those interested in solar thermal conversion technology has historically been very limited. In addition, the data has lacked accuracy and spatial distribution (References: Solar Thermal Conversion Mission Analysis, Southern California Climatology Vol. III, Aerospace Corp., January 1974; Building Application of Solar Energy Study No. 1; Solar Energy and Weather Statistics for Southern California, Southern California Edison/Jet Propulsion Laboratory, September, 1975). Normal Incidence (direct) radiation information is almost totally lacking. Available data points are too widely spaced in time to adequately characterize cloud related interruptions.

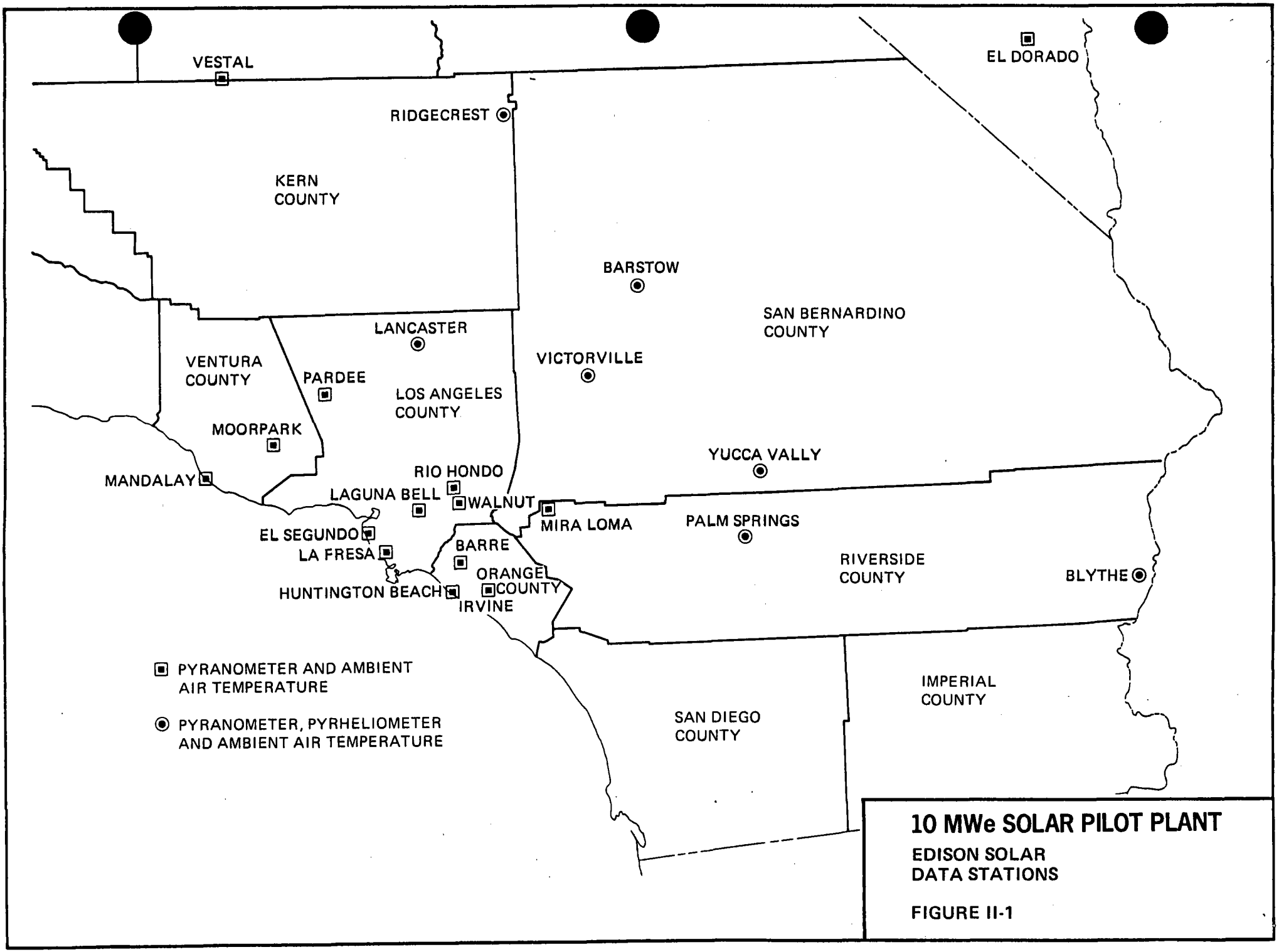
SITE CHARACTERISTICS

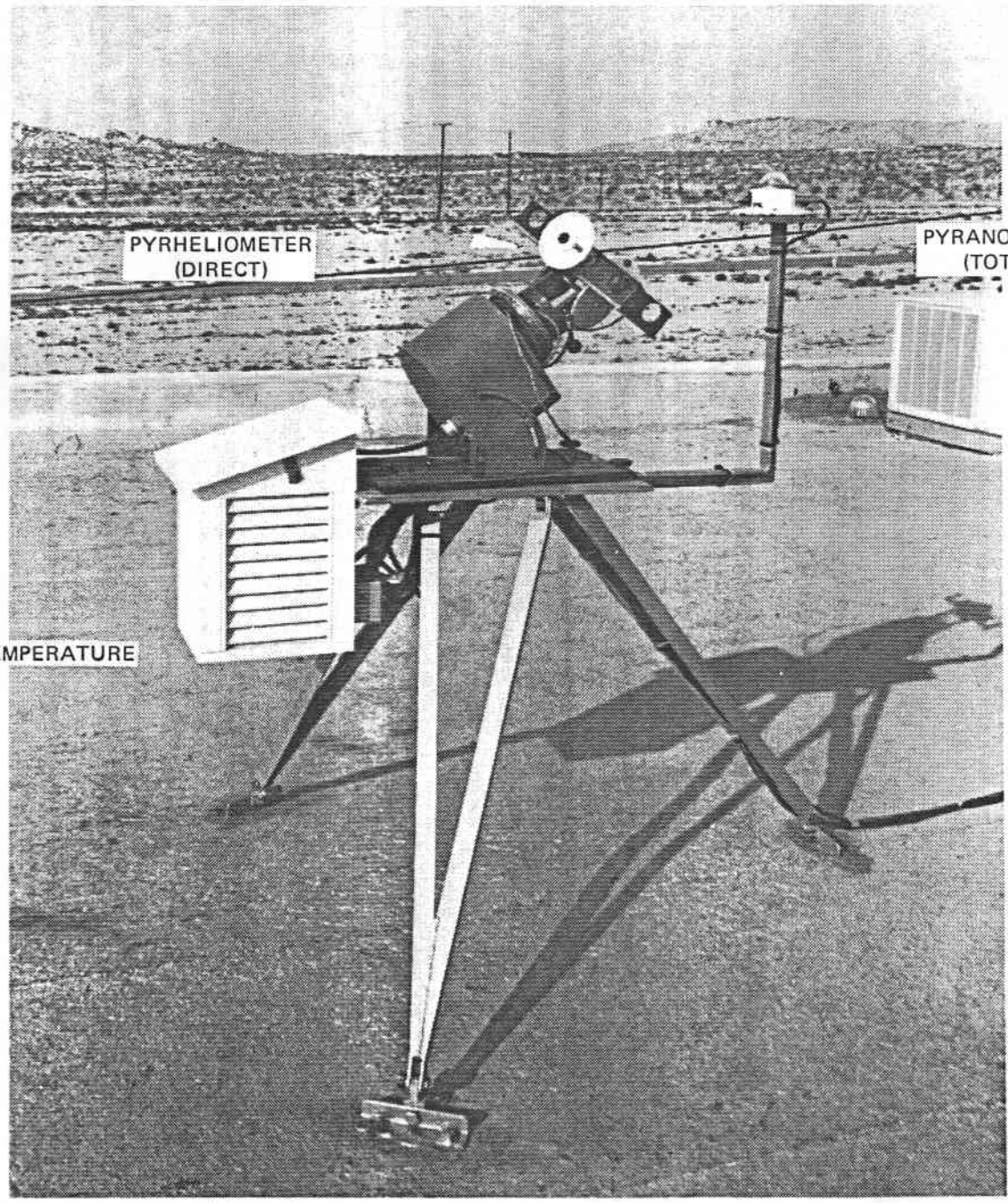
Edison's serious interest in solar energy applications led to a decision in 1974 to establish a solar monitoring network to gather solar insolation data. The network consists of over 20 stations located as shown in Figure II-1. Seven stations, such as shown on Figure II-2, located in potential, solar power plant siting areas record direct radiation, total radiation on a horizontal surface, and ambient air temperature.

Most of the seven stations recording both total and direct solar radiation have been in operation for nearly a year. Measurements are integrated and recorded at 15 minute intervals. Maintenance is performed three times weekly and calibration every six months. Comparable data will become available from other parts of the Southwest as a result of a joint effort by a group of utilities in WEST Associates. Edison will manage the program based on capabilities developed in the current Edison program.

Solar radiation characteristics of California sites are summarized in Table II-1 and Figure II-3. Study of the data suggests the similarity of solar radiation characteristics among sites in the desert of California. Normal incidence levels vary less than 10% among the six locations during six winter-spring months. The proposed Barstow site is representative of sites available in California.

Design of the Pilot Plant located at the proposed site will benefit markedly from data available from the Barstow solar monitoring station. In particular, optimum sizing of the heliostat field and the collector will be greatly aided by the detailed data. In Figure II-4 are the annual profiles of both total radiation on a horizontal surface and normal incidence (direct) radiation. Equally critical to the design but also to the operation of the Pilot Plant is the expected profile of the normal incidence radiation during the course of a day. In Figure II-5 are displayed daily profiles of normal incident radiation at Barstow for each month from August 1975 to June 1976. The profiles were derived by examining every 15-minute interval


VESTAL
RIDGECREST
EL DORADO
KERN
COUNTY
BARSTOW
SAN BERNARDINO
COUNTY
LANCASTER
VICTORVILLE
VENTURA
COUNTY
PARDEE
LOS ANGELES
COUNTY
MOORPARK
YUCCA VALLY
RIO HONDO
MANDALAY
LAGUNA BELL
WALNUT
MIRA LOMA
PALM SPRINGS
EL SEGUNDO
LA FRESA
BARRE
RIVERSIDE
COUNTY
BLYTHE
ORANGE
COUNTY
HUNTINGTON BEACH
IRVINE
PYRANOMETER AND AMBIENT
AIR TEMPERATURE
PYRANOMETER, PYRHELIOMETER
AND AMBIENT AIR TEMPERATURE
IMPERIAL
COUNTY
SAN DIEGO
COUNTY
10 MWe SOLAR PILOT PLANT
EDISON SOLAR
DATA STATIONS
FIGURE II-1



10 MWe SOLAR PILOT PLANT

EDISON SOLAR DATA
INSTALLATION

FIGURE II-2

Table II-1

Mean Daily Solar Radiation At Various Locations
In The Eastern Desert of California

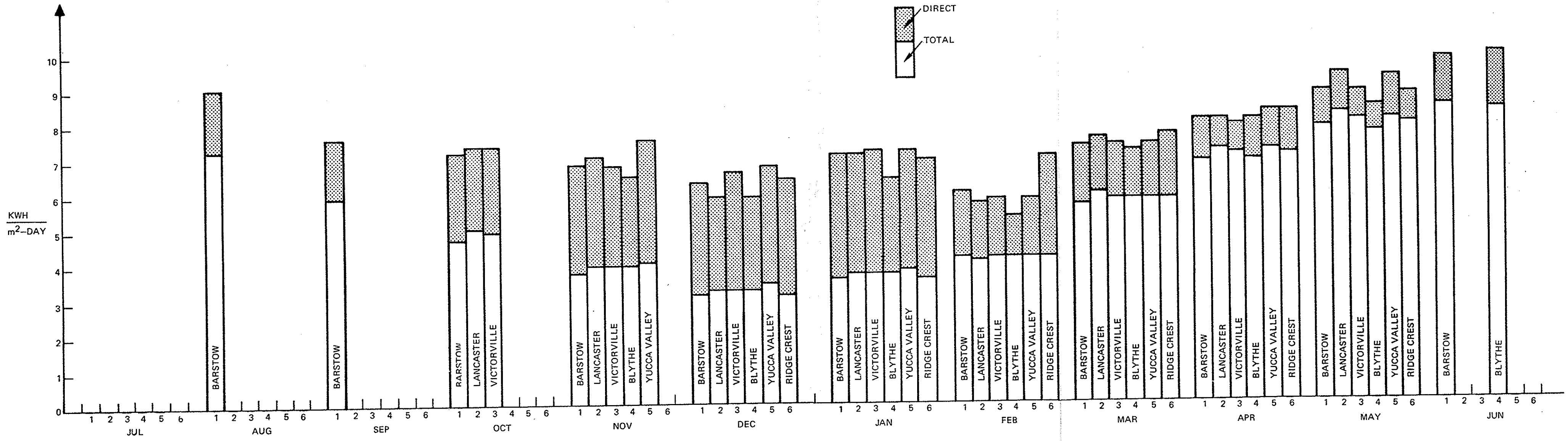
Total Radiation On a Horizontal Surface
(Kw-hrs/m^2 day)

	Barstow	Lancaster	Victorville	Blythe	Yucca Valley	Ridgecrest
Aug	7.3	-	-	-	-	-
Sep	5.9	-	-	-	-	-
Oct	4.7	5.0	4.9	-	-	-
Nov	3.7	3.9	3.9	3.9	4.0	-
Dec	3.1	3.2	3.2	3.2	3.4	3.1
Jan	3.5	3.6	3.6	3.6	3.7	3.5
Feb	4.1	4.0	4.1	4.1	4.1	4.1
Mar	5.6	5.9	5.8	5.8	5.8	5.8
Apr	6.8	7.1	7.0	6.8	7.1	7.0
May	7.8	8.2	8.0	7.7	8.0	7.9
Jun	8.4	-	-	8.2	-	-

Normal Incidence (Direct) Radiation
(Kw-hrs/m^2 day)

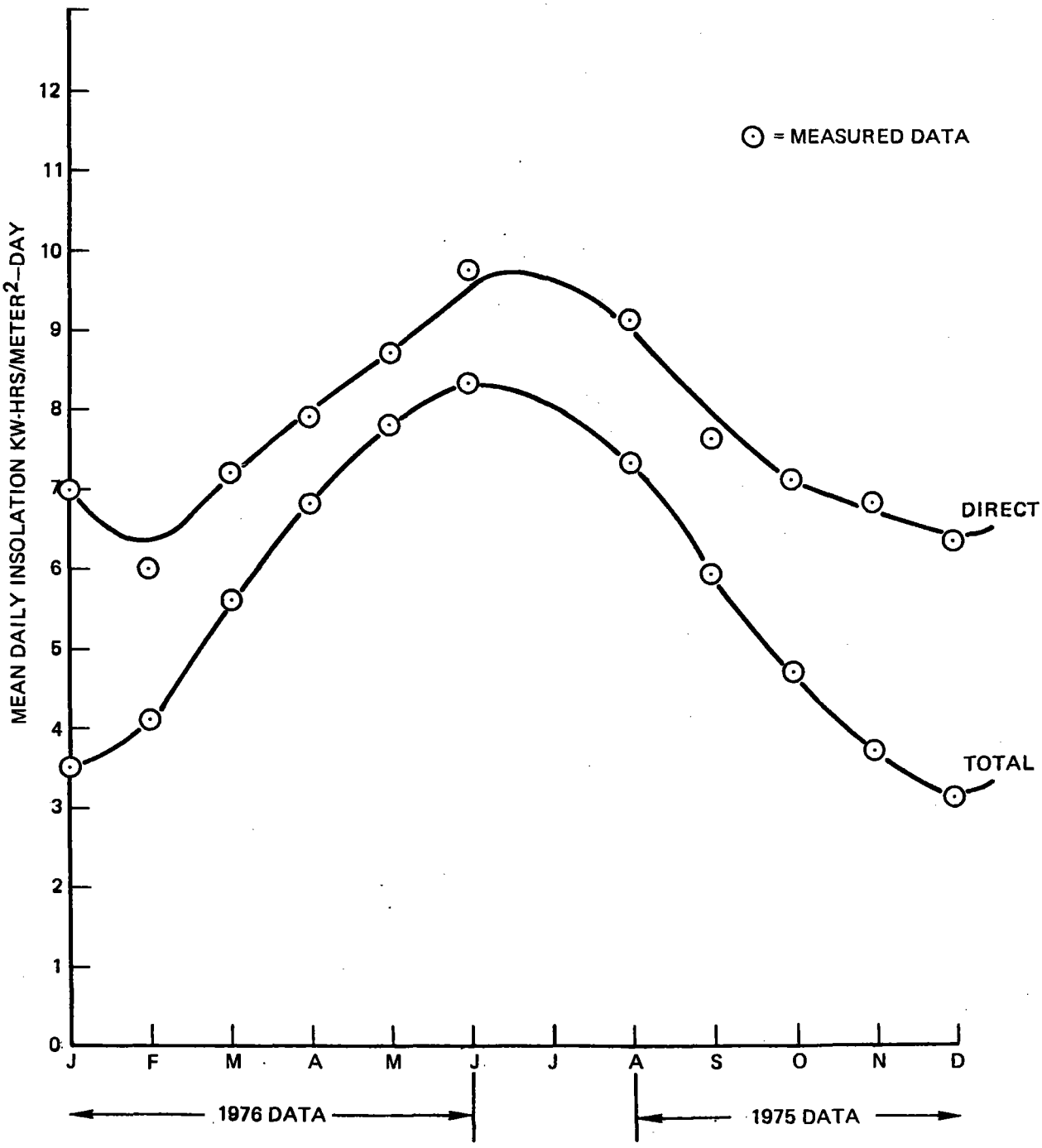
	Barstow	Lancaster	Victorville	Blythe	Yucca Valley	Ridgecrest
Aug	9.1	-	-	-	-	-
Sep	7.6	-	-	-	-	-
Oct	7.1	7.3	7.3	-	-	-
Nov	6.8	7.0	6.9	6.7	7.5	-
Dec	6.3	5.9	6.6	5.9	6.8	6.4
Jan	7.0	7.0	7.1	6.3	7.1	6.9
Feb	6.0	5.7	5.8	5.3	5.8	7.0
Mar	7.2	7.4	7.2	7.1	7.3	7.6
Apr	7.9	7.9	7.8	7.9	8.2	8.2
May	8.8	9.3	8.8	8.4	9.2	8.8
Jun	9.8	-	-	9.8	-	-

(96 intervals per day) for each day of the month and determining the average and maximum insolation level. A comparison of the average insolation level to the maximum insolation level can be used as an indication of the degree of consistency of solar energy



10 MWe SOLAR PILOT PLANT

AVERAGE INSOLATION AT SEVERAL SOUTHERN CALIFORNIA SITES
FIGURE II-3



10 MWe SOLAR PILOT PLANT

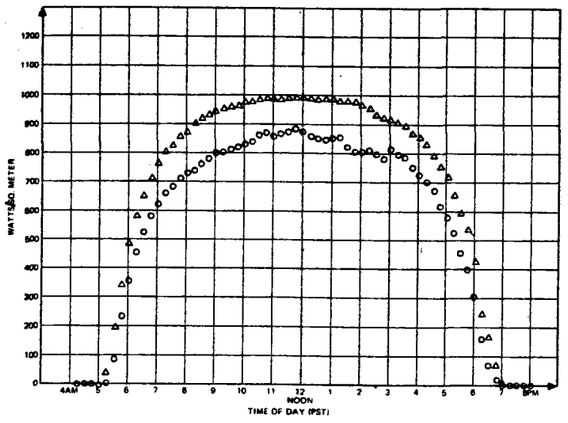
MEAN DAILY INSOLATION –
BARSTOW, CALIFORNIA

FIGURE II-4

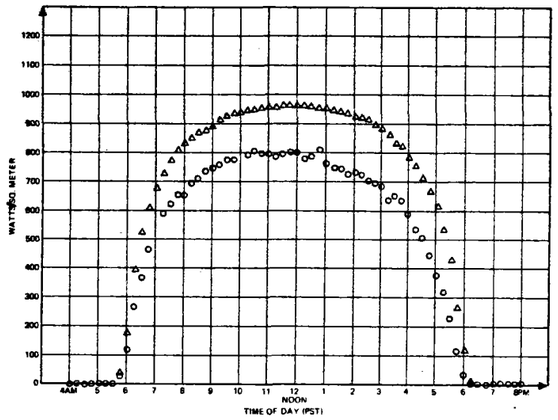
availability. The ratio of average insolation level to maximum insolation level at 12:00 (PST) ranged from .88 in August 1975 to .74 in February 1976, indicating very good consistency in the summer months and fairly good consistency in the winter months.

Consistency of solar energy availability can also be determined by examination of frequency and duration of insolation levels and interruptions. Because of the Edison data recording method (integrated over a 15-minute interval) it is possible to precisely characterize insolation consistency. In Figure II-6 insolation duration information is summarized in a format suggested in "Appendix B, Insolation Methodology", of the PON. Information on the number of consecutive hours of a certain insolation level which can be expected is useful to determining operational constraints on the plant. Barstow, in February, experienced eight cases when the insolation level was above .8 Kw/m^2 for at least six hours. This is interpreted to mean that essentially there were eight days (six hours being most of the day in February) when the insolation level was above .8 Kw/m^2. In contrast, the month of June experienced 23 days of insolation levels above .8 Kw/m^2 for a minimum of 6 hours. Recognizing that a drop in insolation level to .79 Kw/m^2 results in a break in the number of consecutive hours, an alternate means of examining interruptions was developed.

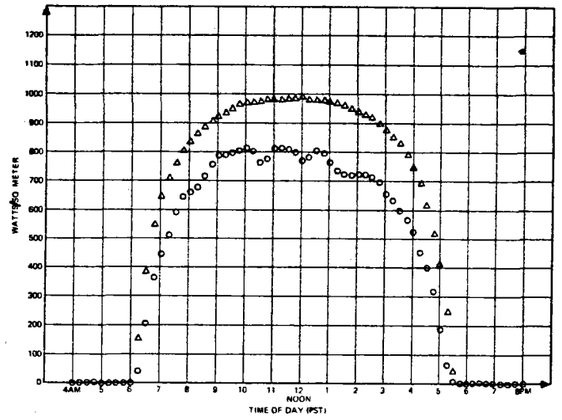
In Figure II-7, an "Interruption Duration Curve" displays the number of interruptions which lasted longer than a given duration in the period from August 1975 to May 1976. An interruption in Figure II-7 is defined as a drop in the insolation level for a 15-minute interval to below 50% of the mean insolation level for that particular 15-minute interval in the month. As indicated, there were 93 instances when the insolation level dropped below 50% of the mean level for only 15 minutes and then returned to normal. There were 58 interruptions which lasted 30 minutes. The number of interruptions which last an hour is



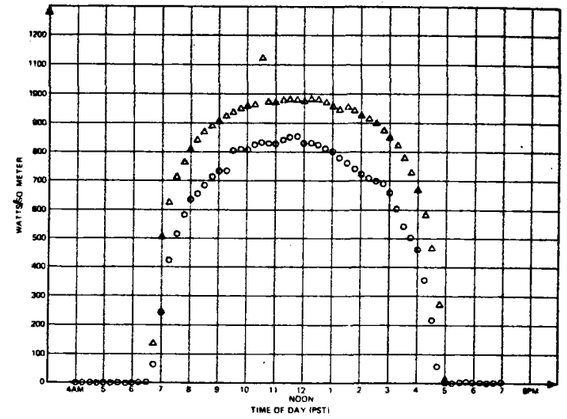
AUGUST 1975



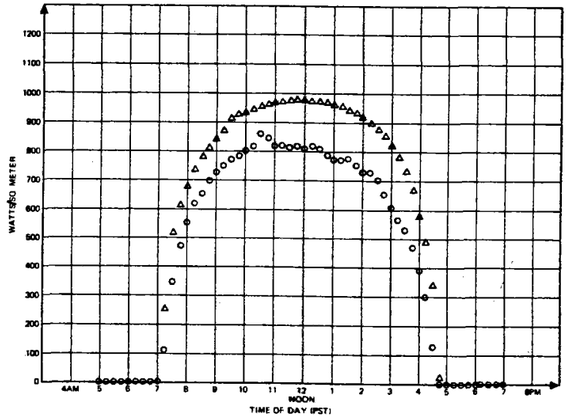
SEPTEMBER 1975



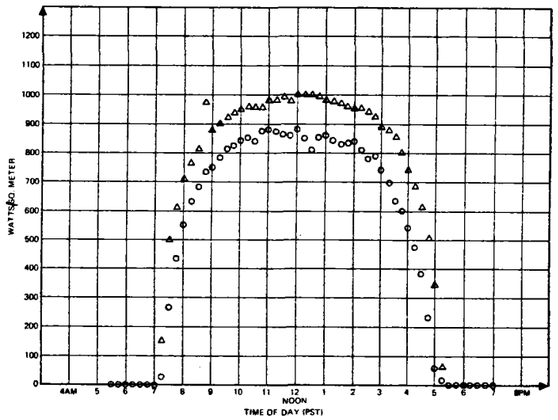
OCTOBER 1975



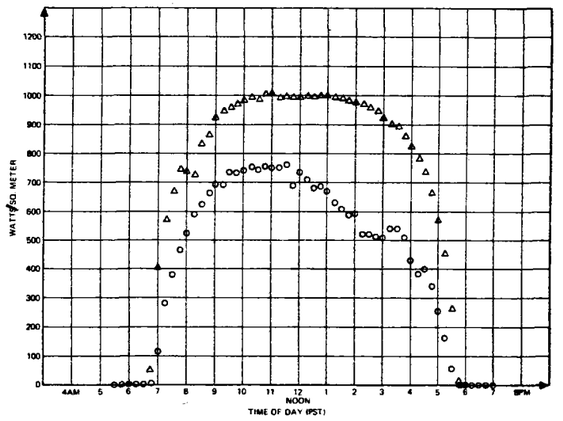
NOVEMBER 1975



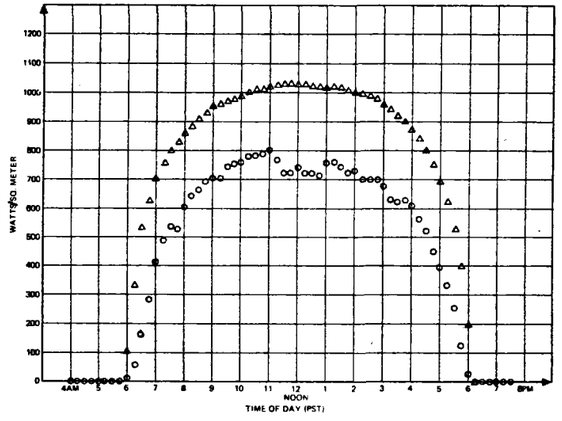
DECEMBER 1975



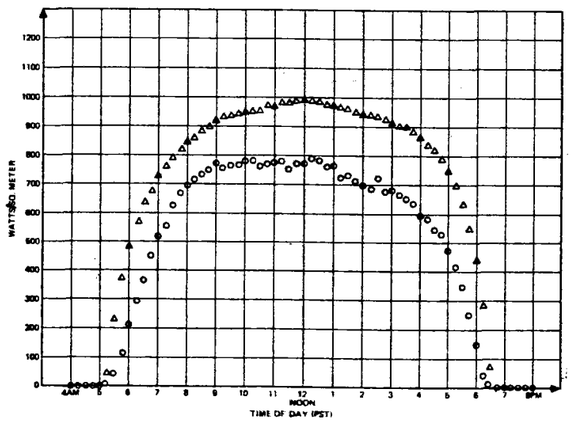
JANUARY 1976



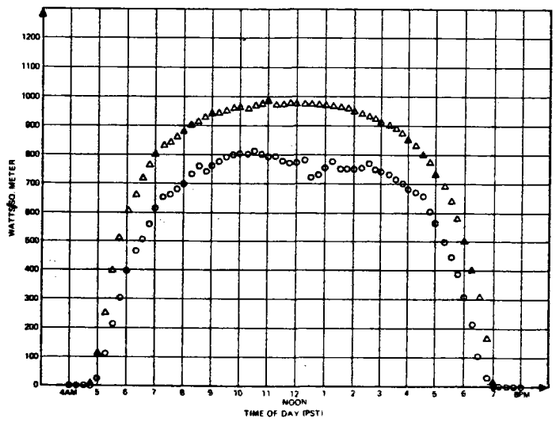
FEBRUARY 1976



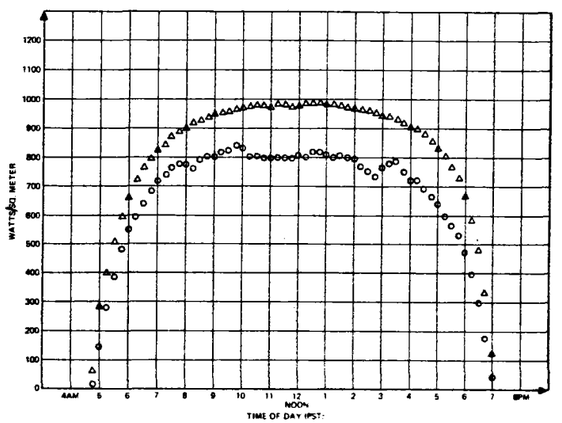
MARCH 1976



APRIL 1976



MAY 1976



JUNE 1976

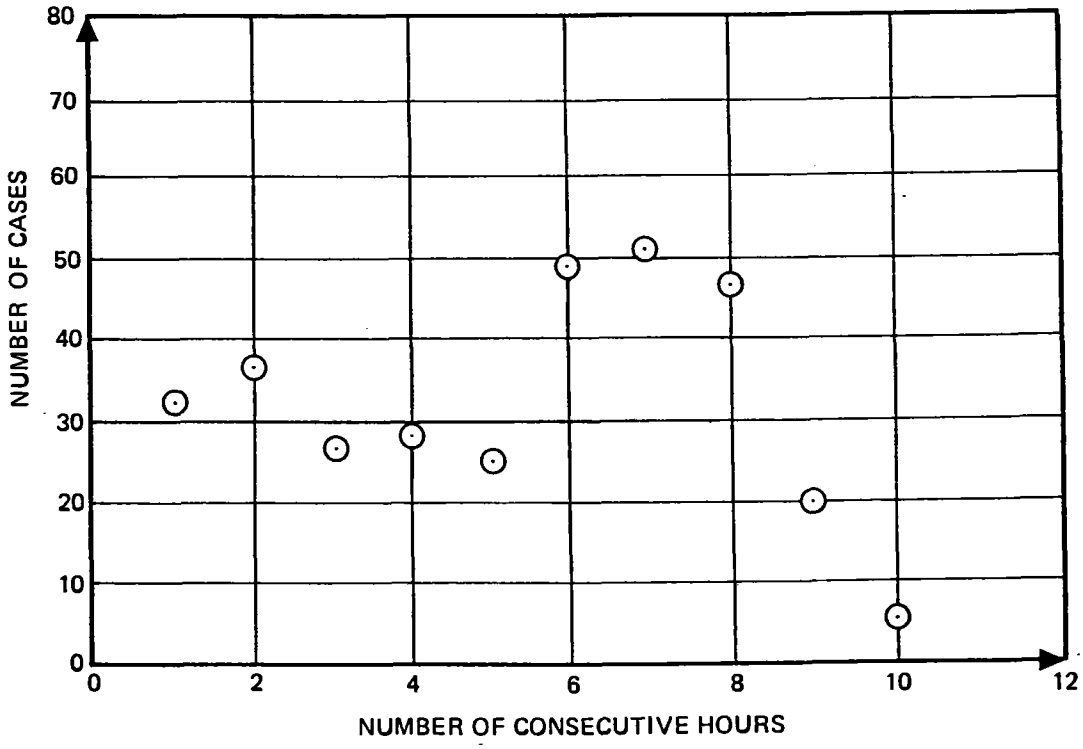
△ = MAXIMUM INSOLATION

O = AVERAGE INSOLATION

10 MWe SOLAR PILOT PLANT

MONTHLY DIRECT INSOLATION
BARSTOW, CALIFORNIA
FIGURE II-5

	NUMBER OF CONSECUTIVE HOURS									
	1	2	3	4	5	6	7	8	9	10
AUGUST	1	1	-	1	4	1	3	11	6	
SEPTEMBER	3	2	2	3	3	-	9	4		
OCTOBER	1	4	1	3	2	6	9	2		
NOVEMBER	2	3	3	2	3	6	9			
DECEMBER	4	4	2	5	4	12				
JANUARY	2	4	8	-	1	13	3	1		
FEBRUARY	3	6	3	4	2	1	5	2		
MARCH	3	5	2	4	1	5	4	5	1	
APRIL	5	3	2	4	2	-	2	10	1	
MAY	4	2	2	2	1	2	7	4	5	
JUNE	4	2	2	–	1	3	0	8	7	5
TOTAL	32	36	27	28	25	49	51	47	20	5



10 MWe SOLAR PILOT PLANT

NUMBER OF CASES OF CONSECUTIVE HOURS OF INSOLATION GREATER THAN 0.8 KW/m^2 – BARSTOW, CALIFORNIA

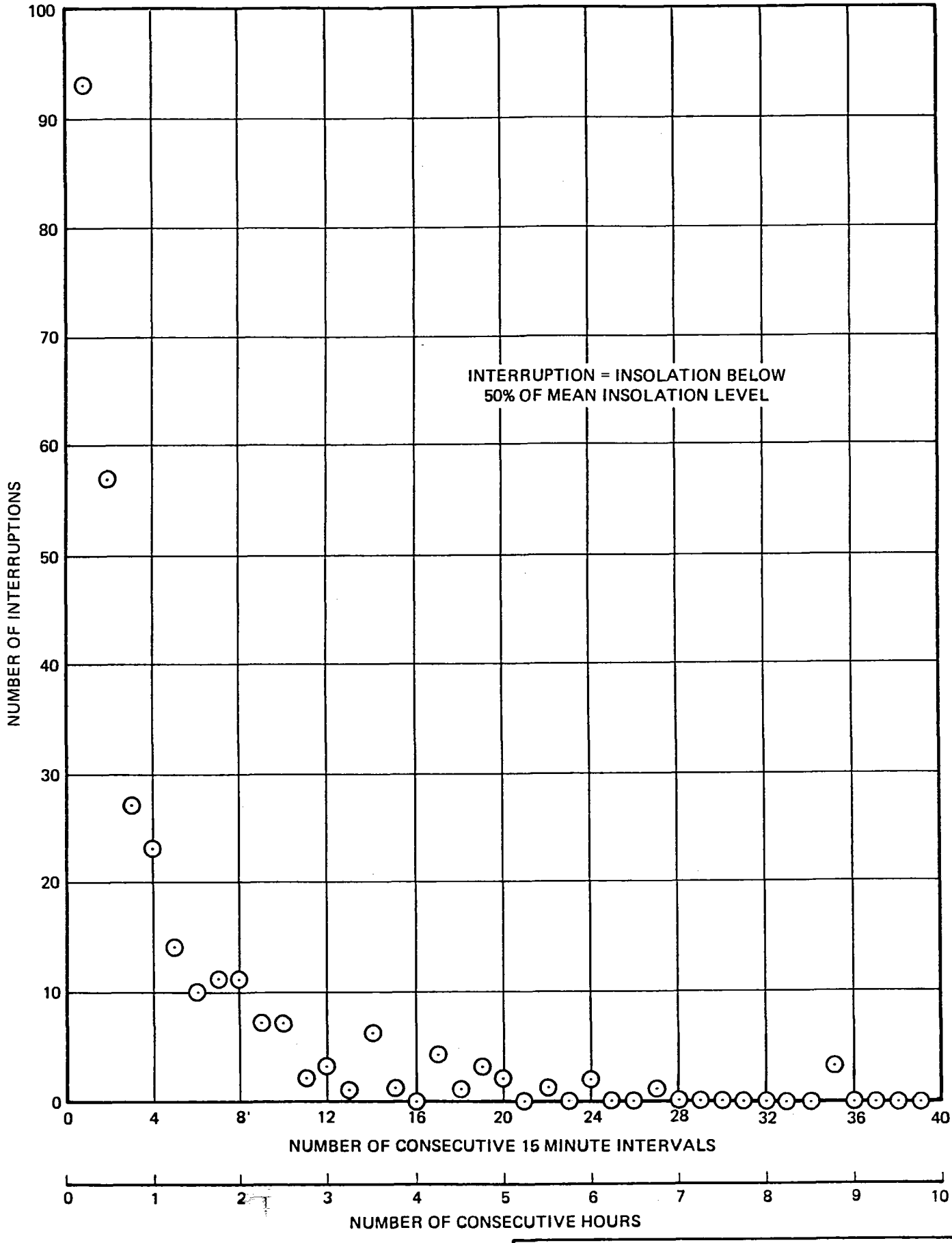
FIGURE II-6

only 23 in the 10-month period. As evidenced in Figure II-7, significant and sudden drops in insolation levels at the Barstow site occur infrequently, indicating that intermittent cloud cover is not prevalent. This type of information is expected to form a good basis for transient design of the plant, in particular the design of the heat receiver and its response to heat flux transients, caused by clouds interrupting or reducing insolation intensity.

Data which has been gathered on the Edison solar monitoring network is high in accuracy and spatial resolution. A comparison of other sites to the proposed site should be based on data of equal caliber. Shown in Table II-2 is a comparison of Edison measured data and insolation levels based on data from the National Climatic Center, Ashville, North Carolina. It is evident that the data from the National Climatic Center is consistently higher than Edison data, negating the assumption that the past year was abnormally low in insolation. Other evaluations of the non-Edison data which has been available to date support the contention that it is generally higher than might be expected. (References: Solar Thermal Conversion Mission Analysis, Vol. III, Southern California Insolation Climalogy, Aerospace Report ATR-74(7417-05)-1, January 1974; Building Application of Solar Energy Study No. 1: Solar Energy and Weather Statistics for Southern California, Southern California Edison/Jet Propulsion Laboratory, September 1975).

Accordingly, the proposed site should not be judged at a disadvantage relative to other sites based on comparisons that involve Edison measured data and data from other sources. There is every indication that comparable data would show the proposed site superior to sites in other candidate states.

For example, a comparison of the proposed site to other sites across the country using non-Edison measured data can be made via the contours of annual mean daily insolation and mean total annual hours of sunshine. As indicated in Figure II-8, the



10 MWe SOLAR PILOT PLANT

INSOLATION INTERRUPTION
DURATION CURVE

FIGURE II-7

Table II-2

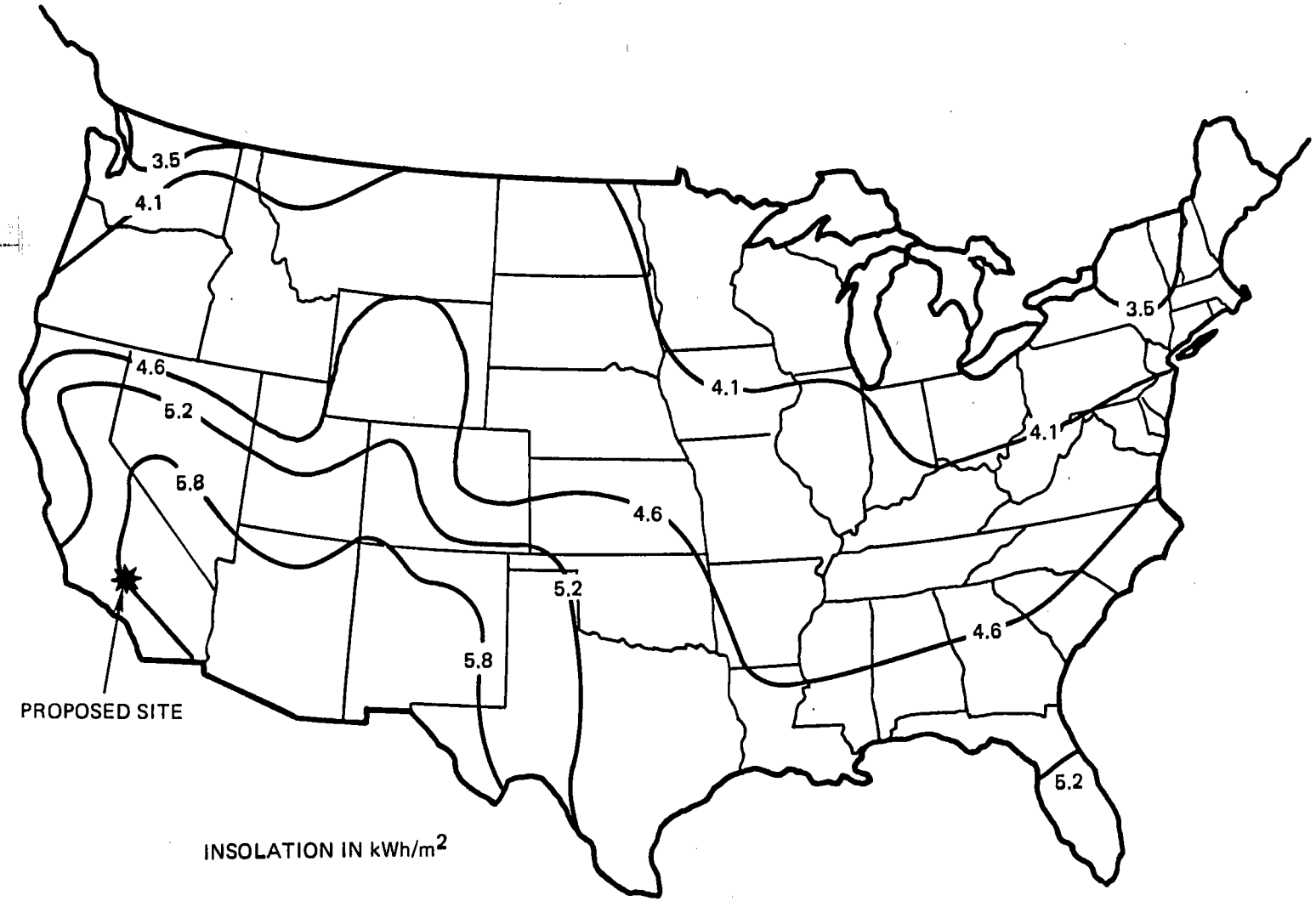
Mean Daily Solar Radiation
(kWh/m^2-day)

Month	Direct		Total		Direct		Direct	
	Edwards AFB/Lancaster (Aerospace)	(SCE)	Inyokern/Ridgecrest (Honeywell)	(SCE)	Inyokern/Ridgecrest (Aerospace)	(SCE)	Yuma/ (Aerospace)	Blythe (SCE)
Aug								
Sep								
Oct	7.4	7.3						
Nov	6.4	7.0					6.7	6.7
Dec	5.9	5.9	3.5	3.1	7.1	6.4	6.3	5.9
Jan	6.1	7.0	3.0	3.5	7.3	6.9	6.8	6.3
Feb	5.8	5.7	4.8	4.1	6.7	7.0	6.7	5.3
Mar	7.5	7.4	6.5	5.8	9.3	7.6	8.0	7.1
Apr	8.5	7.9	7.9	7.0	10.4	8.2	9.2	7.9
May	9.6	9.3	9.0	7.9	10.9	8.8	10.0	8.4
Jun								
Jul								

proposed site is located in the area of highest mean annual daily insolation (5.8 kwh/m^2). As shown in Figure II-9, the site is favorably located in one of the three highest areas of mean total annual hours of sunshine. The plant is also favorably located when one examines the sunfall (cloud interruption) characteristics at three sites in the southwest. Results based on National Weather Service data are presented in Table II-3. (Reference: Integration of Solar Thermal Power Plants Into Electric Utility Systems, Volume II, Technical and Economic Studies, Southern California Edison Company prepared for ERDA, Contract No. E (04-3)-1117, September 1976.) The percent of the total available sunshine which is actually received is highest at Inyokern, a location typical of the California desert. The data also indicates there are significantly fewer days of insolation levels less than 50% of possible sunshine at Inyokern than Phoenix or Albuquerque, indicating that cloud interruption problems will not be as severe at the California site.

Relative to physical interferrence with insolation, there is no natural shading at the site. ERDA criteria require a clear view down to 10° above horizontal between azimuths 135° and 225°. At Coolwater, the maximum shade angle is about 4° due to the Newberry Mountains to the south and the Calico Mountains to the north.

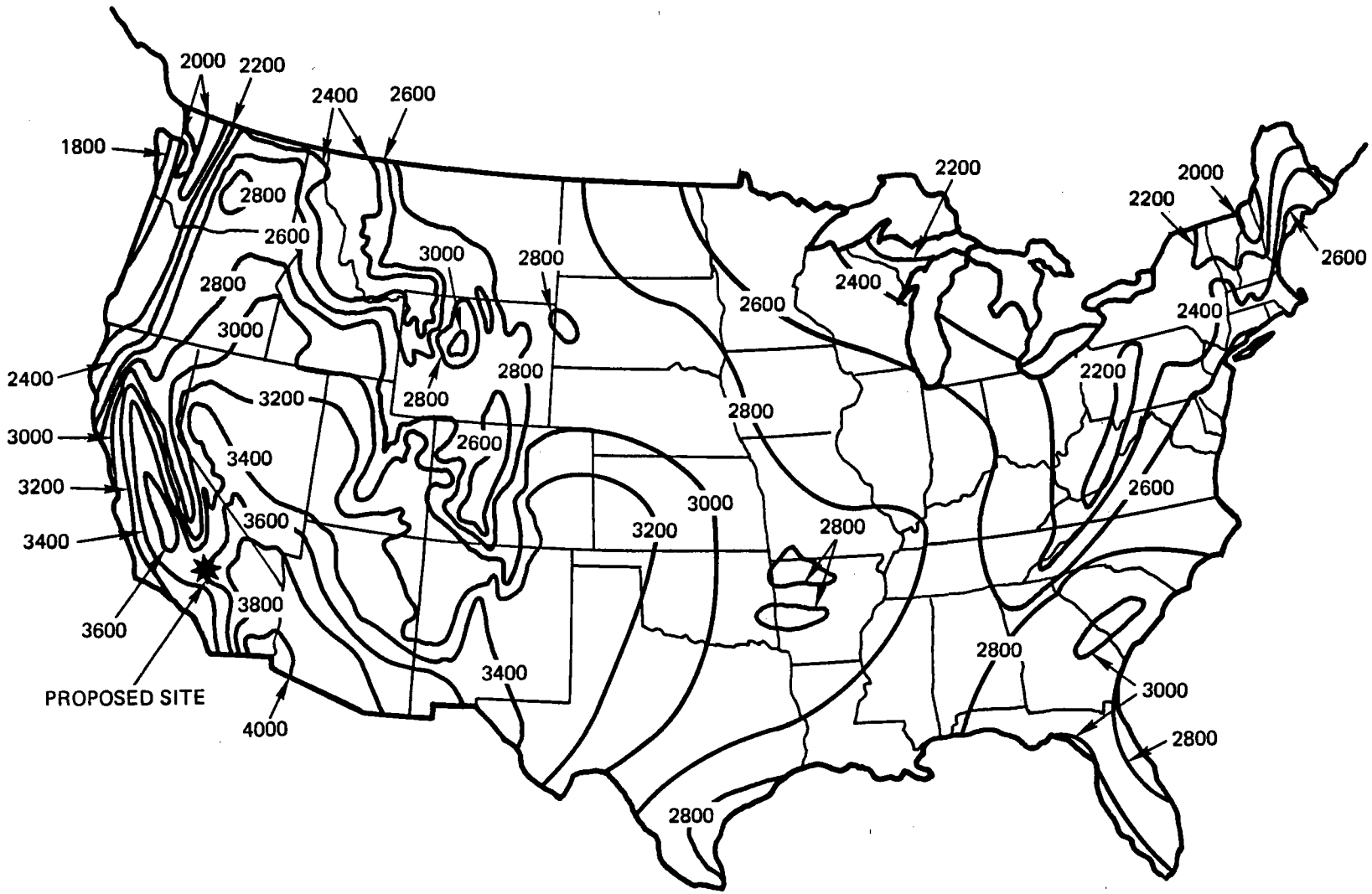
It is unlikely that any structures will be built which could interfere with insolation. Land for about two miles south of the site is either owned by Edison or is being used for highway, railroad and electric transmission line right of way. Land for several miles north is limited for future use by the broad flood plain of the Mohave River, highways and United States Marine Corps installations. Several miles to the west is either owned by Edison or in the flood plain of the river. Land to the east is owned by Edison and open land.



10 MWe SOLAR PILOT PLANT

NATIONAL MEAN
DAILY INSOLATION

FIGURE II-8



10 MWe SOLAR PILOT PLANT

NATIONAL MEAN TOTAL
ANNUAL HOURS OF SUNSHINE

FIGURE II-9

Table II-3

Sunfall Statistics For Three Areas
5 Year Averages

Month	Albuquerque		Inyokern		Phoenix	
	% Sunshine	Days <50%	% Sunshine	Days <50%	% Sunshine	Days <50%
Jan	74	6.2	75	5.9	74	6.2
Feb	74	6.2	79	4.8	78	5.1
March	74	6.2	81	4.3	76	5.6
April	77	5.4	85	3.2	80	4.5
May	80	4.5	90	1.8	84	3.4
June	83	3.7	94	0.7	84	3.4
July	76	5.6	86	2.9	73	6.5
Aug	76	5.6	88	2.3	74	6.2
Sept	81	4.3	93	1.0	83	3.7
Oct	79	4.8	84	3.4	81	4.3
Nov	77	5.4	84	3.2	79	4.8
Dec	71	7.0	77	5.4	72	6.7
Annual Averages	76.8	5.4	84.7	3.2	78.2	5.0

2. Precipitation

Minimum seasonal probabilities of precipitation and minimum depths of snow are important in selecting a site for the Pilot Plant.

Precipitation in the high desert area is quite variable from season-to-season and year-to-year. Analysis of fifteen years of precipitation data (1956-1970) for the Barstow-Daggett airport, several miles from the site, is listed in Table II-4. The monthly average precipitation is at a

Table II-4

Precipitation Summary
Barstow-Daggett Airport (1956-1970)

Precipitation (Inches)	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Average	0.31	0.32	0.28	0.31	0.07	0.05	0.31	0.60	0.51	0.22	0.37	0.35
Maximum 24-Hour	0.73	0.70	0.88	0.65	0.37	0.32	0.96	2.06	1.11	0.66	1.08	1.01
Maximum Monthly	0.98	1.50	1.01	1.83	0.49	0.32	0.96	3.22	2.31	1.01	1.74	2.02
Minimum Monthly	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Annual	3.70											

minimum in May and June with 0.07 and 0.05 of an inch, respectively. The maximum usually occurs in August and September with 0.60 and 0.51 of an inch, respectively. The late summer maximum reflects the occurrence of limited thunderstorm activity. Both the 24-hour maximum of 2.06 inches and the greatest monthly average of 3.22 inches of precipitation have occurred in August. The average annual precipitation at the Coolwater site is 3.70 inches. Precipitation at the site area is usually in the form of rainfall. Occasionally, however, an exceptionally strong cold frontal system will move through the area with precipitation in the form of snow. During the period 1956-1970, a total of fifteen snowfall occurrences have been noted at the airport. Of this total, eleven have amounted to only a trace. The greatest monthly snowfall during the above period was 13.0 inches in December, 1968. Such an occurrence at the Coolwater site is extremely rare.

The levels of precipitation discussed above are considered to be quite good for siting the Pilot Plant.

3. Wind

In order to maintain heliostat stability, minimize blowing particulates and simplify design requirements, minimum incidence and duration of steady winds in excess of 30 miles per hour and gusts in excess of 40 miles per hour are required.

The basic wind flow patterns over Southern California are largely the result of the presence of seasonal semipermanent weather features in the general circulation pattern of the atmosphere. In addition, the low level winds in the complex terrain of the desert are affected to a large degree by local topographical influences. The historical wind data available for the Barstow-Daggett Airport was used in evaluating this site. These records are maintained by the U.S. Department of Commerce Weather Bureau, National Weather Records Center in North Carolina.

Based on this evaluation, the predominant wind was from the west-southwest, west, west-northwest, and northwest directions. This is a direct result of wind channeling through the Mojave River area west of the Coolwater site. The above four direction sectors comprise a total of 74% of the annual wind direction frequencies.

Available records are summarized in Table II-5. The available records give sufficient information needed for determining the suitability of Coolwater as the proposed site. From all the data available it can be concluded that the percentage of occurrence for winds of 30 mph velocity would be approximately 2-3% of the time, and Winds with a velocity of 40 mph would occur 1% or less.

4. Topography

As required by the PON, the natural topography of Coolwater site is nearly level with enough slope for drainage. There is no steep terrain or rocky surfaces which would increase the cost of site preparation.

A substantial amount of soils information is available on the Coolwater site and it has fair foundation characteristics which are discussed under Geologic Stability.

5. Geologic Stability

The following discussion covers soil conditions, regional geologic setting, and site geology.

a. Soil Conditions

This discussion is based on soil data obtained at the site of the generating units now under construction, which is about one mile west of the proposed solar site. It is expected to be representative of the proposed site because the geologic setting is the same.

Table II-5

Wind Summary Barstow-Daggett Airport

Summary 1932-1938

Velocity	% of Occurrence
4-15 MPH	69
16-31 MPH	20
32-47 MPH	1

Summary 1958-1963

1-3 MPH	<1
4-12 MPH	48
13-24 MPH	32
25-31 MPH	2
32-46 MPH	<1
>47 MPH	<1

Summary 1955-1964

1-3 MPH	1
4-7 MPH	15
8-11 MPH	33
12-18 MPH	23
19-24 MPH	10
>24 MPH	3

The natural soils beneath the general site area consist of silty sand, to depths of about one to five feet, underlaid by sand. Thin layers or lenses of silt occur in the sand in many locations, generally within the upper five to ten feet. The surface silty sand is only moderately firm at intermediate moisture content and would become weaker when wet. The sand is firm to very firm but the thin layers of silt within the upper five to ten feet are relatively soft. Firm layers of silty sand, silt, and clayey sand occur below depths of 20 feet.

Specific soil studies will be required at the proposed site to develop design parameters for foundations.

b. Regional Geological Setting

Coolwater is located in the western portion of the Mojave Desert Geomorphic province, one of eleven major geomorphic provinces within California. This province is bounded by the mountains of the Traverse Ranges, Colorado Desert and San Andreas fault on the south and the southwest; and by the Basin and Range geomorphic province on the east.

The western Mojave Desert consists of broad alluvial filled plains and basins ranging in elevation between 2,000 and 3,000 feet, interrupted by isolated hills and low, discontinuous northwest tending mountain ranges rising from several hundred to almost 3,000 feet above the surrounding terrain.

Alluvial fans blanket the base of the mountains. There are many basins of interior drainage, resulting in the formation of dry lakes ranging in area from hundreds of acres to about sixty square miles.

The western Mojave Desert is drained by the Mojave River, which flows northward from the San Bernardino Mountains through Victorville, then turns eastward to pass by Barstow and Daggett, terminating at Soda Dry Lake in the eastern Mojave Desert.

This desert area is underlaid principally by Mesozoic intrusive igneous rocks ranging from granite to diorite. There are also limited occurrences of older metamorphic rocks. These basement rocks form many of the topographic highs in the region. Tertiary volcanic rocks intrude or overlie the basement rocks in many areas. Tertiary non-marine sediments occur in limited areas. Alluvial deposits ranging to several hundred feet in thickness of Pleistocene and Holocene age, cover more than 50% of this desert area.

The dominant structural features in the region are the many northwest-southeast trending faults, several of which are at least sixty miles in length. Some of the longer faults display evidence of ground displacement during Holocene time and are considered active based on earthquake epicenters located on or near their traces.

Vertical displacement along these faults has formed many of the hills and mountains as well as adjacent basins of interior drainage. Most of the older igneous rocks are strongly jointed from the regional stresses which produced the faulting.

c. Site Geology

Coolwater is located on the old flood plain of the Mojave River in a broad alluvial-filled valley. The valley is approximately four miles wide and contains a narrow, dry lake five miles in length, two miles north of Coolwater.

The valley is flanked by the Calico Mountains several miles to the north and the Newberry Mountains several miles to the south, both of which are composed principally of Tertiary volcanic and sedimentary rocks.

Alluvial deposits in the valley consist of sand and gravel on the order of hundreds of feet in depth. These deposits, in turn, are underlaid by indurated Pleistocene fanglomerates possibly several hundred feet in thickness. Based on sedimentary outcrops along the borders of the valley, Tertiary shale, sandstone and conglomerates, of considerable thickness, are believed to underlie the alluvium and fanglomerates. Basement rock in the area consists of granite and diorite.

6. Seismologic Stability

As with all large structures, a low risk zone of seismic activity is preferred for siting the Pilot Plant.

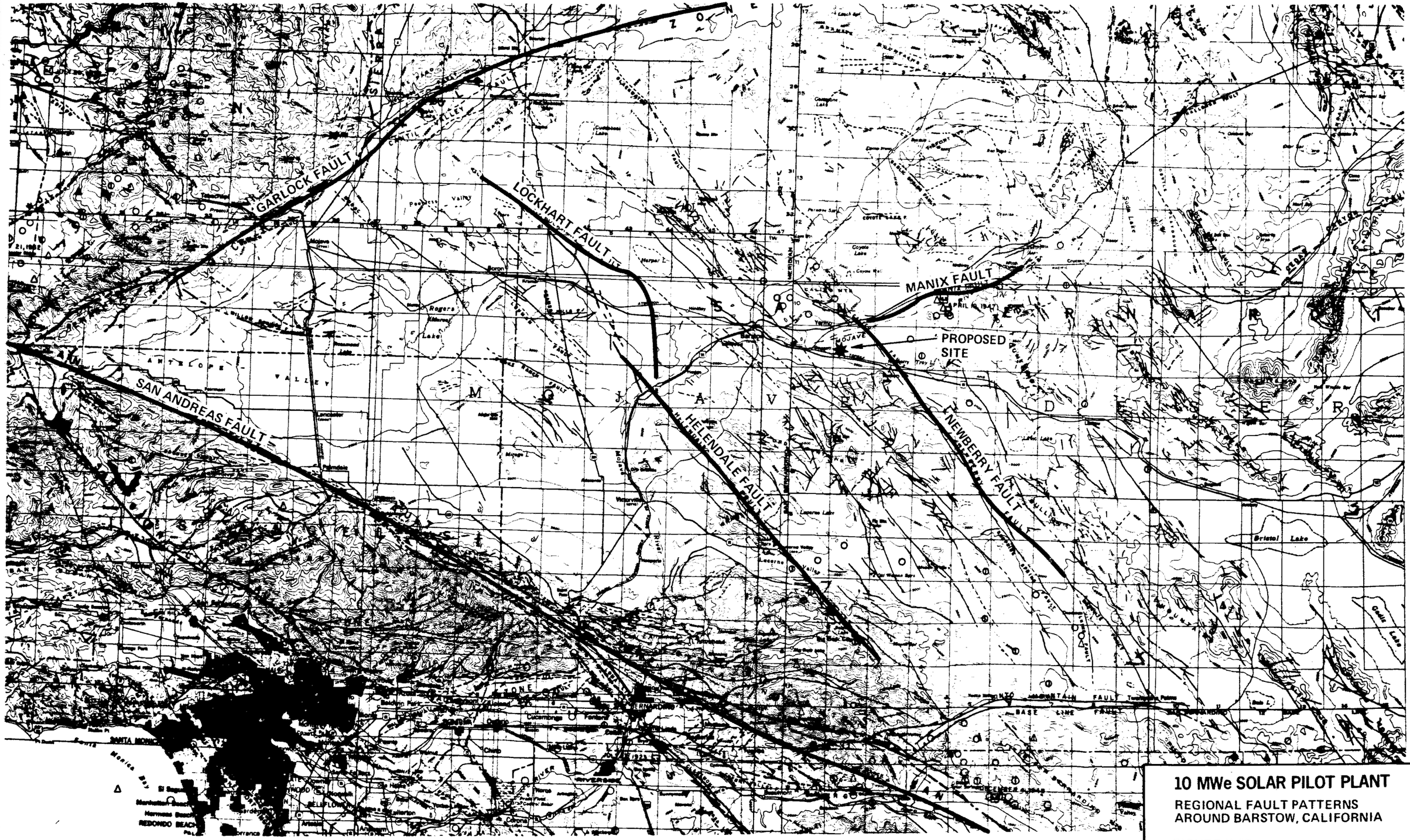
Sufficient distance from fault zones must be allowed to limit expected horizontal accelerations.

The Coolwater site has been extensively studied in developing the existing facilities. Any horizontal earthquake accelerations are expected to be on the order of 0.20 g to 0.25 g. Such levels would not necessitate any special design requirements.

The station is considered to be in an area of moderate seismicity. The closest potential source for a major earthquake of a magnitude 8 or more is the San Andreas fault, which passes sixty-five miles southwest of the site, just north of the City of San Bernardino. The Garlock fault, fifty miles north, is the closest major active fault, although it is much less likely to generate a major earthquake during the life of the project. These and other faults are shown on the regional map of Figure II-10.

Within a radius of twenty-five miles from the site, there are five faults from fifteen to at least sixty miles in length, all of which can be considered active based on displacement of late Holocene sediments and/or historic seismicity. All of these, except for the Manix fault, trend in a northwest-southeast direction. There are also numerous small faults ranging up to several miles in length within a radius of ten miles from the site. Most of the faulting is believed to have originated during the mid-Tertiary time. Renewed movement during the Pleistocene and continuing into relatively recent time has formed many of the mountains and valleys in the area. The longer faults appear to be steeply dipping with vertical displacements in the range of several thousand feet although there is also evidence for lateral displacement of some of the faults.

The longest of the five faults previously noted is the sixty mile-long Helendale fault, twenty-three miles southwest of the site. The forty mile-long Lenwood fault and the



10 MWe SOLAR PILOT PLANT

REGIONAL FAULT PATTERNS
AROUND BARSTOW, CALIFORNIA

FIGURE II-10

thirty mile-long Camp Rock fault are to the southwest, nine and three miles, respectively. The Calico-Newberry fault, which is about fifty miles in length, is six miles to the northeast. The Manix Fault, which trends east-northeast against the regional structural grain, ranges from twelve to twenty-five miles northeast.

Of the five faults previously noted, the Manix generated the largest historic earthquake, registering a magnitude of 6.2 in a shock in 1947. A scattering of earthquake epicenters ranging from a magnitude of 4 to 4.4 have been recorded near the northern limit of the Calico-Newberry fault about nine miles northwest of the site. In addition to numerous earthquake epicenters near the southern terminus of the Helendale fault, recent trenching across the trace of the Helendale in Lucerne Valley, thirty miles south, indicates relatively recent (Holocene) activity.

Probably the most likely source of strong shaking at the site would be an earthquake of the magnitude 8 or more on the San Andreas fault near San Bernardino or an earthquake on the Manix of like magnitude to the shock of 1947. It is estimated that either event would produce an acceleration at the site on the order of 0.20 g to 0.25 g and a shaking intensity of about VII to VIII on the Modified Mercalli scale. Perhaps a slightly higher acceleration and more intense shaking would result from an earthquake centered near the site on the Calico-Newberry fault, but the possibility of such an event during the life of the project does not appear to be as great as strong shaking from an earthquake on the San Andreas or Manix faults.

7. Hydrologic Conditions

The proposed site is not subject to flooding and has adequate currently developed ground water resources. Edison currently pumps on the order of 8000 acre feet annually from ground water beneath the site. About 2800 acre feet are used

for cooling existing Units 1 and 2 and the remainder is used for irrigation in Edison's agricultural operations. In 1978, new Units 3 and 4 will be in operation and will divert an additional 4000 acre feet annually from agricultural use.

It is estimated that about 500 acre feet of water will be required annually for cooling and other uses such as steam supply makeup water and heliostat washing. This can be supplied by diversion from agricultural use and will not require any new wells or additional pumping from the ground water basin. The quality of ground water is good and suitable for most uses. Demineralization will be required for solar receiver and thermal storage boiler makeup water.

8. Accessibility

Access to the proposed site is considered excellent. Adequate paved roads provide access to the site from both Interstate 40 and Interstate 15 within two and four miles respectively. The nearest large airport located in Ontario is about 80 miles via Interstate highways. The Atchison, Topeka and Santa Fe railroad is adjacent to the site with a spur onto the Edison property, with an unloading area. The Union Pacific railroad connects to the Santa Fe railroad at Daggett, two miles west of the Coolwater site. Additionally, a heliport will be provided on Edison property to round out the means of access.

9. Availability of Support

The Pilot Plant and its supporting facilities will require water (both municipal and agricultural quality), electricity, sewage disposal, and trash disposal.

As discussed under Hydrology, adequate ground water exists at the site for all purposes. It is expected that existing wells will be adequate and pumping rates will not be

increased. Water will be diverted from current Edison agricultural operations.

Electricity is available from existing facilities with a minimum of extensions required within the site.

Sewage disposal in the area is by leach field. A new field will be installed to serve the operating personnel and visitor center.

Trash disposal will be integrated with disposal practices at the existing facilities on the site.

10. Availability of Construction Materials

Based on current experience in developing the Coolwater site, material availability and handling is ideal. Proximity of suppliers depends on the specific item required. Most construction materials are available from Barstow or the San Bernardino area. Concrete and lumber are available in Barstow. Most standard steel components are available from Fontana, about 75 miles from the site. Specialized items of major plant equipment will be shipped to the site by the suppliers.

Material handling at the site will not pose a problem. Truck access to the site is simple, with two Interstate highways within four miles. For items shipped by rail, there is a railroad spur onto the site, which eliminates the need for offloading to trucks at an offsite rail terminal. Handling and storage is simplified because the site topography is almost flat and there is sufficient open land to provide laydown areas.

11. Area

The portion of the Coolwater site being proposed is about 130 acres, 100 acres of which is square in shape as required by the PON. The remaining 30 acres is for the information center, access road, cooling towers, and construction

laydown. Figure II-11 shows the Coolwater site property layout with the proposed Pilot Plant site.

12. Zoning and Land Use Restrictions

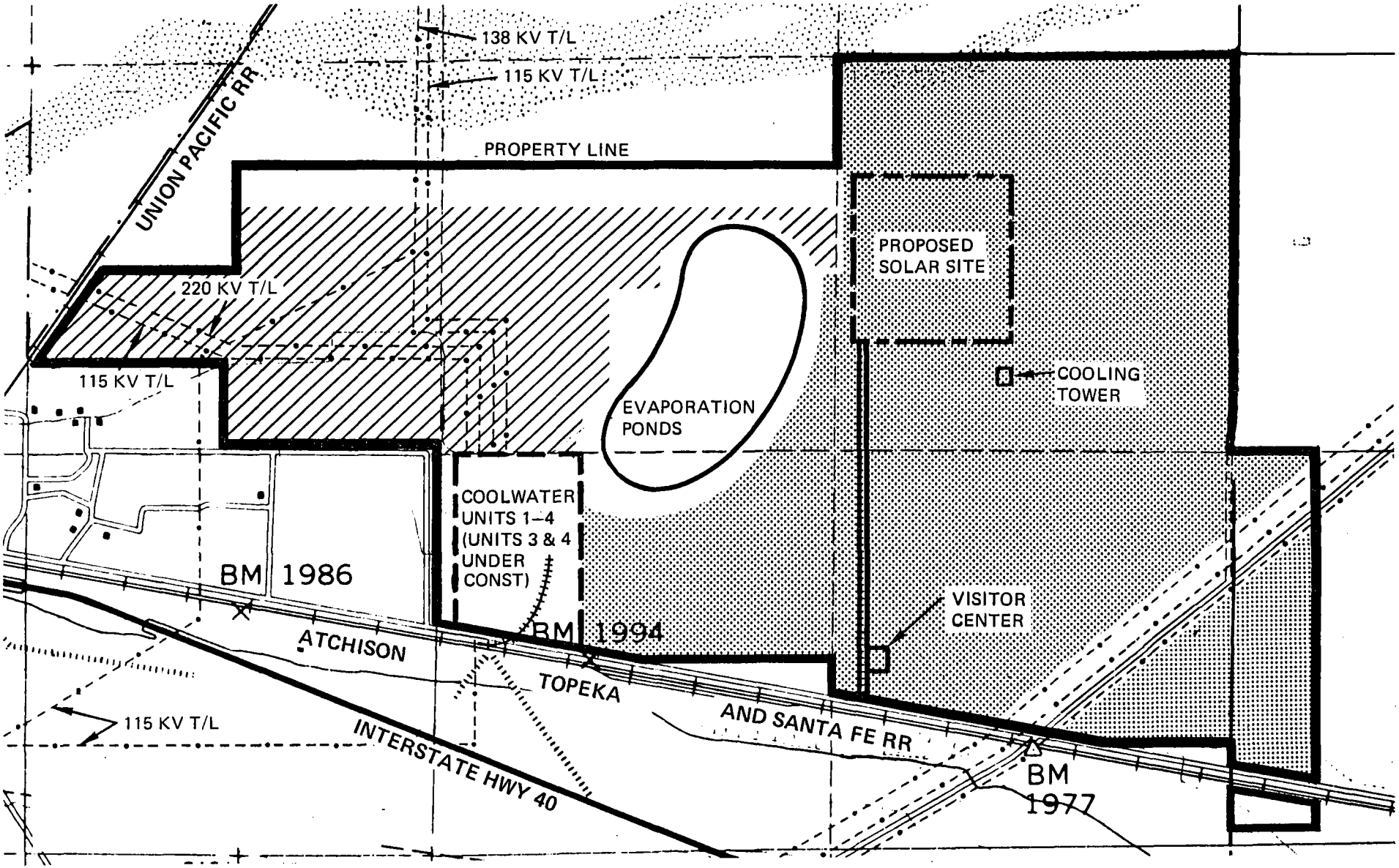
The proposed site is currently zoned by the County of San Bernardino as DL (Desert Living). Accordingly, a zone change will be required. It is expected that such a zone change will be readily issued for a project of this nature because this area has been designated as suitable for energy facility development by the County of San Bernardino. Also, a Federal Aviation Administration variance will be required for the solar receiver tower as a limitation of 150 feet currently exists for structures. Such a variance will also likely be obtained without great difficulty. A height variance was obtained for the 250 foot exhaust stack to be erected for the new fossil units now under construction near the proposed site. Aircraft safety lights will probably be required, though this will likely be the case regardless of where the site is located.

There are no existing or expected restrictions in services such as water use, sewage disposal, or trash disposal which will adversely affect the project.

13. Federal Airways

The proposed site is not within the control zone of any airport though it is quite near the control zone of the Barstow-Daggett airport which is about 2-1/2 miles southeast of the proposed site. This airport is capable of handling most small aircraft.

Areas to the north and northwest of the site are excluded to private planes as these areas are military testing areas. To the southeast is also an additional restricted flight area.



10 MWe SOLAR PILOT PLANT

PROPOSED SITE – PROPERTY LAYOUT

FIGURE II-11

Military flights from Edwards Air Force Base pass in the general area though no interference with low level flights is expected based on normal flight patterns.

Most commercial airlines that fly over the area would be at an elevation in excess of 15,000 feet and the Pilot Plant will have little if any visibility to them. Smaller private planes which fly usually over 10,000 feet elevation will be more likely to see the proposed facility but the visual impact is expected to be minimal.

B. Offeror/Government Participation

This section presents a discussion of

- Proposed commitments of the Program Participants and proposed commitments by ERDA
- A description of how the output from the Pilot Plant will be integrated into the utility electric network
- Plans for transfer of technology gained from design, fabrication, testing and operation to other potential users

1. Program Participants Proposed Participation

The following paragraphs describe the Program Participants' anticipated financial, manpower, and materials and services commitments. These proposed commitments are substantiated by an agreement between the Program Participants which is briefly summarized in Section F of this chapter. The discussion presented in this section expands on material discussed in Sections C and D of Chapter I.

a. Financial

The financial commitment of the Program Participants is indirect in that no funds will be provided to ERDA. The Program Participants propose to provide the non-solar portion of the plant, and other materials and services described later in this section.

b. Manpower

A substantial amount of manpower will be committed by the Program Participants for the design and construction of the non-solar portion, operation of the entire Pilot Plant, and supplemental services. This manpower is included in the above estimated value of the proposed effort. Specific activities which would require commitment of manpower are itemized for each Program Participant below:

(1) Edison proposes to provide manpower for the following services:

- Overall management of Program Participant activities
- Liaison with ERDA for the Program Participants
- Administrative Committee Participation. The Administrative Committee is established by agreement among the Program Participants to provide liaison among them.
- Staff work in obtaining permits
- Preparation of an Environmental Data Statement as input to Federal and State environmental documents
- Design, construction, startup, operation and project management for the non-solar portion of the plant
- Management of total Pilot Plant control systems
- Management of total Pilot Plant startup

Edison proposes to provide either directly or by contract the manpower necessary to carry out these activities.

(2) Los Angeles

Los angeles proposes to provide:

- Administrative Committee participation
- Participation in the preparation of environmental documents and planning work

- Participation in design and construction work
- Completion of a study of the potential use of this technology in conjunction with hydroelectric pumped storage
- An evaluation of the technology as a potential generation resource

It is estimated that with the exception of design and construction manhours this effort will require about 36 man-months. Any design and construction time will be additional, but would partially affect Edison's commitment.

(3) Energy Commission

The Commission proposes to provide:

- Administrative Committee participation
- Information dissemination/technology transfer services
- Funding of certain research activities to be identified during the course of the project
- Development of expertise for evaluating future sites

(4) Others

A substantial amount of interest in this technology has been expressed in California and it is expected that many individuals and groups will constructively participate in its development. While it is not possible to quantify this now it should be pointed out that the advancement of this technology

will be fostered by the support available in California. Additionally, substantial support is expected for this technology throughout the sunbelt.

c. Materials and Services

The Program Participants propose to provide materials and services which, when integrated with ERDA's contribution, should result in a successful Pilot Plant. The Program Participants commitment in this regard is itemized below and the commitment expected from ERDA is discussed in the following section. The numbered items below correspond to and elaborate on the items discussed in Section C of Chapter I. The first seven are specifically required in the PON as a minimum. Items 8 through 13 are offered to enhance the overall program.

(1) Site

Edison will commit 130 acres of a 2,337 acre site it owns near Barstow, California. The site is described in detail in Section II-A.

(2) Steam Turbine and Electrical Network

The turbine generator will be of outdoor construction including all equipment, materials, controls and facilities required to transform the available energy in the steam from the solar portion into electrical energy. This commitment includes design, procurement, construction, start-up and operation of the following non-solar plant elements:

- Turbine generator
- Wet Cooling Towers
- Steam condenser
- Water treatment system
- Civil works and buildings

- Mechanical equipment
- Piping and valves
- Instrumentation and controls
- Electrical equipment
- Engineering/Start-up/Project Management

Because design conditions for the non-solar portion are dependent upon specific design parameters of the solar portion, final design of the turbine generator will be carried out after data is available from the ERDA contractor selected to supply the solar portion.

The output from the Pilot Plant will be fed directly into the Edison system through existing substation facilities at the Coolwater site. The Edison transmission system alone consists of 10,764 miles of AC transmission lines. Additionally, the system is tied into a network which includes Los Angeles and all other California utilities, as well as the entire Pacific Northwest, Nevada, Arizona and New Mexico.

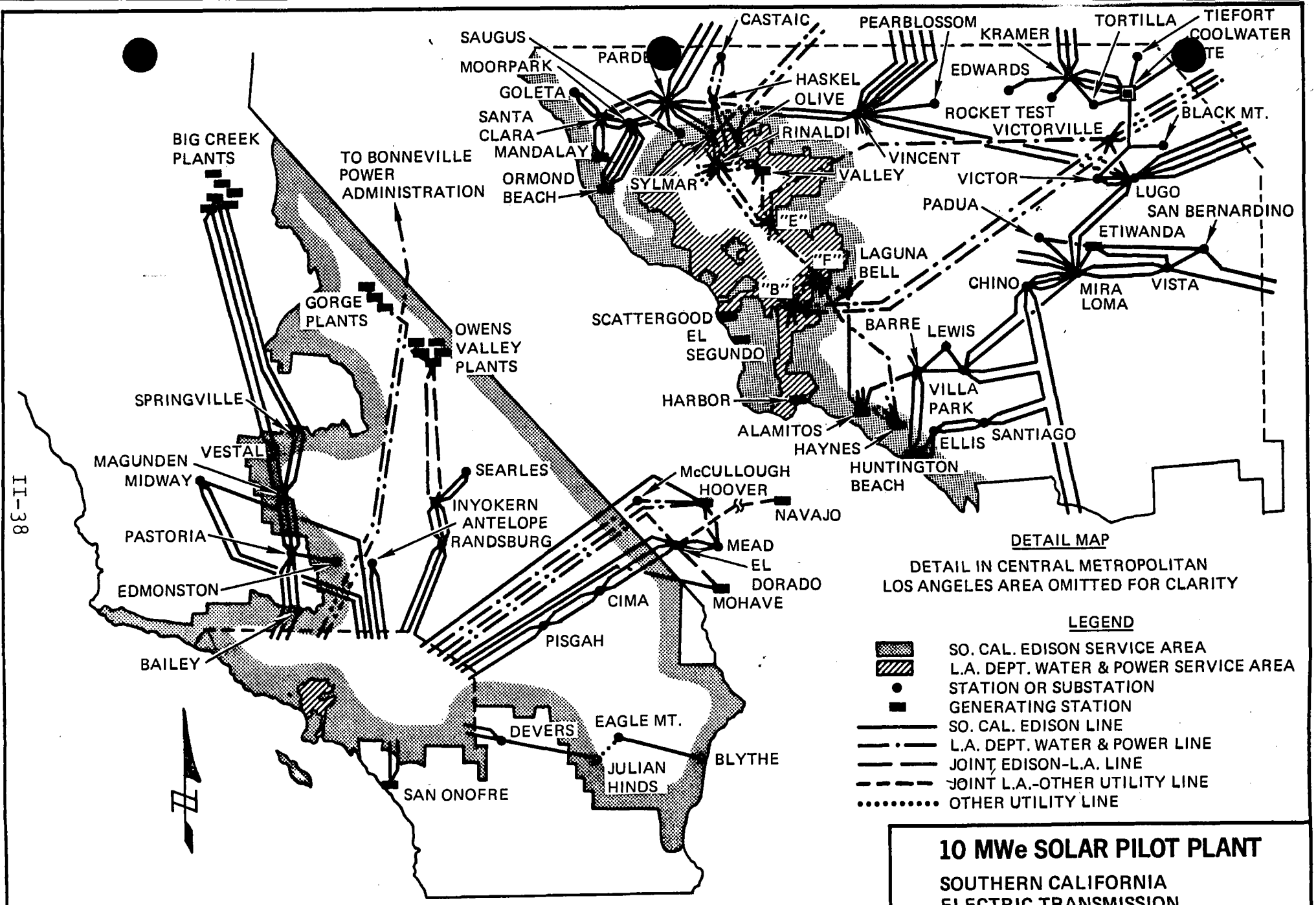
Figure II-12 shows most of the existing Southern California transmission system at 220 kV and above including the connection point for the Pilot Plant at Coolwater.

The Pilot Plant will be connected to the system through modification of an existing 115 kV substation at the Coolwater site.

(3) System Integration and Testing

Output from the Pilot Plant will be synchronized to the system described above and dispatched whenever power is available.

A comprehensive testing program will be developed and carried out in cooperation with ERDA. The Program Participants



10 MWe SOLAR PILOT PLANT

SOUTHERN CALIFORNIA
ELECTRIC TRANSMISSION
SYSTEM

FIGURE II-12

will develop a complete program for the non-solar portion which will include at least the following elements:

- Analyze unique stress on the non-solar components due to the cyclic and possibly fluctuating steam supply
- Determine characteristics of dispatching electrical energy into the distribution network from this type of facility
- Evaluate potential design improvements
- Monitor operating and maintenance costs and characteristics

These elements will be integrated with a solar portion testing program developed by ERDA. Elements which could be considered in an integrated test program include:

- Study reliability of various components individually and as a system
- Evaluate compatibility of solar and conventional plant capabilities
- Evaluate operations in various modes
- Evaluate various maintenance approaches

Operational environmental evaluations will be carried out and will include study of any sensitive issues identified in the preconstruction environmental studies. These evaluations will include at least the following:

- Public acceptance
- Impact on bird populations attracted to evaporation ponds
- Impact on terrestrial populations in adjacent undisturbed lands
- Impact on aircraft operations; both low and high altitude

- Weather monitoring to determine any localized effect on temperature, humidity, or air circulation

The detailed plans for studying these and other later identified factors will be developed prior to plant operation.

(4) Operation and Maintenance

The entire Pilot Plant will be operated and maintained for two to five years following successful startup and acceptance. It is proposed that the costs be shared with ERDA.

(5) Project Reviews and Technological Developments

It is recognized that close cooperation is needed on a project of this nature to assure an integrated team effort. To this end the Program Participants will work with ERDA in regular project reviews and surveillance of project work. The scheduling of reviews is proposed to be negotiated.

Also, because this is a rapidly advancing technology, an up-to-date awareness will be maintained of developments consistent with Edison's past contribution to the Solar Thermal Conversion Program.

(6) Consultation on Solar Concept

Assistance will be provided to ERDA in the selection of a technological concept and equipment to be installed in the solar portion of the plant. This will be a critical element because the solar and non-solar portions must be integrated into

an effective system. Because design data on the solar portion will be required to finalize the turbine design, this effort must be carried out in a timely fashion.

(7) Pilot Plant Operating Procedures

Operating procedures and manuals will be prepared for the non-solar portion of the plant and integrated in a cooperative effort with ERDA into manuals for the entire Pilot Plant.

(8) Supplemental Site Related Services

Several site related services will be provided in support of the overall Pilot Plant effort.

- The entire site will be cleared of vegetation
- Fencing will be constructed around the entire site
- Continuous security and access monitoring will be provided
- An estimated 500 acre feet per year of water will be provided for solar steam supply makeup, heliostat washing, cooling, and general plant uses
- A leach field will be provided for domestic wastes
- Industrial wastes from existing facilities are disposed of in lined evaporation ponds. It is expected that there will be sufficient capacity in existing ponds for Pilot Plant waste water. However, if additional ponds are required, they will be provided
- In order to accomplish integrated site development, all activities at the site will be coordinated by Edison
- To round out the means of site access, a heliport will be provided. Such facilities prove to be an asset at any major construction site

(9) Control System Management and Control Building

In order to assure that the solar and non-solar portions are properly integrated as a system, overall controls management services and a control building will be provided. The Program Participants will provide space in a central control building and will provide non-solar controls. ERDA will be expected to provide controls for the solar portion which are compatible with the non-solar portion controls.

(10) Startup Management

To assure sequential and smooth Pilot Plant startup, overall startup management services will be provided. This is based on the expectation that ERDA will provide manpower and materials for solar portion startup activities.

(11) Permits and Environmental Documents

(a) Permits

As Program Director, Edison will apply for major permits required for the project. Permit requirements for the Pilot Plant will be much simpler than for a major generation plant. Because the Pilot Plant size will be less than 50 MW, a site certification from the new State Energy Commission will not be required. For this same reason, a California Public Utility Commission Certificate of Convenience and Necessity will not be required.

The major permitting agency for the Pilot Plant will be the County of San Bernardino. Preliminary indications are that county permits will include the following.

- Zone change from DL (Desert Living)
- Grading and building permits

- Sanitation
- Fire protection review

Additional permits possibly required from other agencies include:

- Federal Aviation Administrative height variance for the receiver tower
- California Occupational Safety and Health Administration Permit for certain construction activities
- State Department of Industrial Relations, Division of Industrial Safety permit for the pressure vessels.

The above list is based on a preliminary evaluation but is believed to be representative of the scope of permits required.

(b) Environmental Documents

An Environmental Data Statement will be prepared providing information on the site and non-solar portion of the plant for those who must prepare environmental documents. An Environmental Impact Statement will be prepared to meet National Environmental Policy Act requirements and an Environmental Impact Report will be prepared to meet California Environmental Quality Act requirements.

The Environmental Impact Statement under NEPA will include the following major sections:

1. Description of Proposed Action
2. Probable Impact of the Proposed Action on the Environment
3. Probable Adverse Environmental Effects Which Cannot be Avoided
4. Alternatives to the Proposed Action

5. The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

6. Any irreversible and Irretrievable Commitments of Resources that would be Involved in the Proposed Action Should it be Implemented

To satisfy California Environmental Quality Act requirements the Environmental Impact Report must include the above sections with the addition of the following two items:

1. Mitigation Measures to Minimize Impact

2. The Growth Inducing Impact of the Proposed Action

Included in the sections of these reports will be an in-depth evaluation of all the criteria used in evaluating sites for this proposal.

The County of San Bernardino has the greatest local government responsibility for permitting of the project and will prepare the California Environmental Impact Report.

(12) Solar Data Base

As discussed in detail in Section A of this Chapter, Edison is currently developing a solar data base for Southern California. This effort will provide highly accurate and detailed solar radiation data especially suited to the Pilot Plant design. Data of comparable quality and suitability are not believed to be available for sites in other states.

(13) Public Information/Technology Transfer

The Program Participants' complete plans for public information and technology transfer is discussed in Section H of

this chapter. The planned three phase program is briefly described as follows:

(a) Public Information

An important element of overall program success is public exposure to the Pilot Plant. As part of this, an information center on the site is deemed essential. The size and architecture of the building and the type of material contained is proposed to be jointly decided by the Program Participants and ERDA.

(b) Technology Transfer Through the Electric Power Research Institute

At the initiation of Edison and other utilities, the Electric Power Research Institute is setting aside funding to provide for Pilot Plant evaluation data to be analyzed and disseminated among interested utilities.

(c) Information Dissemination and Technology Transfer Through the Energy Commission

The Energy Commission will establish an information dissemination program and technology transfer processes which will speed the deployment of solar thermal generation in California and provide ERDA with reports on its activities which will enable the Federal Government to transfer the learning which has taken place in California to other States. To accomplish these goals the Commission will:

- Appoint a broadly-based Task Force of potential users of solar thermal technology, interested public agencies, public interest groups and technical experts which will serve as a focus for discussing issues which arise during the course of the Project, help resolve

problems related to the technology, identify research needs, and act as an independent evaluation group for the Commission's work

- Establish with ERDA, an Interstate Coordination Council on Solar Thermal Technology which will serve as a focus for transferring the experience gained in this project to other states
- Examine the mandated regulatory procedures in power plant siting and certification and in energy conservation to determine how these processes should be used to help speed the implementation of solar thermal technology
- Determine how solar thermal technology can best be used in California's mix of energy generation methods
- Formulate components of an implementation methodology for solar thermal technology appropriate to the Commissions role in the state's energy future. This plan will form the basis of a report to ERDA
- Evaluate the changes in Commission procedures recommended in the implementation methodology and provide ERDA with a report on the problems encountered and solutions arrived at in this process.
- Establish a communications network of interested groups and individuals within California and regionally to receive regular reports on the progress of the project
- Establish a Library of information about solar thermal technology in general and about on-going work of the Project in particular
- Provide ERDA with a report identifying the processes believed necessary to establish solar thermal technology on a widespread basis

PROPOSED PARTICIPATION

- Identify institutional barriers which could slow down the adoption of this technology and to make recommendations for solving these problems
- Identify potential non-utility users of solar thermal technology and examine the implications for the electricity network of various levels of off-system power generation
- Provide ERDA with a report on the establishment of an institutional support network for solar thermal technology in California
- Provide ERDA with annual reports on all of the Commissions activities related to this project.

2. Proposed ERDA Participation

It is proposed that ERDA provide the following toward a completed Pilot Plant effort.

a. Solar Portion of Plant

ERDA will be expected to provide materials and services necessary to complete and start up the solar portion, except controls management and startup management, and including the following.

- Complete heliostat field including provision of a means to collect heliostat wash water to prevent ground water contamination
- Complete receiver
- Complete thermal storage system
- All solar controls in a manner which is integrated with conventional plant controls. This effort is proposed to be managed by the Program Participants
- Start-up activities for the solar portion. This effort is proposed to be managed by the Program Participants

b. Public Information Building

Public exposure to the Pilot Plant is considered to be a key element in program success. An information center on the site is deemed essential for this purpose. The size and architecture of the building and the type of material contained is proposed to be jointly decided by the Program Participants and ERDA.

c. Federal Permits

It is expected that ERDA will provide assistance if requested by the Program Participants for obtaining Federal permits required for the Pilot Plant. It is expected that a Federal Aviation Administration height variance will be required for the solar receiver. This is the only Federal permit that has been identified so far in the preliminary evaluation.

d. Federal Environmental Impact Statement

With inputs from the Program Participants on the site and non-solar portion of the plant, it is expected that ERDA will prepare the Environmental Impact Statement required by the National Environmental Policy Act.

e. California State Environmental Impact Report

The California Environmental Quality Act requires preparation of an Environmental Impact Report before State and local permits can be issued and before Los Angeles as a public agency can financially commit to participate in the project. The County of San Bernardino has the greatest local government responsibility for permitting of the project and will be the lead agency in preparing this document. The document will be prepared with major input from the Program Participants on the site and non-solar portion of the plant.

It will be necessary for ERDA to provide information for the EIR in a timely manner on the solar portion of the plant.

f. Special Testing

The Program Participants will cooperate with ERDA in the development of a testing and evaluation program. ERDA will be expected to pay for testing of the solar portion of the plant. The Program Participants will operate the plant for such testing and conduct testing of the non-solar portion.

g. California Property Tax

It is possible that Edison, as operators of the Pilot Plant could be assessed by the California State Board of Equalization as holding possessory interest to the entire Pilot Plant. It is proposed that if such an assessment were to occur, ERDA reimburse Edison. It is further proposed that ERDA reimburse Edison for any tax assessed against the solar portion provided by ERDA.

A formal opinion has been requested from the State Board of Equalization relative to the type of assessment to be expected, if any, considering the research nature of this project.

3. Integration into Utility Network

The PON requested a discussion of plans for integrating energy generated into the utility network in this section. This material is covered in Section B.1.c.(2) of this Chapter.

4. Technology Transfer

The PON requested a discussion in this section of the Program Participants' plans for transferring the technology gained through the design, construction and operation of the Pilot Plant to other potential users. This material is covered in Section H of this chapter where plans for all levels of information dissemination and technology transfer are described in detail.

C. Schedule

This section presents a discussion of the timing of proposed activities as it relates to ERDA's milestone dates shown in the PON. The following schedule features are discussed:

- Overall schedule
- Design and construction
- Start-up and operation
- Test and evaluation
- Public information and technology transfer

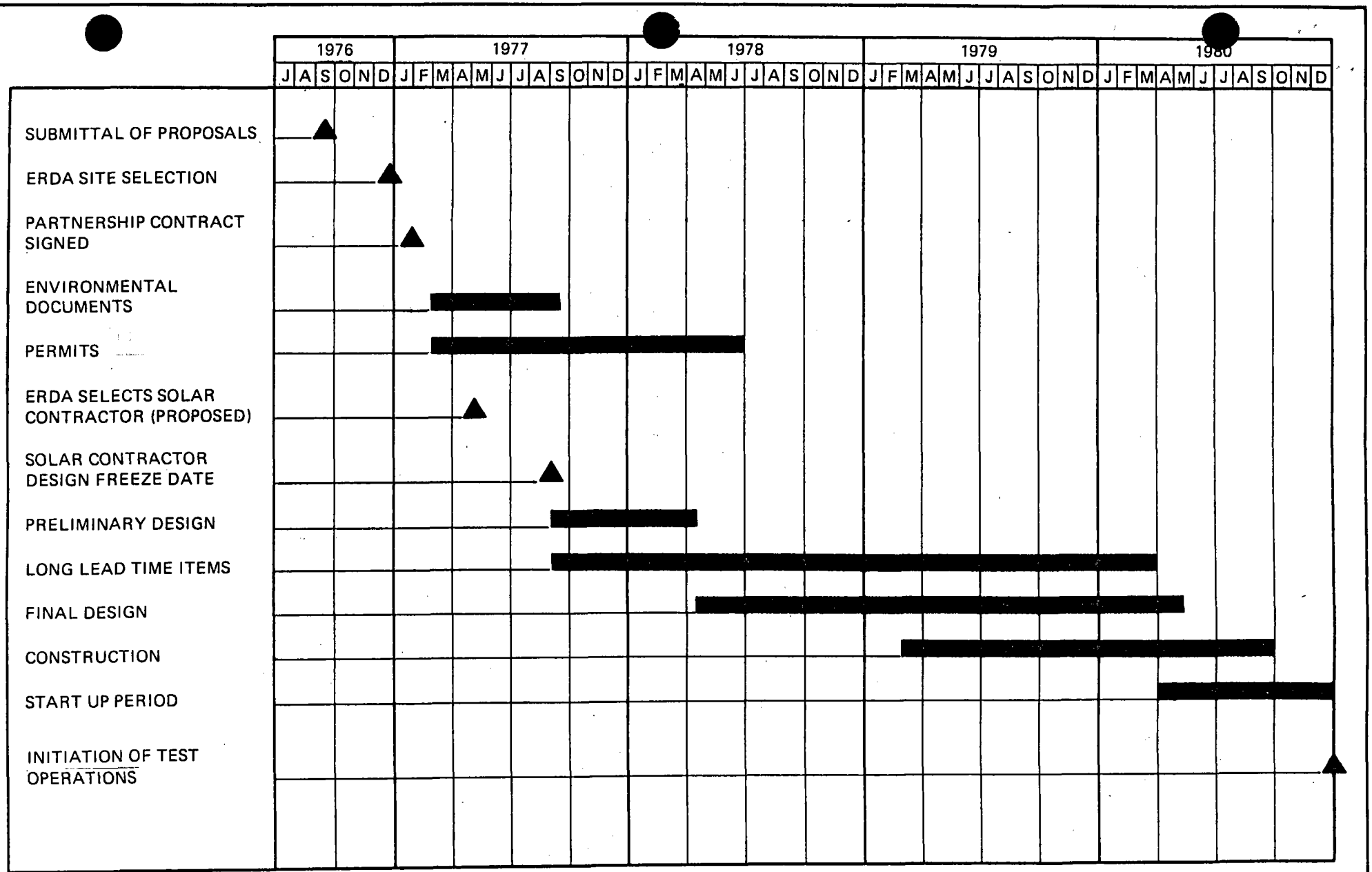
1. Overall Schedule

An overall schedule has been prepared for the proposed effort and is included in Figure II-13.

Generally it appears that the schedule for the non-solar portion of the plant will readily fit within most ERDA milestone dates. However, there are two aspects of the schedule which should be given particular attention. These are the environmental documentation phase and the finalization of interface conditions (design freeze) between the solar and non-solar portions of the plant. Both are closely related to the date planned for selection of a Phase II architect-engineer by ERDA. The following discussion supports the Program Participants' proposal that the Phase II architect-engineer be selected on May 1, 1977 rather than mid-July, 1977 and that ERDA should prepare a detailed schedule of early activities.

a. Environmental Documents

A period of 2-1/2 months is shown in the PON for "Environmental Impact Assessment". It is assumed that this refers to preparation of an Environmental Impact Statement (EIS) by ERDA. The 2-1/2 months indicated is considered insufficient



10 MWe SOLAR PILOT PLANT

PROPOSED PROGRAM SCHEDULE

FIGURE II-13

for this effort. Also, the Environmental Impact Report (EIR) required for California cannot be prepared in such a short time.

To clarify this point it is proposed that ERDA develop a more detailed schedule for early activities. In this regard, evaluation of activities on the non-solar portion of the plant and site construction schedules for the entire Pilot Plant indicate that the California EIR is needed in certified form by September 15, 1977. Based on a partnership contract being initiated in February 1977, it is judged that work on site specific environmental documents could begin on March 1, 1977. Assuming environmental documents are prepared between March and September, it will be necessary for ERDA to determine which solar concept will be used in early May 1977, so the documents will accurately reflect the solar components to be used. This will probably require ERDA selection of a Phase II architect-engineer by May 1, 1977 rather than mid-July as shown in the PON.

It is recommended that ERDA evaluate early activities and establish a date when environmental documents must be completed to allow procurement and other activities on the solar portion of the plant. The Program Participants will cooperate with ERDA in such an evaluation.

b. Solar/Non-Solar Portion Interfaces

The most critical element in initiating preliminary engineering and design activities for the non-solar portion is determination of precise interface conditions between the solar and non-solar portions.

Final design and procurement of long lead time items necessitates that the interface conditions be identified and established early. Accordingly, it is proposed that a "freeze"

date be established after which design conditions should not be significantly changed. Such an approach is deemed necessary to minimize engineering rework and manufacture interruptions which can adversely affect the project completion. Based on an analysis of non-solar design and procurement activities, September 1, 1977 is proposed as an acceptable "freeze" date. In order to establish design parameters by this date it will be necessary to select the Phase II architect-engineer several months early on May 1, 1977 rather than mid-July, 1977.

2. Design and Construction

The date that has been established for initiation of test operations of the Pilot Plant is December 31, 1980. Because of the long lead times of certain critical items of major equipment as discussed below, it is necessary that preliminary design, including the development of operating parameters and procurement activities for these long lead items, commence on September 1, 1977.

An evaluation of lead times for major equipment revealed that the two items of major non-solar equipment with the largest time span between initial preliminary design activities and completion of erection, are the turbine-generator and the feedwater heaters. The activities involved in establishing this time span are:

- Preliminary design to establish the operating parameters of the equipment
- Preparation of the equipment specification
- Vendor bidding period
- Evaluation of proposals and award
- Vendor design, fabrication and delivery
- Erection

The equipment schedule shown in Figure II-14 for major long lead times shows the overall time span for the turbine-generator and the feedwater heaters to be thirty months. These lead times establish the date for ERDA approval to proceed with preliminary design as September 1, 1977.

Final design should begin April 1, 1978. This activity will encompass a two-year period, and will include procurement of the balance of the non-solar portion equipment and material.

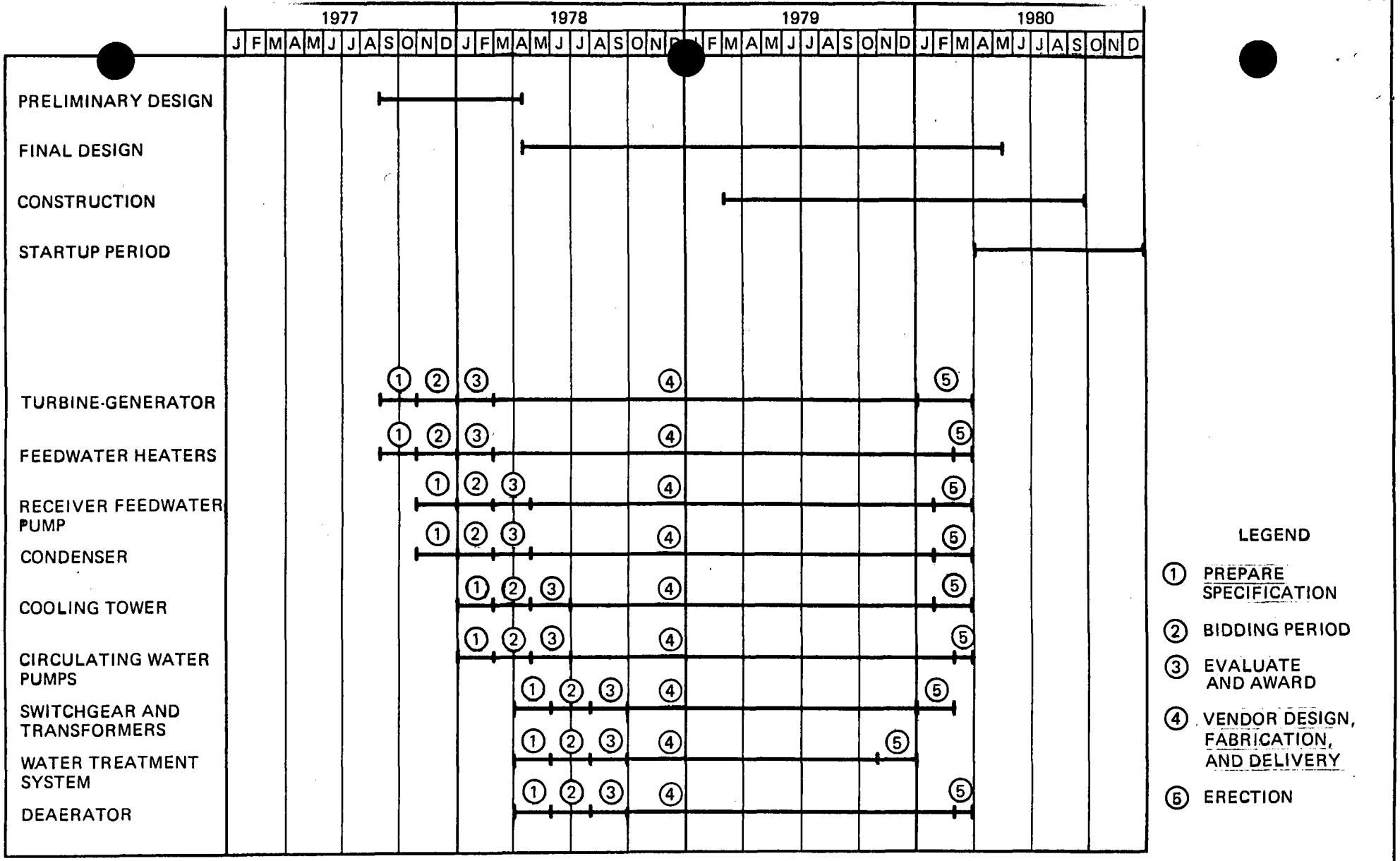
It is expected that all required permits can be obtained prior to initiation of construction on the solar portion scheduled by ERDA to begin July 1, 1978. Construction on the non-solar portion will begin March 1, 1979 and total Pilot Plant construction is expected to be complete by October 1980.

3. Startup and Operation

Overall facility checkout and startup is scheduled for the period between April, 1980 and December, 1980 with the test and evaluation period planned to begin at the end of December 1980.

At a point six months prior to the end of the construction period and nine months prior to the total plant being operational, the critical systems and equipment will be cleaned, checked out and started up. All activities for the non-solar portion will be intimately coordinated with similar activities for the solar portion, so that at the end of the first three months of the startup period for the non-solar portion, the Pilot Plant will be ready for initial startup as a unit. At the point of initial startup on July 1, 1980, the turbine will be rolled for the first time utilizing the available energy in steam generated by the collection of solar thermal energy.

Following initial startup of the Pilot Plant as a unit, the checkout period will encompass six months, during



10 MWe SOLAR PILOT PLANT

NON-SOLAR PLANT PORTION
EQUIPMENT PROCUREMENT
SCHEDULE

FIGURE II-14

which time any necessary adjustments and/or alterations will be made to provide for safe and dependable operation. About midway through the checkout period, the generator electrical power output will be synchronized to the Program Participants' transmission system for the first time. The six-month initial operating period will culminate in initiation of the test and evaluation period of the Pilot Plant on December 31, 1980. By definition, this date will be the start of a two to five-year period of test and evaluation to determine the technical and economic feasibility of generating electrical power from solar thermal energy.

4. Test and Evaluation

A detailed Pilot Plant test plan will be developed beginning in June 1979. Based on the detailed plan, the two year evaluation period will begin on January 1, 1981, after the plant becomes operational.

5. Public Information/Technology Transfer

a. Publicity Schedule:

Ample opportunities to publicize the Pilot Plant are available. News releases will be prepared by the Program Participants in coordination with ERDA to cover the following:

(1) Awarding of the contract to the Program Participants

(2) Major Construction Milestones, i.e., delivery of heliostats to the site and construction and completion of the power tower

(3) Completion of construction and successful startup, including appropriate coverage of ceremonies attendant to completion of the project

(4) Periodic releases will be made as appropriate on the specific research work being carried out

Press packets and brochures will be prepared highlighting the solar project. In addition to making these available to the regular communications media, they will also be offered to tourist bureaus and the Southern California Visitors Council.

b. Energy Commission Schedule

Table II-6 presents a detailed schedule of technology transfer activities planned by the Commission.

Table II-6

Schedule of Energy Commission Activities

Activity	Performed By	Start	End	ERDA Deliverable
Task Force Operations	Task Force R&D Division Staff	5/77	1/84	
Interstate Coordination Council Operations	Council R&D Division Staff	10/77	1/84	
Identify Siting Issues	Task Force R&D Division Staff Other Divisions	5/77	1/78	
Document Solar Thermal Siting Process	R&D Division Staff Agencies Involved	1/77	1/78	
Study Effects of Centralized Solar on Energy Mix for the State	R&D Division Task Force Consultants	1/78	1/84	
Report on Components of Implementation Methodology	R&D Division Other Divisions Consultants	1/78	6/78	1/80
Problems in Commission Regulatory Processes Which Could Hinder Implementation	Advisory Committee	1/78	1/79	
Study Impact Assessment Improvements	R&D Division Staff Task Force Agencies Involved	6/78	6/80	

Table II-6 continued

Schedule of Energy Commission Activities

Activity	Performed By	Start	End	ERDA Deliverable
Examine Generic Changes in Energy Commission Procedures to Accommodate Solar Plants	R&D Division Staff Other Divisions Staff	1/80	1/83	
Report on Problems Encountered and Developed in Adopting Commission Regulatory Procedures to Solar-Thermal Technology	R&D Division Other Divisions Task Force Consultants	6/81	1/82	1/83
Establish Communications Network of Interested Groups and Individuals	R&D Division	2/77	1/84	
Establish Library of Information about Solar-Thermal Technology	R&D Division	2/77	1/84	
Formulate Research Needs of Potential Users and Regulators	Task Force	6/77	1/84	
Report on Process for Establishing Credibility of this Technology	R&D Division Consultants	1/78	6/82	6/83

Table II-6 continued

Schedule of Energy Commission Activities

Activity	Performed By	Start	End	ERDA Deliverable
Examine Changes in Public Agency Regulatory Processes	R&D Division Task Forces	6/81	1/84	
Identify Potential Non-Utility Uses	R&D Division Task Force Consultants	6/79	1/84	
Formulate Report on Necessary Institutional Changes	R&D Division Task Force Consultants	1/82	1/83	1/84

D. Organization and Management

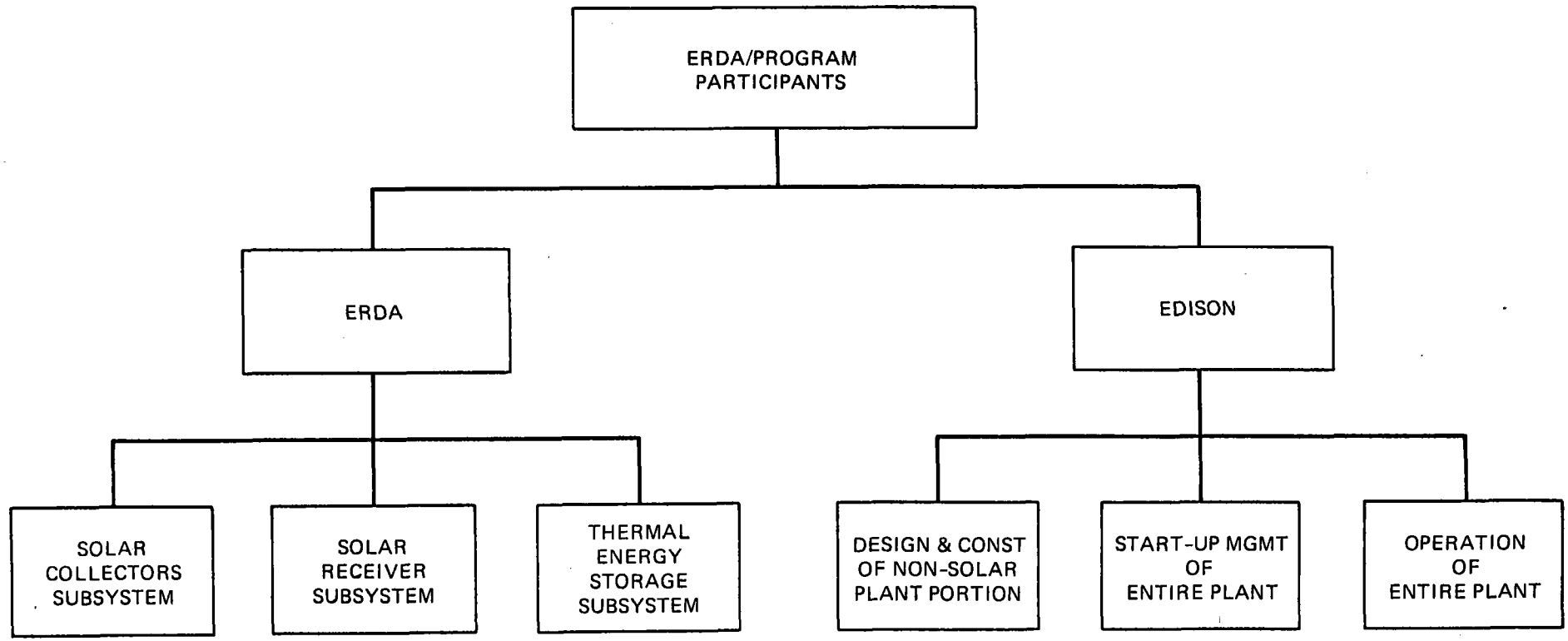
This section provides a discussion of the Program Participants' general capabilities to carry out the project. Included is a discussion of:

- Description of the planned organization
- Qualifications of key personnel
- Description of work plan
- Capabilities in constructing and operating power systems

1. Program Organization

There are basically three levels of organization in which the Program Participants plan to participate in the Pilot Plant. The first is an overall organization designed to direct all efforts leading to successful completion of the entire effort. Edison, having overall program management responsibility for the Program Participants will establish a Program Director who will act as the liaison between ERDA and the Program Participants. Figure II-15 presents the proposed organization with ERDA and the Program Participants directing the program. Under the general coordination of this partnership ERDA would manage the solar subsystems and Edison would manage the activities offered in this Proposal.

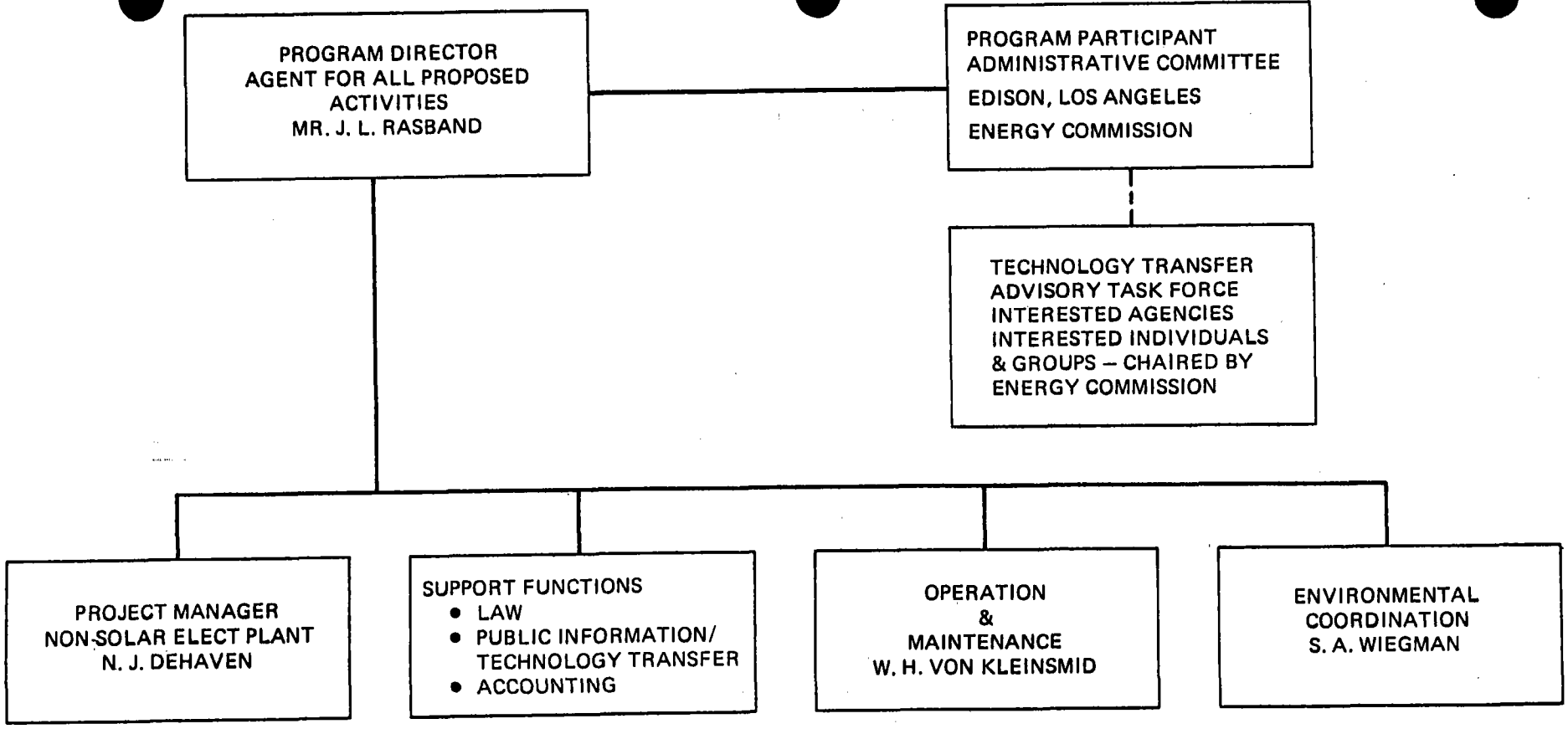
The second level of organization is among the Program Participants for completion of the overall activities planned to be carried out by the Program Participants. Figure II-16 is a diagram of the proposed organization. Edison, through Mr. J. Lynn Rasband, is the Program Director and will coordinate all proposed activities. On matters related to



10 MWe SOLAR PILOT PLANT

PROPOSED OVERALL PILOT PLANT PROGRAM MANAGEMENT ORGANIZATION

FIGURE II-15



10 MWe SOLAR PILOT PLANT

PROPOSED PROGRAM
PARTICIPANT ORGANIZATION

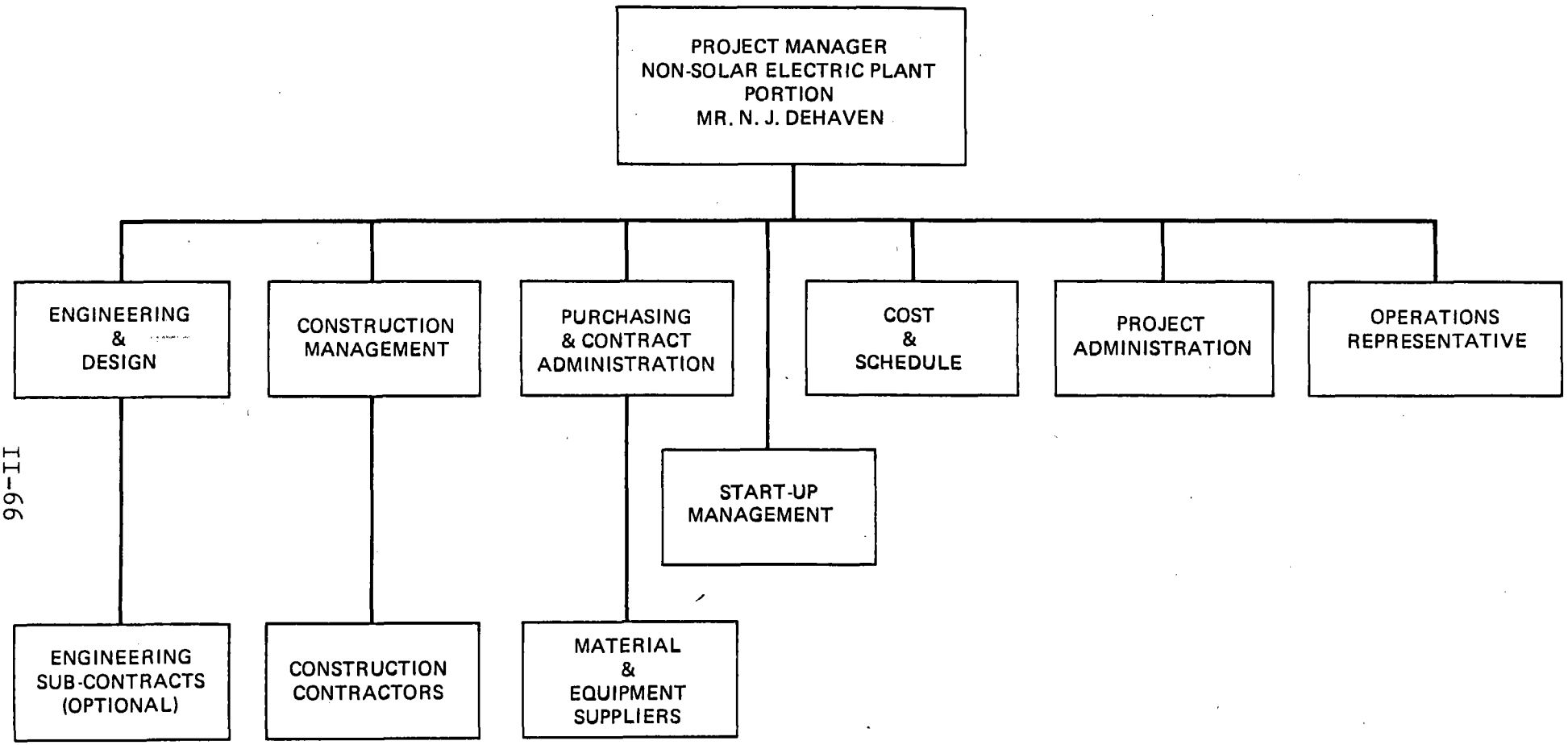
FIGURE II-16

cost, schedule, and operations the Program Director will receive input from an Administrative Committee consisting of representatives from Edison, Los Angeles, and the Commission. Reporting to the Program Director for specific activities will be Mr. N. J. DeHaven, Project Manager who will be responsible for the cost and schedule for the non-solar plant portion engineering, design and construction, Mr. W. H. von Kleinsmid as an operations advisor, and Mr. S. A. Wiegman, an Environmental Engineer to coordinate environmental studies, and various support functions as noted on the figure.

A technology transfer task force will be established by the Energy Commission to bring together potential users, regulators, and special interest groups as a forum for discussing and disseminating information. This group will perform an advisory function to the Administrative Committee.

The third level of organization is the project management structure leading to completion of the non-solar plant portion. Mr. N. J. DeHaven from the Edison Project Management Organization has been designated as Project Manager for this activity. He is currently serving as Project Manager for construction of two new generating units at the Coolwater site. His planned organization is as shown in Figure II-17. This organization is based on the Project Management concept which is one of the key organizational controls to be used. Edison intends to utilize its Project Management Organization including its cost and schedule tools developed on larger projects to manage the design and construction of the non-solar electric plant.

The Energy Commission has established a supplemental organization to carry out its activities on this project as



II-66

10 MWe SOLAR PILOT PLANT

NON-SOLAR PLANT PORTION
PROJECT MANAGEMENT
ORGANIZATION

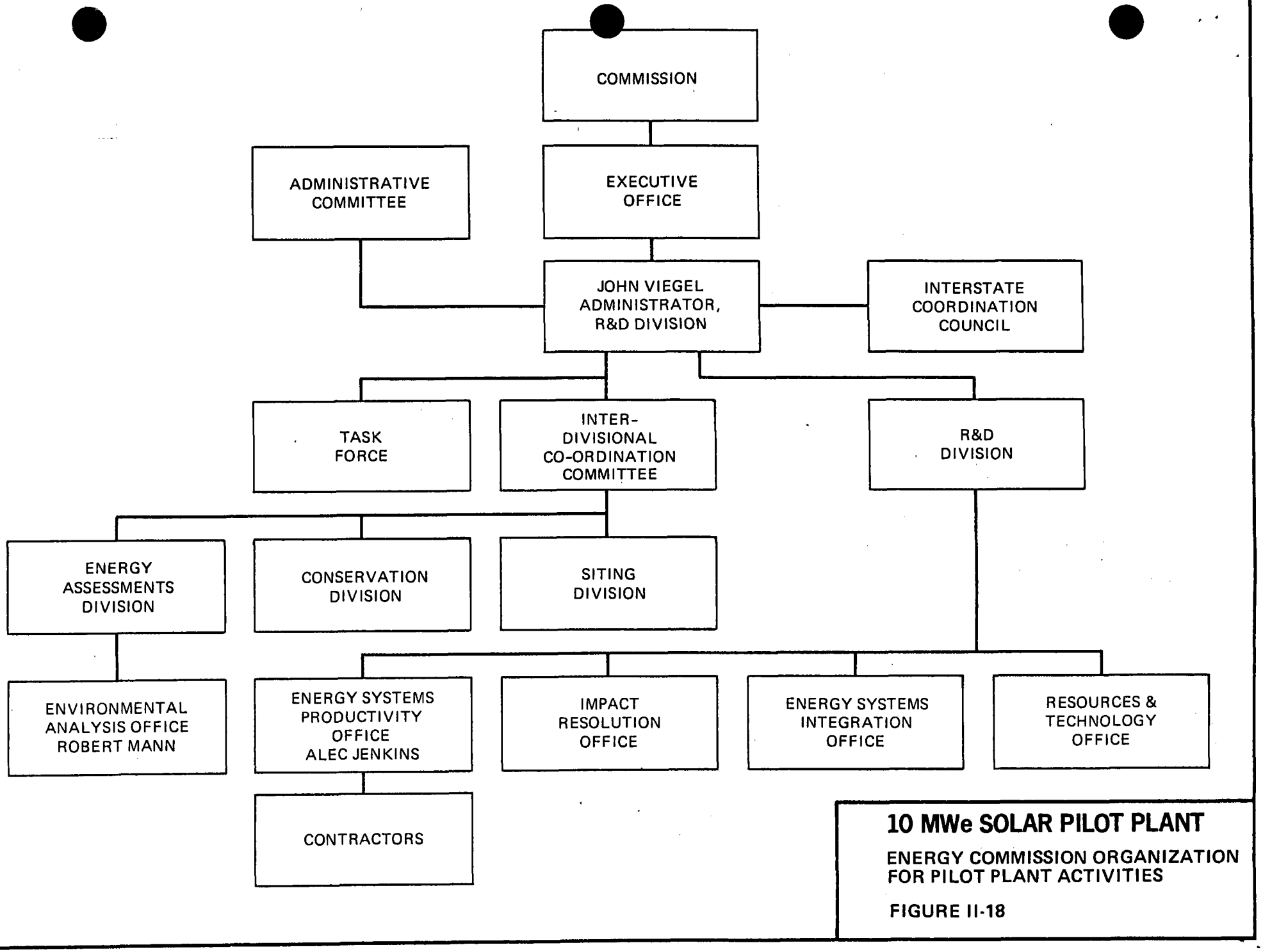
FIGURE II-17

shown on Figure II-18. The Commission's Administrator of the Research and Development Division, Dr. Jon M. Veigel, will be the overall manager for the Commission's portion of this Project and will be its representative on the Program Participant Administrative Committee. Mr. Alexander Jenkins will be the Office Manager in charge of work within the Division. Mr. Robert Mann, Office Manager, from the Energy Assessments Division will manage the Commission work in impact assessment Review.

The Commission itself will make the final determination on expenditures of money for Commission contracted services based on the recommendations of the Research and Development Division, the Executive Office, and the Fiscal Office.

2. Personnel Qualifications

The combined expertise of the Program Participants is more than adequate to assure a successful program with the pilot plant. The staff of Edison has very successfully developed a system serving one of the nation's largest electric load centers. The staff of the Los Angeles Department of Water and Power has successfully developed the largest municipal utility in the nation. Finally, the Energy Commission R&D Division staff includes people with training and experience in biology, geology, chemistry, engineering, physics, sociology, public policy and planning.



10 MWe SOLAR PILOT PLANT

ENERGY COMMISSION ORGANIZATION FOR PILOT PLANT ACTIVITIES

FIGURE II-18

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(Personnel Information)

a. Personnel Substitution

As requested in the PON, if any substitution of key personnel is planned after acceptance of this proposal, the Program Participants will seek ERDA concurrence before implementing such changes.

3. Proposed Work Plan

The general work plan described in this section is intended to result in successful implementation of proposed participation and integration with ERDA activities.

a. Work Flow and Controls

A project of this complexity requires the development of organized procedures under which the work is conducted and the installation of proper controls on that work. The Project Management concept briefly described previously will be the structure through which all work flows. Work on this project will be broken down into elements to achieve identity and control. Major task elements include:

- Post site selection activities
- Design and construction - non-solar plant portion
- Start up and operation, test and evaluation

All of these task elements will be under the direction of the Program Director as shown previously on Figure II-16. Specific work control mechanisms to be used in designing and constructing the non-solar electric plant are discussed under that activity later in this section.

b. Specific Activities

(1) Post-Site Selection Activities

After the proposed site has been selected by ERDA, the Program Participants plan to undertake certain background activities prior to initiating the design of the non-solar electric plant. The purpose of these activities will be to assist in plant licensing, and form a basis for subsequent design, construction and operation activities.

(a) Permits

As Program Director, Edison will undertake to obtain major permits required for this project. Permit requirements for the Pilot Plant are much more simple than for a major generation plant as discussed in Section B of this Chapter.

Applications for all needed permits will be filed with the appropriate agencies and staff liaison will be carried out during permit processing. The Program Director will be responsive to the agencies in a manner which will minimize or eliminate delays in normal processing times.

(b) Environmental Documents

As discussed in Section B of this chapter it is expected that an Environmental Impact Statement will be required of ERDA under the National Environment Policy Act and an Environmental Impact Report will be required under the California Environmental Quality Act.

The Program Participants will prepare an Environmental Data Statement as input to those agency prepared documents. The Data Statement will provide information on the site and non-solar portion of the plant in a manner compatible with the needs of the agencies.

(c) Preliminary Design Studies

The objective of these studies will be to optimize the economics of the non-solar electric plant subsystem equipment prior to engaging in plant preliminary and final design activities. The following studies are representative of those optimization studies that will be conducted.

The effect of plant lifetime on capital cost of the Pilot Plant is unknown at this time. A study will be undertaken to determine if significant savings in capital cost will result with a 10 year plant design lifetime as opposed to a conventional 30 year utility plant lifetime. The capital cost savings with the 10 year lifetime will be compared to additional savings in displaced fuel associated with a 30 year solar plant lifetime. This economic study will be limited to the non-solar electric plant subsystem. However, the analysis could be extended to the entire pilot plant should ERDA desire to participate.

A study will also be undertaken to determine the optimum turbine capacity for the Pilot Plant. The cost associated with a larger turbine-generator will be compared with the value of increased capacity and energy which could be made available from the Pilot Plant. Consideration will be given to the value of capacity as a function of time of day and season. Close liaison will be maintained with ERDA design contractors in order to account for the effects of different turbine sizes on the heliostat, receiver and thermal storage subsystem costs.

Additional trade-off studies will be performed on non-solar electric plant equipment. For example; the optimum number and size for receiver feed water pumps will be determined based on the need for a reliable supply of receiver feed water and the cost associated with increased levels of reliability. Certain preliminary design data will also be necessary to support the preparation of environmental documents for the power plant project.

(d) Solar Data Base Development

Work will continue on the solar data base program described in Section A-1 of this chapter. Data will be supplied to solar subsystem designers for use in optimizing design.

(2) Design and Construction - Non-Solar Plant Portion

The engineering and construction of the non-solar plant portion will be accomplished through an Edison Project Team, which will provide support to the Program Director, in a manner similar to that of an engineering and construction contractor. The Project Team will be under the direction of the Project Manager, who will report to the Program Director and will have the responsibility for the cost, schedule and quality of the non-solar plant portion.

The Project Manager will also have the authority to enlist the assistance of other Edison Departments, other Participants, and outside firms as necessary for the execution of the engineering and construction role.

The basic plan for the engineering and construction is as follows:

(a) Design Approach

Design will be conducted by Edison utilizing the Engineering Design Organization of the Engineering and Construction Department. At Edison discretion, certain portions of the engineering may be contracted to one of the other Program Participants or an outside firm.

A Project Engineer who will report to the Project Manager will be selected to manage the engineering. The engineering will include but not be limited to:

- Non-solar plant portion layout
- Design criteria

- Piping and instrument diagrams
- Electrical one-line diagrams
- Logic diagrams
- Detailed engineering drawings
- Electric cable schedules
- Material take-offs
- Engineering studies
- Specification preparation
- Equipment bid evaluation and system descriptions
- Startup and testing

The engineering work will be broken down into discrete work packages such as foundations, equipment, piping, electrical, etc. A discipline engineer will be assigned to each work package and will be responsible for its engineering and design for each work package. This package concept will be carried through the entire design phase of the project, culminating in a scope of work that can be awarded to a construction contractor. This package concept has proven successful on several Edison projects such as the current Coolwater expansion project.

(b) Construction Approach

The non-solar portion construction will be supervised by the Edison Construction Organization of the Engineering and Construction Department. A project Construction Superintendent will be selected to manage all of the construction activities and will report to the Project Manager. This will include but not be limited to onsite construction management of the various "work package" contractors, field office administration, contract administration, and labor relations. Edison will provide all temporary jobsite construction office facilities for the

non-solar plant portion construction as well as appropriate site security for the total Pilot Plant construction jobsite.

(c) Cost and Schedule Approach

The cost and schedule control system will be supervised by the Cost and Schedule Organization of Edison's Engineering and Construction Department. A project cost and schedule engineer will be selected to supervise all cost and schedule activities and will report to the Project Manager. Cost and schedule control techniques developed at Edison to assist in the management of large and complex projects such as major power generation facilities will be used for the proposed effort. Cost and schedule activities will include:

- Work Breakdown Structure

  The framework for the non-solar portion cost and schedule system will be the Work Breakdown Structure (WBS). The WBS is a cost and schedule system tool that displays the division of equipment, services, and other work tasks and organizes, defines, and displays the project product, as well as the work to be accomplished for the project effort. At a designated level in the WBS, each element is identified with a scope of work, budget, schedule, and work plan. The accumulation of the WBS elements represents the project scope with the corresponding estimate or budget.

- Work Packages

  A key ingredient of the non-solar portion cost and schedule system will be the work package. A work package is an element, or combination of elements of the WBS. Each work package has a defined scope, budget, schedule, task prerequisites, equipment list,

bulk quantities, responsible engineer, and work plan. A base estimate for each work package will be developed during preliminary design. This estimate will serve as the base for design evolution and "cost trending" and will be structured so that each work package can be closely monitored and performance analyses provided throughout the design phase of the project.

- Trend Program

  The cost and schedule trending program will be initiated after establishment of the base estimate. This program is established in the early engineering phase because design decisions have a far-reaching effect on project cost and schedule. All major design decisions will be evaluated and their effect on project cost and schedule analyzed. This provides the Project Manager and other project team members with updated cost and schedule visibility and allows decisions to be made with economics as a consideration. Trend reports will be published on a monthly basis showing the effects on the base estimate and base schedule of design decisions made since the establishment of the base estimate and schedule. During the procurement and construction phase of the project, the trend program will incorporate economic considerations and evaluations of the actions taken in these two areas.

- Scheduling

  A schedule monitoring effort will be maintained throughout the life of the project. Included in this effort will be Critical Path Method (CPM), or similar, scheduling of engineering, design, procurement, construction, and start-up activities. Edison

or its Contractor(s) will prepare the schedules and report progress and status against them. Included in the engineering schedule monitoring will be drawing and specification status and progress. Included in the construction schedule monitoring will be physical progress, bulk quantity installation, and productivity. Edison, as Program Director, will take the appropriate required action as a result of any deviations in performance to control engineering and construction.

- Cost Forecasting

  Periodic cost forecasts will be prepared for elements of the WBS. A forecast is a cost estimate based on actual project performance. Project information is frozen and a cost forecast is prepared on the basis of the information available as of that date. In most cases, the cost forecast is not expected to deviate from the total of the most recent estimate or forecast and the cumulative cost trends since the previous estimate or forecast.

- Cost Accounting

  Provisions will be made for accumulating expenditures to meet existing Federal Power Commission (FPC) codes of account and other regulatory requirements through cross-referencing with WBS cost elements. Construction contractors will be properly qualified so that their cost and schedule systems are capable of meeting the cost, schedule, and accounting requirements.

(d) Procurement Approach

A Project Purchasing Agent, who will report directly to the Project Manager will be selected to manage all of the material service requirements. This will include but not be

limited to procurement of all material and equipment, material and equipment expediting, traffic and transportation, major procurement or construction contract negotiation and administration.

(e) Document Control Approach

The balance of plant document controls will be managed by Edison's Engineering Document Management Organization of the Engineering and Construction Department. A document control center will be established which will provide storage, retrieval, and reproducibility of all project documents, drawings, data, and correspondence. This will include support at the Project offices and at the jobsite.

(f) Other Services

The Project Manager in executing his duties will also obtain support from other Edison Departmental organizations such as Claims, Insurance, Right of Way and Land, Law, etc., and the other Program Participants as required.

(3) Startup, Operation, and Testing and Evaluation

The Program Participants will start up and place into operation the non-solar balance-of-plant portion, as part of its scope of supply. Additionally, the Program Participants will manage the startup of the solar portion, leading to intimate integration of both activities and resulting in a sequential and smooth startup and operation of the Pilot Plant.

The Program Participants will develop detailed startup procedures for the non-solar portion, including checkout, performance testing, and verification of design criteria for the various systems, subsystems and equipment components. As indicated previously, these procedures will be integrated with similar procedures for the solar portion.

The Program Participants will develop, supervise and conduct detailed formal demonstration tests of non-solar portion operation and performance. The tests will include load pickup and load rejection capability, backup sources for auxiliary systems, load capability with selected auxiliary equipment out of service, functional testing of protective relays, etc. Under the direction of ERDA, the Program Participants will conduct similar demonstration tests of solar portion operation.

The demonstration and test period will be two to five years from the date of initiation of test operations. The Pilot Plant will be operated and maintained by the Program Participants in a manner that will assure maximum availability, reliability and efficiency, coincident with compatible operation to satisfy changes in system load demand. These operations will necessarily be compatible and heavily dependent on solar portion operation. The essence of Pilot Plant operation at all times will be maximum safety to personnel and equipment. Pilot Plant operation will be achieved with the following broad criteria:

- Pilot Plant operation and maintenance functions will be under the supervision of qualified personnel experienced in electric utility generating station practices.
- The Pilot Plant will be operated by qualified personnel having successfully undergone rigorous, detailed on-the-job training or an acceptable utility apprentice program. Operator qualifications will be ascertained by formal testing procedures prior to assignment. Operator qualifications will be maintained and improved through continuing on-the-job training programs or other acceptable programs for education and training.

- Operating procedures and practices for both normal and emergency operation will be developed and maintained in manual form. These manuals will be the basis, in part, for the formal operator testing procedures, and will be readily available to all operating personnel.
- Continuing training programs will be implemented for supervisory, operating and maintenance personnel to promote awareness and habits of safety for personnel and equipment.
- The Pilot Plant will be maintained by qualified personnel fully experienced with generating station equipment and maintenance routine, and major equipment overhaul.
- Procedures and practices for both routine and preventative maintenance will be developed and maintained in manual form. For the solar portion, these procedures will be developed in concert with ERDA. These manuals will be readily available to all maintenance personnel, and will include inspection and overhaul procedures for major and auxiliary equipment based on experience or regulatory agency requirements, whichever is the more stringent.
- The operating condition and performance characteristics of major equipment and protective circuits will be monitored through appropriate test programs to assure satisfactory operation.
- Routine maintenance operations will be monitored to assure compliance with previously determined procedures. An equipment history file for all major equipment and other significant areas within the

jurisdiction of station maintenance will be developed and maintained.

The resulting electric power produced by the Pilot Plant, during startup and initial operating period activities and after firm operation, will be integrated into the Program Participants' power transmission system.

(4) Commission Performance Control

The Commission controls the performance of the staff work through its Executive Director, Mr. Loyd Forrest. All work within the Divisions under Mr. Forrest is planned in advance through the development of budgets, schedules and task definitions, and documented in work plans agreed to between Divisions and between the Divisions and the Director. Cost control is maintained by the Administrative Services Division, and Divisions are directly accountable to the Director for scheduled work.

4. Power Generation and Transmission Experience

The general experience and capabilities of Edison, Los Angeles and the Energy Commission are discussed in the following paragraphs.

a. Southern California Edison Company

Edison has been operating generating stations continuously for over 80 years. During that time it has designed, constructed, and operated numerous major facilities ranging from high voltage transmission systems and hydroelectric plants to nuclear, combined cycle and coal-fired steam generating stations. In the past decade, these facilities have grown in both size and financial requirements to current plants of greater than 2000 MW capacity with project costs in excess of $2 billion. Edison has increased its staff and, more importantly, its experience to meet the challenges posed by these projects. This experience and associated knowledge has been recognized by other participants in the choice of Edison as project manager for a series of jointly owned major generating facilities using both nuclear and coal fuel since the late 1960's and continuing into the 1980's.

In addition, over the past 20 years, Edison has been involved in many programs for the development of new concepts. In the past 5 years, Edison has served as project manager for multi-utility programs requiring research efforts to establish technical feasibility of new technologies and continuing through the design, construction, and operation of demonstration facilities to commercial utilization of the technology. Through these activities many new project cost and schedule control tools have been developed and will be applied to the proposed effort.

EDISON CAPABILITIES

As air quality regulations have been made more stringent, Edison has developed expertise in the chemical processing area to be able to design and engineer cleanup systems for power plant emissions. The scarcity and high cost of low-sulfur oil has caused a strengthening of this expertise and a parallel development of expertise in the utilization of alternate energy sources which offer promise of eventually replacing fuel oil.

Also, water quality restrictions have become increasingly stringent and Edison has developed capabilities in water chemistry and treatment. Currently, a development program is underway for coastal generating stations to treat plant waste streams before discharging. Thus, Edison has obtained and can utilize a broader range of backgrounds, experience, and knowledge than electric utilities traditionally have had in the past.

In 1975 Edison was named the "Outstanding Electric Utility of the Year" by Electric Light and Power magazine. According to its editorial director, selection of Edison is especially noteworthy this year because, "All of the nations' 3600 electric utility organizations -- public and investor-owned -- have been faced with unprecedented problems as costs have skyrocketed, led by doubled prices for fuels used to generate electricity. These rapid cost increases, coupled with the added investments required to improve air and water quality, and limited abilities to increase their rates sufficiently, have pushed many utilities to the brink of financial disaster or at least to the point where the quality and reliability of their service have been reduced."

Design and construction of Edison's operating facilities and demonstration projects have required interdepartmental cooperation within Edison, coordination of Edison and

contractor activities, and coordination of multi-owner or multi-participant interests in the project.

A description of recent and ongoing relevant projects follow.

(1) Mohave Generating Station

The Mohave Generating Station, consisting of two 760-MW, coal-fired, steam generating units is jointly owned by the Southern California Edison, Los Angeles Department of Water and Power, Nevada Power Company, and Salt River Project. Edison was chosen to manage the design and construction of the plant and to operate it when it was completed. This facility was put into commercial operation in 1971.

One novel feature of the facility is the use of coal which is transported 273 miles to the plant in the form of a slurry.

As project manager for this plant, Edison increased its technical experience in coal and coal slurry handling, water treatment, process systems, and solid, liquid, and gaseous waste handling.

(2) San Onofre Nuclear Generating Station, Units 2 and 3

San Onofre Units 2 and 3 are each 1140-MW, pressurized-water nuclear generating units which will be owned by Southern California Edison and San Diego Gas and Electric. Edison is the design and construction manager and, after startup in 1980 and 1982, will be the operating agent.

Edison has contracted with an Engineer-Constructor organization for the principal services required for design and construction of the units but will retain responsibility for procurement of most major equipment. Several contracts have been issued to firms other than the Engineer-Constructor for specialized products and services. Edison is responsible for managing all contracts as well as performing certain design and engineering efforts in-house. The Edison construction management associated with the project includes the plant startup effort.

This project represents a use of Edison project management and technical experience for extremely large and sensitive projects with extensive quality assurance requirements.

(3) Coolwater Generating Station

The Coolwater Generating Station consists of two oil-fired generating units which were constructed in the early 1960's. Edison is currently constructing on the Coolwater site, two additional combined cycle (combustion turbine and steam turbine) units each rated at 236 MW. These units are being constructed and will be completed in mid-1978. Edison has utilized its Project Management technique on this project with good success. The engineering of the plant was conducted by outside engineering firms while the Construction Management is being totally conducted by Edison.

(4) Long Beach Generating Station

The Long Beach Generating Station consists of several old generating units that were built in the early part of the century. Edison is currently completing construction on an

up-grading project of two of the units. This re-powering project consists of installing new combustion turbines, new boilers and rejuvenated steam turbine generators, and will increase its output from 158 MW to 585 MW. Edison, as part of its objective to increase its engineering capabilities, undertook the entire engineering design with its own engineering and construction management personnel. This experience has provided Edison with many new techniques for controlling the engineering, design and construction of projects. These techniques and experience will be utilized for engineering on the non-solar portion of the Pilot Plant.

(5) Mohave SO_2 Scrubbers

In order to comply with local air quality regulations and because of the lack of adequate technology, Edison undertook the development of SO_2 scrubbers for the Mohave and Navajo Generation Stations. With Edison as the program manager, eight different scrubber concepts including one conceived by Edison, were tested in Pilot Plant size. The Edison designed scrubber and one other were selected for further testing in demonstration plant size.

This project required Edison to manage efforts from the research phase beginning in 1971 through design, construction, and operation of demonstration facilities. As a byproduct to the main project, extensive experience has been gained in the handling of waste products and chemical process systems.

(6) Solar Energy Research and Development Activities at Edison

Edison is active in the development and application of advanced technology. For several years these efforts have

been coordinated by its Research and Development organization. This allows Edison to respond quickly in implementing new technology and in solving the special problems of its electric system and region. Exploratory activities in solar energy date back to 1971 and the beginning of Edison's R&D organization.

(a) Overall Edison Solar Objectives

- Solar Power Generation - The objective is to acquire the necessary information and to apply Edison's capabilities as an electric utility to support the development and demonstration of solar power generation technology in Southern California at the earliest possible date.
- Solar Heating and Cooling - The objective is to adapt selected solar/electric heating and cooling concepts to the requirements of Southern California buildings. Concepts chosen for development and demonstration should not only conserve fossil fuels, but their use should result in efficient use of electricity and the capital equipment involved in its generation.
- Solar Energy Data - The objective is to provide the data base necessary to allow cost effective design and sizing of solar equipment in Southern California, including both power generation and heating and cooling systems.

In accomplishing these objectives, a fundamental assumption is that the various solar projects should rely heavily on the efforts of Edison engineers and technicians as well as project management experience. In all cases, since Edison expects to be involved in implementation of commercial

solar technology when available, it is important that the R&D efforts provide Edison engineers with as much first-hand experience with solar technology as possible.

In Edison's solar energy R&D program, there are subprograms corresponding to each of the three objectives stated above. The solar electric power generation subprogram is discussed below.

(b) Edison Solar Electric Power Generation Program

By early 1974, studies sponsored by the National Science Foundation (NSF) and NASA had provided some preliminary information about solar thermal power plant characteristics and costs. Using this information, Edison initiated efforts to identify advantages and disadvantages and overall feasibility of solar generation in the context of its future generation needs. This was completed in early 1974. The study indicated that the potential did exist for solar power plants to become economically feasible, considering expected fossil and nuclear generation costs, and that Edison would be in an excellent position to make use of the technology, if it were successfully developed. The study also indicated the importance of thermal energy storage as a part of a solar thermal power plant, and the need for more rigorous analytical studies to better define how solar units would fit into a generation resource mix.

Discussions with NSF and later ERDA indicated that there was a need for such a study in the National R&D program. As a result, Edison submitted a proposal to the newly formed ERDA to study in depth the integration of solar plants into a large electric system.

The ERDA/Edison project has been conducted with its major tasks being concerned with the analysis of the effect of solar on electric system reliability and the evaluation of

the economic worth of solar generation based on the reliability analysis results. The computer programs that have been used allowed solar generation to be treated analytically just as it will be treated when it is a proven alternate resource. The study has provided an understanding of how the characteristics of a large electric utility system would be affected by the introduction of solar power plants. It has also yielded considerable insight regarding the features that solar plants need in order to best fit into electric systems of the future.

Power Generation Siting Studies - In mid 1974 a national goal was established to have a pilot scale solar power plant operating by 1980. The need for strong electric utility involvement in this project and the benefits of early utility experience with solar electric technology were recognized by both the managers of the Federal program and by Edison. Recognizing its potential contribution to the project, as the nation's largest potential user of the developing technology, Edison began to lay the groundwork for its potential role. Sites were identified that had the potential of satisfying the needs of the Federal program and the constraints resulting from the desire to connect the Pilot Plant electrically to a utility system. Meanwhile, the work in the Federal program has gone forward, planning the Pilot Plant project and conducting preliminary design studies.

Alternate Solar Power Generation Concepts Studied - Because it will provide the first opportunity to gain direct experience with solar power technology and operational characteristics of solar plants, the ERDA central receiver Pilot Plant is at the focus of Edison's solar power R&D activities. However, Edison's long term interest in solar power technology motivated an interest in other concepts which actually predated ERDA's central receiver program.

EDISON CAPABILITIES

Following an initial feasibility demonstration at the University of Arizona, in late 1973 Edison joined with the General Atomic Company to explore the feasibility of a concept which involves an unique collector geometry. The General Atomic concept enables the mirrors used for sunlight concentration to be built and supported using potentially low cost construction techniques. In this configuration the mirrors need not be tilted and steered to follow the sun. This concept is fundamentally different from the central receiver; instead of concentrating heat on a single monolithic heat receiver using thousands of large mirrors, heat is collected in a large number of modular collectors and transported as a hot fluid to a central location where it can be used to generate steam and drive a turbine.

A three foot by ten foot model of such a collector was completed in late 1974 and has been used extensively at the Arizona State University to evaluate different heat absorber configurations. Other experiments with the Edison funded concentrator have explored the use of concentrating mirrors in connection with nonthermal solar to electric conversion processes, such as photovoltaic (solar cell) conversion.

Parallel efforts on the General Atomic concept over the past year have been supported by Edison, ERDA, and the Electric Power Research Institute (EPRI), and have provided preliminary designs of full scale collector modules, an evaluation of alternative low cost construction techniques, and studies to identify the cost and performance of systems using the General Atomic collector. It is our hope that work on this concept will move along rapidly now that the initial studies are complete.

b. Los Angeles Department of Water and Power

The Department is the largest municipally owned utility in the United States. It exists under and by virtue of the Charter of the City of Los Angeles enacted in January 1925, and the subsequent amendments to the Charter. Administration is under the direction of a five-member Board of Water and Power Commissioners; they are appointed by the Mayor and confirmed by the City Council. The Water and Power Systems of the Department are operated financially independently of each other.

The Department serves water and electricity almost entirely within the boundaries of the City of Los Angeles, which encompasses some 464 square miles. The Department is now serving a population of approximately 2.7 million.

The Department is one of a minority of utilities that maintains a complete in-house engineering and construction staff to bring power facilities from conceptual design to commercial operation. This experience began with the operation of the Department's first major hydroelectric unit in 1917 and its first steam unit in 1941. Both units have provided reliable service to this day.

The Power System's net electric resource capability is about 5700 megawatts. This capability is made up of coal-, gas-, and oil-fueled steam units (69%), conventional and pumped storage hydroelectric units (23%) and various purchase and exchange agreements (8%). The coal-fueled units are located at two plants in which the Department shares ownership: the Mohave Generating Station in Southern Nevada and the Navajo Plant in Northern Arizona. The oil- and gas-fueled units are located in the Los Angeles area.

LOS ANGELES DEPARTMENT OF WATER AND POWER CAPABILITIES

The Power System's conventional hydroelectric units are located in the Owens Valley area of California, at Hoover Dam on the Colorado River, and in the Los Angeles area. The pumped-storage units are located north of Los Angeles at the 1250-megawatt Castaic Plant on the State's Water Project. The purchased power comes mainly from the Pacific Northwest area of the United States.

Future electric power generation resources presently in various planning stages by the Power System include: a 2000-megawatt coal-fueled plant (4 units) in Southern Nevada, a 500-megawatt coal-fueled plant (2 units) in Southern Utah, and a 5200-megawatt nuclear-fueled plant (4 units) in central California.

For many years, the Department's Power System has been a leader in the field of electric power transmission. In the late 1930's, the Power System designed and built the three 287.5 KV transmission lines from Hoover Dam to Los Angeles, a distance of about 250 miles. For over two decades, these transmission lines remained the highest voltage lines in the United States; and recently, one of the lines was upgraded to 500 KV with only minor modifications.

In May 1970, the Power System placed in operation this nation's first direct current transmission system. This 850-mile, 800 KVDC line connects the hydroelectric generating resources of the Pacific Northwest with the large load centers of southern California. The Power System designed and built the 580 miles of transmission line from the Oregon-Nevada border to Los Angeles and the southern terminal at Sylmar, California.

The Department participates actively in the solar program of the Electric Power Research Institute (EPRI). It is

represented on EPRI's Solar Electric Subcommittee and on review panels for solar electric projects.

The Department also participates in the WEST Solar Resource Evaluation Program. Data obtained through this program will be used to provide information to potential users of solar heating and cooling systems.

The Department has almost 11,500 employees; about 8400 are Power System and 3100 are Water System employees. Long-term career service is typical of Department employees. About 8300, almost three-quarters, have been with the Department ten years or more. The Department has about 850 engineers trained in a wide variety of disciplines. In addition to the experience gained in the many aspects of utility operations, it is Department policy to strongly urge engineers to continue their formal training at the many fine colleges and universities in the Los Angeles area. In addition, professional registration is a prerequisite for promotion beyond a specific level; the majority of Department engineers are registered professional engineers in California.

c. Energy Commission

The Energy Commission was established by the California Legislature in 1974 to provide co-ordinated public agency control over the State's energy future. The Commission has both regulatory powers and a mandate to develop alternative energy sources. It approves sites for all thermal power plants over 50 MWe in establishing energy conservation standards for buildings and appliances, and the Legislature is considering giving the Commission the power to set interim standards for the performance of solar collectors. It has a specific mandate to accelerate the use of the State's solar and geothermal resources and to conduct evaluations of a broad spectrum of energy sources.

Under Dr. Veigel, the staff of the Research and Development Division is organized into four offices which provide the capabilities to direct the Commission's work in technology transfer for the project. The offices are outlined below with specific examples of their relevance to this project.

- Systems Integration - which has the overall responsibility to see that work undertaken by the division is valuable and viable when begun, remains so during the course of the project, and that the results are properly utilized.
- Energy Resources and Technologies Development - source for Commission expertise in the technology and development of solar-thermal plants and the solar resources of California.
- Impact Resolution - which has the responsibility for addressing problems of impediments to the adoption of a new technology (e.g., environmental problems,

institutional lethargy, lack of ready capital) or consequences of its use (e.g., statewide energy system impacts, societal impacts).

- Energy Systems Implementation - which has the responsibility to develop adequate mechanisms to apply and support solar thermal technology in California (including both regulatory and non-regulatory mechanisms).

The Research and Development Division will be supported by staff from the Siting Division which has prime responsibility for the Commission's regulatory role in the siting of electric generation facilities, by the Energy Assessments Division which has the major responsibilities for environmental impact assessment and for planning California's future energy supply mix, and by the Conservation Division which has both regulatory authority and planning responsibilities for the State's future load configuration.

It is important for the purposes of the 10 MWe pilot facility and for the commercialization of solar-thermal technology that additional resources be available to pick up and address problems as they arise. The Commission has included within its participation the ability to contract for this type of work as the resources of available staff are exceeded. This mechanism will be used to help develop solutions as problems are defined through Commission participation in the course of the project.

The Commission's solar program is managed through its Research and Development Division. The Division also manages the Commission's programs in geothermal development, fuels, utility systems and nuclear.

(1) The Commission's Solar Program

The objective of the Commission's program in solar energy is to ensure the widespread utilization of California's solar energy resources through comprehensive resource assessment and through the resolution of the technical and institutional barriers to development in order to help bring all methods of using solar energy to the point of commercialization as quickly as possible. The program began in 1975 and continues with a budget for the current fiscal year of $1.1 million. The program is managed by Alec Jenkins who will be directly responsible for carrying out the work described in this proposal.

Major impetus to the development of this program has come from legislative mandates and pending legislation; the needs of the solar energy market - both buyers and sellers - and the desirability to influence and participate in federal programs of benefit of the State. Relationships have been established with federal, state and local agencies, with solar energy societies, with the community of solar energy expertise and interest, and with institutions upon whose future support the fate of much of the solar market depends.

The Commission activities have been carried out under three sub-program areas, including resource assessment and evaluation, electric power generation, and thermal applications.

E. Environmental Evaluation

Primary environmental considerations of importance for the development of a solar power plant are land use, terrestrial biology, archaeology, socio-economics, aesthetics, heliostat and receiver glare, water quality, and water resources. Each of these is discussed below with consideration of the existing environment, expected impacts including cumulative and long term, and any conflicts with land use plans. It should be noted that the general site area has been studied extensively in the development of facilities now under construction. Several environmental reports have been prepared for these developments as follows:

- Southern California Edison Company, Environmental Report for the Coolwater Combined Cycle Project Units 3 and 4, Dec. 11, 1972
- California Public Utilities Commission, Draft EIR, Southern California Edison Company Coolwater Combined Cycle Units 3 and 4, Application No. 53389, June 8, 1973
- California Public Utilities Commission, Final Environmental Impact Report Coolwater Combined-Cycle Project Units 3 and 4, Aug. 1975
- Southern California Edison Environmental Report Coolwater-Kramer 220 kV Transmission Line, June, 1972
- California Public Utilities Commission Draft EIR Southern California Edison Company Coolwater-Kramer 220 kV Transmission Line Application 53602, June 8, 1973

- California Public Utilities Commission Final Environmental Impact Report, Coolwater-Kramer 220 kV Transmission Lines, August, 1975.

These reports along with Edison's solar data and extensive ground water studies provide an excellent data base for required state and Federal environmental documents.

It has been determined that the County of San Bernardino has the greatest local government responsibility for permitting of the proposed Pilot Plant and will be responsible for preparing an Environmental Impact Report under the California Environmental Quality Act. The County has an excellent environmental staff and public involvement program. Also, the County is aware of the substantial data base available for the site. It is expected that an excellent Environmental Impact Report will result from their efforts.

The Program Participants will cooperate with ERDA to facilitate preparation of the Environmental Impact Report required by the National Environmental Policy Act.

The following paragraphs present a brief environmental evaluation of the proposed site.

1. Land Use

Because the solar power plant concept is highly land intensive, existing land use is a primary consideration in the development of this potential energy resource. In selecting a site for this proposal, an effort was made to minimize the impact on land use. The proposed site is located on a sparsely vegetated area of currently unused land.

If the proposed site is selected, no land use other than the Pilot Plant will be possible until the facility is dismantled after which the land could revert to its natural state or be used for other purposes. The land is currently zoned DL (Desert Living) by the County of San Bernardino and a zone change would be required.

2. Terrestrial Biology

Terrestrial impact is minimized by the fact that the site is very sparsely vegetated land with minimum signs of wildlife and no apparent rare and endangered species.

Existing vegetation consists of Creosote Bush Scrub with low species diversity. Dominant shrubs are creosote bush, burro bush and Ephedra (Mormon Tea). Woody bottlewasher primrose (Oenothera sp.) and giant galleta grass are present but sparse.

There is little evidence of animal activity on the proposed site, though coyote, desert kit fox, merriam and desert Kangaroo rats could be expected. The site falls within the distribution of protected desert tortoise and the rare Mojave ground squirrel, though no signs of these are present.

It is possible that existence of the facility could have effect on birds attracted to the 120 acre evaporation ponds on the Coolwater site. Typically, there is a fairly substantial number and variety of birds at the ponds. Most likely, any impact would not be significant because the birds could modify their flight patterns around the Pilot Plant. This aspect will be further evaluated during preparation of environmental documents.

3. Archaeology

Preliminary review by an Edison staff archaeologist indicates a low probability of archaeologically significant features. A detailed survey will be conducted as input to environmental documents, and mitigation steps will be taken if significant features are found.

4. Socio-economics

The Pilot Plant will have a beneficial socio-economic impact on the Barstow area. Construction of the facility will provide a continuation of the jobs for many workers who will be employed during the construction of generating facilities now in progress on the Coolwater site. Operation of the facility will also provide jobs. The many visitors expected will have beneficial effect on travel facilities including motels, restaurants and others.

While providing economic stimulation, the above features will not overburden any existing facilities because they are currently well developed. Accordingly, no facilities will have to be built to accommodate personnel or visitors. Because of this, there will be no significant economic letdown when the facility is retired.

5. Aesthetics

The aesthetic features of the Pilot Plant at this site are not considered to be adverse because of the environmental setting. The area is developed with the existing generating station, transmission lines, highways, the small town of Daggett, and marine depot installations. Because of existing development, no pristine views will be disturbed by the plant.

The Pilot Plant will be visible from Daggett, scattered residences, Interstate Highways 15 and 40, nearby-marine depots, and the Calico Ghost Town. The receiver tower is hidden from Barstow by Elephant Mountain. As part of the public relations program, it is intended that small signs be placed on the Interstate highways if acceptable to Cal Trans, and that a small plaque be placed at an established observation point in Calico Ghost Town, if acceptable to the San Bernardino County Department of Regional Parks.

6. Heliostat and Receiver Glare

The extent to which glare is a problem depends on the magnitude of the glare and people being in a position to be impacted by it. Preliminary indications are that heliostat glare would only be visible from aircraft or possibly from the Calico Ghost Town. Calico is higher in elevation and north of the site. However, the location of Calico in relation to the site makes it unlikely that a significant glare would occur. It is expected that glare will not be a problem for high altitude aircraft and that visibility would be similar to reflection from a body of water.

The Barstow-Daggett airport is located about 2-1/2 miles southeast of the proposed site. The Pilot Plant will be visible to pilots flying to and from that airport.

7. Water Quality

Ground water basins such as the aquifer under the Coolwater site can be degraded by percolation of impure water. Because of this, the highly saline cooling tower blowdown must

be disposed of in lined evaporation ponds. Also, it will probably be necessary to collect heliostat wash water, reuse it or dispose of it in the ponds.

If possible, existing evaporation ponds will be used for disposal of waste waters. If the ponds do not have sufficient capacity, a new pond will be constructed specifically for the Pilot Plant. Disposal by this method has no adverse effect on water quality.

8. Water Resources

It is estimated that about 500 acre feet of water per year will be required for operation of the wet cooling tower, heliostat washing and miscellaneous plant uses. This amount will be supplied by diversion from remaining agricultural irrigation on the site.

About 8000-9000 acre feet per year are currently pumped by Edison at Coolwater. About 2800 acre feet are currently being used for cooling towers for existing units 1 and 2, with the remainder used for irrigation. In 1978, an additional 4000 acre feet will be diverted from Edison agriculture to cool units 3 and 4 now under construction. Water for the Pilot Plant will be diverted from the remaining irrigation water. No additional pumping is contemplated for cooling of the Pilot Plant.

The ground water at the site is high in quality and suitable for most uses including domestic and agriculture. Demineralization will be necessary for steam boiler make-up water and possibly for heliostat wash water. Such demineralization would be necessary for any natural water source.

F. Cooperative Arrangements

The Program Participants have entered into a three party participation agreement for the Pilot Plant. The agreement provides the terms and conditions whereby Edison, Los Angeles, and the Energy Commission will cooperate to provide ERDA with a partner for the non-solar portion of the Pilot Plant. The agreement provides that Edison will be the Program Director for the Program Participants and will act as the agent for the other two participants for proposed activities. These activities will include

- Negotiation of a partnership agreement with ERDA
- Performance of environmental and planning work
- Providing the non-solar portion of the Pilot Plant
- Work to obtain all permits and licenses required for this project
- Operation and maintenance of the entire Pilot Plant
- Capital improvments and integration of the electrical generation into Edison's distribution system which is interconnected to Los Angeles and others

Ownership percentages of the non-solar facilities are:

Edison - 80 percent

Los Angeles - 20 percent

Energy Commission - None

The Energy Commission is a party to the proposed effort but will be providing services rather than a capital commitment.

The agreement provides for an Administrative Committee as a liaison body for the activities proposed which will impact cost, scheduling or operation of the proposed effort. The Administrative Committee will consist of one representative from each of the Program Participants. However, the Energy Commission representative will be a non-voting member.

The California Environmental Quality Act provides that public agencies cannot participate in other than planning and feasibility work until after an Environmental Impact Report has been certified. Accordingly, Los Angeles cannot contractually commit itself to financing a portion of the non-solar plant portion until after an appropriate Environmental Impact Report has been accepted. To accommodate this requirement in California State law, and to provide ERDA with an effective partnership, Edison is prepared to assume the performance of the obligations of Los Angeles if they are prevented from participating in the project.

G. Financial

In addition to the technical abilities previously described, the Proposing Parties possess the necessary financial strength to carry out the work proposed herein. The discussion which follows pertains primarily to Edison and Los Angeles which are the financially participating parties. Because the Energy Commission is offering certain non-capital services which it will fund, information for the Commission is also included.

1. Southern California Edison Company

Southern California Edison Company, incorporated in 1909 under the laws of California, is a public utility primarily engaged in the business of supplying electric energy in portions of central and southern California, excluding the city of Los Angeles and certain other cities. Edison's service area covers about 50,000 square miles, with an estimated population of approximately 7,680,000 as of December 13, 1975.

Edison's operating revenues for 1974 and 1975 were $1,483,000,000 and $1,668,000,000, respectively. Total operating revenues for 1974 and 1975 increased by $404,084,000 and $184,583,000 over the respective prior years. These increases were due principally to general rate increases and upward fuel cost adjustments in Edison's rates. The level of energy consumption by Edison's customers declined by 5.6% in 1974 and increased by only 0.5% in 1975. This situation was due to customer reaction to the sharply higher rates per kilowatt-hour, which for 1974 and 1975 averaged 45.5% and 12.2% higher than for the respective prior years, as well as to voluntary and mandatory state and federal governmental restraints on energy usage. Revenues for 1974 and 1975 of $34,100,000 and $96,300,000, respectively, are attributable to increased rates for certain resale customers and are subject to refund with interest to the extent that any of the increases are determined by the Federal Power Commission to be inappropriate.

Net income increased in 1974 over 1973 by $70,567,000 but decreased in 1974 from 1974 by $31,636,000. The increase in 1974 was unusual and substantially all of such increase was due to significantly greater than average-year availability of low-cost hydroelectric power from Edison's own facilities and to an even greater extent from the Pacific Northwest, a greater amount of natural gas available than projected and a less than projected use of higher-cost fuel oil, and changes in Edison's general rates, which increased in late 1973 (retail) and in 1974 (resale). Net income decreased by 14.5% in 1975 because the aforementioned combination of favorable operating circumstances present in 1974 did not recur to the same degree in 1975, although such circumstances in 1975 still exceeded those for an average year. This decline occurred primarily as a result of the decreased availability and increased cost of purchased power and natural gas, and lower hydroelectric generation.

For the purpose of refinancing its presently estimated gross plant investments for the period 1976 through 1980, and in order to refund $186,811,000 of long-term debt obligations maturing during such period, Edison estimates that its requirements to obtain additional money from outside sources through 1980, including the issuance from time to time of short-term obligations, could approximate $1.9 billion. The remaining money requirements for such period are expected to be obtained from internal sources, principally from provisions for depreciation and other reserves, and retained earnings. The foregoing estimates are subject to frequent revision and are based upon assumptions as to the factors affecting Edison's operations through 1980.

Gross plant investments less contributions in aid of construction for the years 1973 through 1975 were approximately $346,291,000, $352,092,000, and $420,025,000, respectively. Plant retirements for the years 1973 through 1975 were $29,925,000, $29,739,000 and $27,779,000, respectively. Edison

conducts a continuing review of its construction program, and such program and the above estimates are subject to frequent revision based upon changes in assumptions as to system load growth, rates of inflation (including costs of labor), receipt of adequate and timely rate relief, the availability and timing of environmental and other regulatory approvals and the availability and costs of outside sources of capital. Edison has in the past revised its construction program in light of the above factors and may effect further such revisions in the future.

2. Los Angeles Department of Water and Power

The City of Los Angeles Department of Water and Power serves customers within the Los Angeles City limits, an area of 464 square miles with a population of over 2,500,000. On a revenue basis, electric power sales amount to approximately 77% of the Department's business.

Combined total assets of the Water and Power Systems at June 30, 1975, were in excess of $2.7 billion with $618,297,842 attributable to the Water System and $2,129,800,510 to the Power System. The City's equity in the two Systems topped $1.1 billion. In accordance with its basic fiscal policies, the Department continues to use current revenues to pay all costs of operation, debt service and part of the cost of new facilities and capital improvements. The remainder of the cost of new construction is met from the sale of revenue bonds and from contributions in aid of construction. No financial obligation or burden is placed upon the taxpayers of the City of Los Angeles.

Power System energy sales fell about 100 million kWh to 16.3 billion kWh for 1974-75. Operating revenues, including fuel cost recovery, came to $451,783,053, an increase of $71 million over the prior fiscal year. The average number of customers served decreased slightly to 1,117,639.

Operating expenses of the Power System rose to $339,946,246, caused by a $36 million increase in fuel costs and increases in labor, material and equipment due to inflation. Net income of $73,545,652 was 22% below the prior year; however, a change in accounting principle was responsible for $29,303,820 in recorded net income in 1973-74. The Power System received approval for a rate increase, effective November 9, 1975, which is expected to provide 12% additional power revenues to counteract inflationary pressures in operating and construction costs.

Net income of the Water System declined almost 55% to $4,798,212. Inflationary forces pushed operating expenses to $67,813,604, a record $7 million year-to-year increase. In an effort to offset the upward trend in operating costs, the Water System received approval of a rate increase, effective November 9, 1975, which is expected to provide 15.4% additional water revenues.

3. Energy Commission

The Commission's budget for this fiscal year is $13 million. Of this amount the Research and Development Division has been allocated $3.9 million for its programs including $1.1 million for its solar program. The Commission's funds come from a surcharge on the price of electricity sold to consumers in California. The current rate is one-tenth of a mill/kWh and is collected by utilities and forwarded to the State Board of Equalization for inclusion in the Commission's Special Account within the State General Fund. Each year the Commission submits a budget request to the Legislature for approval to spend this money. The Commission's enabling Legislation allows for increases in the surcharge up to a ceiling of two-tenths of a mill/kWh.

H. Public Information/Technology Transfer

There are several levels of information to be disseminated as a result of this project. Public information will play a key role in the development of a general public understanding of solar power and its application. Also, transfer of the technology to potential users and future experimenters is essential to assure that the technology advances in an optimum fashion. To serve these general needs, three approaches will be taken. First, a public information program will be implemented. Second, a program of results analysis and publication will be undertaken through the Electric Power Research Institute. Third, the Energy Commission will form a task force of potential users, public interest groups, public agencies and energy experts to serve as a focal point for the institutional and social network needed to foster establishment of this technology.

Each of these programs are discussed in the following paragraphs:

1. Public Information

The Program Participants, through Edison, will establish and carry out a comprehensive public information program during the lifetime of the project. Edison has had extensive experience conducting public information programs for complex, controversial projects such as the 2200 MW San Onofre Nuclear Generating Station.

The Program Participants have prepared an abbreviated, preliminary public information plan for the Pilot Plant. Upon approval of the proposed site by ERDA, a detailed plan based on the preliminary plan presented below will be prepared.

a. Public Information Policy

It is the Program Participants' policy to be open and candid in their relations with the public, the communications media, governmental agencies, civic organizations and special interest groups in all matters, including the development and construction of new generating plants. Edison will respond expeditiously to all inquiries and make available to the public a continuing flow of factual information with regard to the proposed Pilot Plant and its relationship to the environment.

b. Overall Public Information Objectives

- Explain and communicate the need for new sources of energy in order to meet growing power requirements while fulfilling this demand with clean sources of generation that have a minimum impact on the environment
- To convey factual information to the public as technological developments of solar generation occur, and to communicate our efforts to minimize the environmental impact of all electrical generating sources
- To muster widespread support for the project as a positive contribution to the cause of cleaner air and reduced use of petroleum fuels.
- To demonstrate the benefits of solar power as a source of energy for the future.

c. Background - Current Climate of Opinion

Two main concerns of residents of desert areas are water availability and smog-free air. Regarding the latter; solar offers potential as a source of electricity virtually free of air pollution, and therefore no organized opposition is expected to its development in remote desert areas. Some opposition could be expected from groups or individuals concerned with

preservation of desert flora and fauna and retaining open lands. Objections from this quarter will have to be addressed as state-of-the-art developments combined with commercial-sized plants requiring larger land areas for solar sites.

Specifically, regarding the siting of the Pilot Plant at the proposed site, a positive reaction appears assured from the communities of Barstow, Daggett, Yermo and Newberry Springs, all located within a few miles of the site. To a considerable degree, these communities are economically dependent upon transient motorists traveling Interstate Highways 15 and 40. Community leaders are expected to view the Pilot Plant siting as a novel tourist attraction and positive stimulus to business.

d. Visitor Information Center

Public exposure to a Pilot Plant at the Coolwater site offers maximum public relations value. Geographically, the site is seen easily from elevated portions of Interstate Highway 40 directly south of the Coolwater site, and to a lesser degree from Interstate 15 on the north.

According to state records, average annual traffic in the vicinity is in excess of 6,000 automobiles daily on Interstate 40 and 14,000 automobiles on Interstate 15. The latter is a main vacation artery from Los Angeles to Las Vegas, Nevada. Considerable attention, therefore, should be given to a comprehensive Visitor Information Center contiguous to the plant proper.

e. Organization

Overall responsibility for implementation of the Public Relations Plan for the Pilot Plant will be assigned to Edison's Eastern Division Manager. He will be assisted directly by his Division Community Activities Representative and Barstow District Manager to foster good relations with county and local governments and civic organizations.

Edison's Corporate Communications Manager will provide additional assistance and act as liaison with other public relations entities such as Los Angeles, Department of Water and Power, as well as metropolitan Los Angeles news media.

2. Technology Transfer Through the Electric Power Research Institute

A concerted effort will be made to assure that the technology and experience is shared with others in the industry. At the initiation of Edison and other utilities, the Electric Power Research Institute is setting aside funding to provide for Pilot Plant evaluation data to be analyzed and disseminated among interested utilities. The Program Participants are committed to the objective of providing for proper documentation of the project and its test results, and will work closely with ERDA, EDRI, and others to this end. A continuous action effort will be made to involve other utilities in the project.

3. Information Dissemination/Technology Transfer Through the California Energy Commission

Successful implementation of central solar thermal technology will require a partnership among federal, State and local levels of government and private users. Therefore, it is important that each partner in this pilot project be strategically placed, well informed and properly motivated so as to have an influence on the future of solar energy.

The California Energy Commission is unique among state agencies across the nation in having both the responsibility and the authority to help determine the State's energy future. It is equipped to accomplish this purpose through a combination of research and regulatory programs, the research activities exerting an influence over future energy options and providing information to the regulatory processes. Unlike other State Commissions, the California Energy Commission directly influences the future energy mix for the State through programs guiding the

decisions of the ultimate users toward the implementation of preferred alternative energy technologies.

Three goals have been identified to guide the participation of the Commission in the project. The first goal places an emphasis on the regulatory capabilities of the Commission and on the adaptation of these capabilities to carry out technology transfer. This goal is:

- To assure that regulatory and institutional aspects of solar thermal technology are an asset instead of a hindrance to its being considered a serious alternative

The next two goals which guide the participation of the Commission place emphasis on the nonregulatory mechanisms for technology transfer, particularly those mechanisms by which technological credibility can be established and institutional support for the technology developed.

- To provide an institutional process by which potential users everywhere can gain familiarity with solar-thermal technology so that they can proceed with confidence toward implementation
- To establish the necessary general institutional support for solar technology

The following sections structure Commission work around these three goals, and conclude with a detailing of mechanisms which will be utilized to carry out technology transfer during the course of the Pilot Plant program.

a. Regulatory Mechanisms for Implementation

Within California, the Energy Commission occupies a central position on energy matters with respect to other State agencies. In order to carry out its legislative mandate to help determine California's energy future, the Commission is required by law to independently forecast energy supply and demand, to regulate the siting of power plants on the basis of

environmental and land use criteria and determinations of need, and to implement the development of alternative sources of energy, especially solar. Thus, the Commission's unique position allows it to participate in the research, development, and implementation work necessary to bring solar-thermal electricity generation to the point of commercialization.

To meet these needs, the following goal and consequent activities are proposed.

Goal: To assure that regulatory and institutional aspects of solar-thermal technology are an asset instead of a hindrance to its being considered a serious alternative.

Consequent Activities:

- The Commission staff will develop the components of an implementation methodology and plan appropriate to its role in the state's energy future. These components may address, among others, the following issues, in terms of central station solar technology:
  - Appropriate placements of the technology in the future state supply mix
  - Integration into the utility pool
  - Alternative future load configurations as suggested by both technology developments and regulatory responsibilities
- A report will be provided ERDA which describes the components of the implementation methodology and plan. The objective of the report is to assist ERDA in its own technology transfer processes. Since it can be expected that other states will eventually have a more coordinated control over their energy futures, this report will also be valuable to other states as an example of solar implementation planning

- As in all states, California's power plant siting process is designed for conventional fossil fuel and nuclear plants. The Commission will use the experience it gains from the Pilot Plant to determine if solar plants can be reasonably evaluated in a shorter time span or with different procedures than conventional plants. Siting procedures will be developed which are appropriate for this technology.

- The Commission is the lead agency for Environmental Impact Reports for power plants for which it approves sites. The Energy Assessment Division is currently preparing guidelines for these documents which include an initial, broad look at solar-thermal technology. The Commission staff will use the experience gained with the Pilot Plant to determine specific data needs for subsequent EIRs for solar thermal plants. The staff will provide an outline of the issues which should be addressed in permit and review processes for this new technology at state and local levels. This information will also be transferred to other states for use in their own environmental review processes. The County of San Bernardino will be lead agency for preparation of the EIR for this project. After the EIR is accepted, the Commission staff will work closely with the County of San Bernardino staff in order to gain full benefit from the County's experience in the preparation of this document. Thus, important learning in impact assessment for the technology is conserved and transferred to the state level and the Commission will be able to work from experience with the next generation of solar-thermal plants.

- As a next step, the Commission staff will identify and list criteria and data needed for siting future solar-thermal plants. Based on these findings, the staff

will recommend research needed to establish a factual basis for future siting processes

- A report will be provided to ERDA which describes problems encountered and the solutions developed in these regulatory processes so that experience is conserved at the federal level and model processes are made available for transfer to other states

b. Non-regulatory Mechanisms for Implementation

Complementing its regulatory responsibilities for California's energy future, the Energy Commission also has the capability, through its Research and Development Division, of conducting a comprehensive program of implementation of solar-thermal power systems centered around a 10 MWe pilot project. For purposes of the 10 MWe Pilot Plant, the non-technological problems can be expected to present as great an impediment to the successful resolution of energy problems as the technical problems. Acceptance of a new energy system is very much an institutional as well as a technical process. Establishing such credibility can be a difficult process. The implementation mechanisms described in this proposal will help ease the barriers and accelerate the process.

There are two kinds of work required to bring about the successful transfer of this technology through nonregulatory measures: the involvement of potential users, regulators and interest groups at the state and local levels and the provision of the leadership necessary to effect institutional changes required for implementation.

Involving significant future state and local level actors in the experiment now is important for several reasons.

- They will be able to raise issues at an early stage whose resolution can help direct the course of development of this technology

- They will have access to the research process so that questions important to them can be answered at this early stage which, unanswered, would inhibit the later speedy implementation of this technology
- They will gain detailed information so as to be able to incorporate this technology into their planning for future actions
- They will form the nucleus from which will evolve the prepared institutional and social support network which will speed the adoption in the medium-term future of a proven technology

To meet these needs, the following pair of goals and consequent activities are proposed.

First Goal: To provide an institutional process by which potential users everywhere can gain familiarity with solar-thermal technology so that they can proceed with confidence toward implementation.

Consequent Activities:

- The Commission will establish, lead, and maintain mechanisms which will enable potential users of this technology, regulators other than the Commission, and public groups to have full access in forms usable to them of information about this project needed to fulfill their responsibilities. But information transfer should not be a one-way process in an experimental situation. The speed by which technology is ultimately transferred will depend in large part on how soon questions of concern to potential users, regulators and the public are answered, and upon how soon these participants become familiar with the technology. An interstate coordinating council will be formed for participation by out-of-state utilities in these processes

Commission leadership of a broadly based task force will provide the two-way information transfer to the appropriate interest levels throughout the State. Commission participation on the Administrative Committee will assure accurate and timely transfer of project information

- A number of State and local agencies outside the Energy Commission will maintain a policy role in siting solar-thermal electric power plants. The interchange with these agencies which is necessary for the Commission to fulfill its statutory obligations provides an immediate vehicle for the exchange of information, ideas, and concern about the Pilot Plant and solar power plants in general. The Commission's activities under this proposal will provide a participatory process for these agencies

- A report will be provided to ERDA which documents the progress and identifies the processes found to be most valuable in establishing an institutionally based credibility of solar-thermal technology in California and out-of-state

Second Goal: To establish the necessary general institutional support for solar-thermal technology.

Consequent Activities:

- Through the processes described under the previous goal, a number of institutional and social barriers to the routine placement of solar-thermal technology will be uncovered and described. An institutionally based knowledge of the state of development of the technology is not sufficient to establish the technology as a promising alternative. In the introduction of any new technology, barriers are discovered and important gaps in institutional support must be filled

The Commission staff will focus on identifying institutional changes - outside of its own regulatory procedures - which will eliminate obstacles to the speedy adoption of this technology as well as those changes needed to actively encourage it. This will involve, for example, the development of comprehensive implementation planning with public agencies, such as the Public Utilities Commission, to set forth steps by which solar-thermal technology receives maximum institutional support

- The Commission staff will identify potential non-utility applications for central receiver technology in California. This examination will also encompass the implications to the State's electricity network of on-site generation of power
- There are over 30 utilities in California which provide electricity to the State's residents and each of these utilities is a potential client for solar-thermal technology. The Commission has already invited statewide utility participation in the 10 MWe program, and will locate this participation within the broadly based task force to be described in the next section. Out-of-state utilities will be invited to participate through an interstate council, also described in the next section
- A report will be prepared for ERDA which describes the problems identified, solutions developed and the progress made in providing the necessary institutional support environment for solar-thermal technology, so that experience is conserved at the federal level and transferred to other states

c. Specific Mechanisms for Technology Transfer

The Commission proposes four mechanisms for achieving the above three goals: an on-going solar electric Task Force, an inter-state coordination council, the staff assigned by the Commission to perform specific tasks and to serve as coordinator and source of continuity over the life of the project for this work, and contractors hired for research and other specific tasks with Commission funds.

Task Force:

The primary mechanism will be a Commission-chaired task force which will be representative of the institutional and social network needed to establish a credible solar technology. (See Table II-7 for a list of groups to be represented.) This task force will be a source of ideas for the project, will identify the concerns of its members, will help to resolve those concerns, and will provide an outside on-going evaluation of the information dissemination/technology transfer work.

The prime responsibility for leading and providing continuity in the technology transfer work of the Commission and in the task force rests with the Research and Development Division of the Energy Commission. The Division Administrator, Dr. Jon Veigel, will chair the task force and will define support tasks as the project proceeds. Dr. Veigel will also be the Commission's representative on the Project Administrative Committee, and will thus serve as the authority through which the work of the task force, the Commission staff, and of various consultants is coordinated with on-going project work.

Inter-state Co-ordination Council

Commission staff will develop, with ERDA, linkages with other states and their utilities which are interested in having a role in the information dissemination/technology transfer process. The chief mechanism for this transfer effort will be

an Interstate Coordination Council on Solar Thermal Technology which will be chaired by Dr. Jon Veigel. This group will include representatives from energy-policy agencies and utilities in other states, as well as the National Association of Public Regulatory Commissions and EPRI.

Beginning in January 1978, the Commission staff will provide ERDA with a yearly report on the information dissemination/technology transfer activities and the learning which has resulted from them. These reports will serve as a detailed and integrated record of all phases of the Commission's work related to the project and will allow ERDA to distribute timely information which will be useful to efforts elsewhere to establish the institutional framework for solar-thermal technology.

Table II-7

Task Force for Information Dissemination/Technology Transfer

Chairman

Dr. Jon Veigel, Administrator of the Research and Development Division of the California Energy Resources Conservation and Development Commission

Representative of Governmental Agencies

Energy Research and Development Administration
Federal Energy Administration
California Public Utilities Commission
California Office of Planning and Research
State Legislature - two representatives, one each from the major energy committees of the California Assembly and Senate
Local Government - the planning director or planning commission member from a desert county in California

Representatives from Potential Users and Investors

Electric Power Research Institute
The investment banking community
Utilities
Large industrial users of electricity

Representatives of Outside Groups

Environmental
Business
Consumer

Persons Representing Relevant Technical Disciplines

Power plant engineering and construction company representatives
Professional engineering and scientific society representatives

I. LOCAL SUPPORT

Initial indications are that general support is quite high for siting the Pilot Plant as proposed. Evidence of this support is strongly shown by resolutions and letters of support from groups with a specific stock in the proposed site and from cities through Southern California who enthusiastically believe the development of this technology is necessary to our energy future. Following is a list of the resolutions and letters of support already received during the preparation of this proposal:

- State of California Assembly Concurrent Resolution
- San Bernardino Board of Supervisors Resolution
- Barstow City Council Resolution
- City of San Bernardino Resolution
- Barstow Chamber of Commerce Resolution
- San Bernardino Chamber of Commerce Letter of Support
- Inland Action Incorporated Letter of Support
- City of Chino Letter of Support
- City of Monrovia Letter of Support
- Fontana Area Chamber of Commerce Letter of Support
- City of Lake Elsinore Resolution
- City of Whittier Resolution
- City of Redlands Resolution
- City of El Segundo Resolution
- City of Newport Beach Resolution
- City of Montebello Resolution
- City of Perris Letter of Support

Copies of the first four listed documents are included in the following pages, followed by a brief discussion of the County of San Bernardino utility planning activities.

AMENDED IN SENATE AUGUST 23, 1976

CALIFORNIA LEGISLATURE—1975–76 REGULAR SESSION

Assembly Concurrent Resolution No. 240

Introduced by Assemblyman Chimbole

August 23, 1976

Assembly Concurrent Resolution No. 240—Relative to solar energy.

LEGISLATIVE COUNSEL'S DIGEST

ACR 240, as amended, Chimbole. Solar energy.

Urges siting of a specified solar thermal pilot plant in California

Fiscal committee: no.

WHEREAS, The Federal Energy Research and Development Administration will soon cause to be built the nation's first solar electric powerplant to be integrated into a utility network; and

WHEREAS, Several states are competing for the site for this $100 million pilot plant; and

WHEREAS, California has abundant solar resources, large electricity load centers, strong technical and industrial communities, and public and private sector leadership committed to the rapid development of solar energy across the state; and

WHEREAS, The knowledge gained from this plant will help California to speed the incorporation of this form of electricity generation into the state's mix of energy sources; and

~~WHEREAS, The California Department of Water Resources is actively engaged in seeking new energy sources to power the state's water projects, and~~

WHEREAS, The State Energy Resources Conservation and Development Commission considers the development of solar energy to be one of its principal objectives; and

WHEREAS, ~~These two agencies are~~ *This agency is* participating in a joint proposal with Southern California Edison Company and the Los Angeles Department of Water and Power to the Federal Energy Research and Development Administration to site this plant in Daggett, California; now, therefore, be it

Resolved by the Assembly of the State of California, the Senate thereof concurring, That the members hereby urge the siting of the 10MWe Central Receiver Solar Thermal Pilot Plant in California; and be it further

Resolved, That the Chief Clerk of the Assembly transmit copies of this resolution to the President and Vice President of the United States, to the Speaker of the House of Representatives, and to each Senator and Representative from California in the Congress of the United States.

O

OF SAN BERNARDINO COUNTY, CALIFORNIA

R-76-199

RESOLUTION OF THE BOARD OF SUPERVISORS
OF THE COUNTY OF SAN BERNARDINO

On motion by Supervisor James L. Mayfield, duly seconded by Supervisor Nancy E. Smith, and carried, the Board of Supervisors hereby adopts the following resolution:

WHEREAS, San Bernardino County, land of sunshine, is deeply committed to the development of both solar thermal and solar electric power as a major alternate source of energy; and

WHEREAS, solar power can be a strong alternate source of power for Southern California and greatly assist the abatement of air pollution problems in the region; and

WHEREAS, San Bernardino County has a long history of innovative programs in planning and resource management, education, citizen participation, environmental impact assessment and intergovernmental coordination; and

WHEREAS, this County adopted in December 1975, the State's first Joint Utilities Management Plan which includes energy management goals and programs, facility siting analysis maps, siting criteria, community concerns and a citizen participation program; and

WHEREAS, one of the four goals of the Joint Utilities Management Plan is to "encourage the development of alternate energy sources which have a minimum adverse effect on the environment"; and

WHEREAS, the Energy Resources and Development Administration program to build a ten megawatt electric central receiver solar pilot demonstration plant receives the highest support and commendation from the County; and

WHEREAS, San Bernardino County supports Southern California Edison, the Los Angeles Department of Water and Power, the California Department of Water Resources and the California Energy Resources Conservation and Development Commission in their joint proposal for the project; and

WHEREAS, the Siting Analysis Maps of the Joint Utilities Management Plan show the proposed site to be in an area of "least potential for adverse effects";

BE IT THEREFORE RESOLVED that San Bernardino County strongly recommends that the County and the proposed site twelve miles east of Barstow be utilized for the project; and

BE IT FURTHER RESOLVED that San Bernardino County will fully commit staff resources to cooperating on this project in the areas of planning, environmental assessment, citizen participation, procedural review monitoring and transfer of knowledge programs.

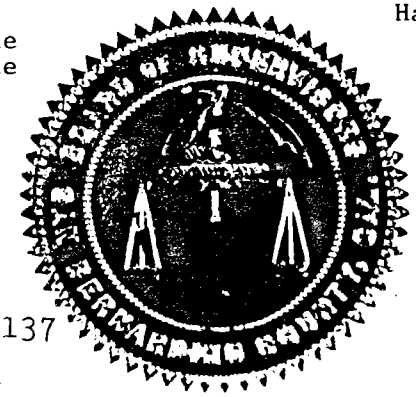
PASSED AND ADOPTED by the Board of Supervisors of the County of San Bernardino, State of California, by the following vote:

AYES: SUPERVISORS: Mayfield, Mikesell, Townsend, Smith, Hansberger

NOES: SUPERVISORS: None

ABSENT: SUPERVISORS: None

Dated: August 9, 1976



The City of
BARSTOW
California

● City Clerk

RECEIVED
AUG 19 1976
RLM

August 17, 1976

Mr. Richard L. Maullin, Chairman
State Energy Resources Conservation and
Development Commission
1111 Howe Avenue, Meeting Room 620, Bldg. 600
Sacramento, California 95825

Dear Mr. Maullin:

Following up on my telegram of this date, enclosed is a certified copy of Resolution No. 1908 which was adopted on August 16, 1976 regarding siting of a Solar Thermal Electrical Power Plant pilot project. Our City Council endorsed this pilot project enthusiastically and it is our sincere hope that the Coolwater Generating Facility at Daggett will be the site selected.

Sincerely yours,

Betty Rowe

(Mrs.) Betty Rowe, CMC
City Clerk

enclosure

220 East Mountain View Avenue • Barstow, California 92311 • Phone (714) 256-3531

RESOLUTION NO. 1908

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF BARSTOW REGARDING SITING OF SOLAR THERMAL ELECTRICAL POWER PLANT PILOT PROJECT

WHEREAS, the nation is actively involved in exploring and developing alternative means of energy production, and

WHEREAS, the State of California Energy Resources Conservation and Development Commission, in conjunction with the Los Angeles Department of Water and Power, Department of Water Resources and Southern California Edison have submitted to the Federal Energy Research and Development Administration a proposal for the siting of a 10 megawatt solar thermal electrical power plant pilot project, and

WHEREAS, said project would be located in conjunction with the Coolwater Generating facility and related grid system lying within the greater Barstow area, and

WHEREAS, the proposed facility would provide valuable energy research for national energy planning, as well as focusing social environmental and economic interest regarding this potential in the Barstow area,

BE IT THEREFORE RESOLVED that the Barstow City Council not only endorses this project but stands willing to actively participate in its implementation and development in whatever appropriate means possible.

ADOPTED THIS 16TH DAY OF August, 1976

George E. Goldsmith
Mayor of the City of Barstow

I, BETTY ROWE, City Clerk of the City of Barstow, DO HEREBY CERTIFY that the foregoing resolution was duly adopted by the City Council of said city and was approved at a regular meeting held on the 16th day of August, 1976 and that it was so adopted as follows:

AYES: Councilmen Keller, Padilla, Vigil, Gilliam and Mayor Goldsmith

NOES: None

ABSENT: None

Betty Rowe
City Clerk

A RESOLUTION OF THE CITY OF SAN BERNARDINO URGING THAT THE PROPOSED SITE, TWELVE MILES EAST OF BARSTOW BE AUTHORIZED FOR THE TEN MEGAWATT SOLAR ELECTRIC DEMONSTRATION PLANT BEING FINANCED BY THE FEDERAL ENERGY RESOURCES AND DEVELOPMENT ADMINISTRATION.

WHEREAS, The Energy Resources and Development Administration plans to build a 10 megawatt electric central Receiver Solar Pilot Plant and is requesting proposals for a site; and

WHEREAS, the State of California, through the State Energy Commission is co-sponsoring a proposal with Southern California Edison Company, the Los Angeles Department of Water and Power, and the California Department of Water Resources; and

WHEREAS, the proposed site is in the County of San Bernardino, about twelve miles east of Barstow, at the existing Coolwater Facility; and

WHEREAS, the County of San Bernardino has adopted the State's first Joint Utilities Management Plan one goal of which is to encourage development of alternate energy sources which have minimal adverse environmental effects; and

WHEREAS, the area of the proposed site has been determined to be one of "least potential for adverse effects";

NOW, THEREFORE, BE IT RESOLVED THAT THE MAYOR AND COMMON COUNCIL OF THE CITY OF SAN BERNARDINO urge the Federal Energy Resources and Development Administration to accept the State of California joint proposal and that the proposed site twelve miles east of Barstow be utilized for the project.

Dated this 16th day of August, 1976

Lucille Bostwick by Shawna Clark, Deputy
City Clerk

Mayor of the City of San Bernardino

LOCAL SUPPORT

The County of San Bernardino has the greatest local government responsibility for permitting of the project and will be the lead agency in preparing the California Environmental Impact Report.

The County of San Bernardino has a history of active and intelligent involvement in energy issues. The County has recently adopted a Joint Utilities Management Plan (JUMP) which is a policy document for the Board of Supervisors, the Planning Commission and any State agency with energy authority in the County. The Plan includes siting analysis maps based on an exhaustive list of environmental and social criteria. The plan was developed by County staff and a Committee of volunteer citizens from diverse backgrounds, including the mayor of Barstow, over an 18-month period. Adopted in December 1975, the Plan has already been used to review several energy projects. The Plan is enabling the County to site energy facilities with a minimum of adverse impacts and ensure enlightened review of projects by citizens and local government.

The Plan has as one of its major goals the encouragement of the "development of alternate energy sources which have a minimum adverse effect on the environment." This goal is made operational through a number of policies designed to encourage the use of solar heating and cooling devices in the County and by a policy which specifically commits the County to active involvement in demonstration projects for alternative energy production methods. A recent result from the JUMP Committee efforts was a Solar Symposium held in the County which attracted over 850 people to a day of demonstrations, speeches and information sharing about solar energy.

The County has a highly skilled staff which has received a number of national awards for planning and environmental work. Last year the National Association of Counties

cited San Bernardino County for having the best environmental review process in the nation--one which combines thorough review and citizen participation with efficiency of operation.

The County has also received a National Association of Counties Award for being the first County in the nation to have an air quality plan which integrated air quality emission characteristics with land use planning. The County documented their efforts in producing this plan in such a way as to transfer their knowledge to other professional planners.

Thus, the County has had successful experience with the kind of the regulatory and environmental review work required for the Pilot Plant.

The County also has a history of successful inter-governmental relationships. They work continuously with the Bureau of Land Management. Recently the Bureau completed desert planning work in the area which recommended an off-road vehicle policy. The County has since adopted an ordinance based on this plan to regulate off-road vehicles.

J. Labor Availability

The availability of personnel necessary to carry out the major tasks associated with the proposed effort is discussed in this section. Also, it is expected that because of excellent labor availability, sufficient manpower will easily be available for the entire Pilot Plant effort.

1. Post Site Selection Work

The background technical and environmental work associated with this task will require small teams of engineers, technicians, and environmental specialists. The maximum number of people involved in these activities at any one time will be approximately 10. The Program Participants have highly qualified specialists who will perform most of these activities.

2. Design and Construction

a. Design

The majority of the labor associated with balance-of-plant design will include draftsmen, designers and engineers. These personnel will be employed either by the Program Participants or by an Architect-Engineering company as a subcontractor. It is anticipated that the peak personnel level during design will be 20 to 30 people.

b. Construction

The availability of manual labor for construction of the entire pilot plant was investigated as a part of the preferred site selection process. The ease of access to a large labor pool was considered to be a necessity, as well as some knowledge of the make-up of that pool. A study of the labor unions having jurisdiction in the site area was conducted and

a listing of the crafts, together with their approximate local memberships, is shown in Table II-8.

The expected on-site construction manning for the total plant is as yet undetermined pending final design of the overall Pilot Plant, but a peak manning requirement of less than 500 men would seem to be a very safe assumption. Based on that figure, the labor pool is judged to be easily sufficient. Also, at the time construction on the Pilot Plant begins, Edison will have just completed a 474 MW oil fueled generating station project at the Coolwater site with a peak manual manpower requirement of approximately 600. The information gained during that project will provide a basis for planning to alleviate any unforeseen labor shortages.

Table II-8

Craft Labor Pool For Site

Craft	Disptaching Local	Approximate Membership
Asbestos Workers	Local 5 Los Angeles	375
Boilermakers	Local 92 Southgate	3600
Bricklayers	Local 20 San Bernardino	500
Carpenters	Local 944 San Bernardino	1200
Cement Masons	Local 97 Colton	450
Electricians	Local 477 San Bernardino	675
Iron Workers:		
Reinforcing	Local 416 Los Angeles	2000
Structural	Local 433 Los Angeles	4000
Laborers	Local 783 San Bernardino	1600
Linemen	Local 47 Whittier	450
Millwrights	Local 113 San Bernardino	350
Operating Engineers	Local 12 District 5 Colton	3000
Painters	Local 775	300
Piledrivers	Local 2375 Wilmington	1200
Pipefitters	Local 364 Riverside	500
Sheet Metal Workers	Local 509	360
Teamsters	Local 166	480

K. Small Business Participation

Edison, as Project Manager, will utilize small local business participation to the extent it is economically efficient for the engineering and construction of the non-solar portion of the Pilot Plant. These small businesses will principally come from the Barstow and Victorville Communities. These businesses will be, where appropriate and economically efficient, contracted to provide various material, equipment and services. As examples of the type of businesses contemplated, the current expansion project for the Coolwater Generation Station is already using similar local businesses such as concrete suppliers, hardware stores, lumber companies, office supply stores and certain maintenance services. These same type businesses will be used on the proposed project. In addition to those businesses, it is anticipated that many others will be affected such as motels, service stations, restaurants, etc.

CHAPTER III

COMMERCIAL INFORMATION

A. Cost Summary

1. Total Cost

Table III-1 presents a summary of the cost estimate which serves as a basis for this proposal. A detailed discussion of the estimate and a description of the design assumptions is contained in Section B of this chapter.

Table III-1 shows that the total cost of the non-solar portion of plant is estimated to be [redacted] Additional services and material result in a total proposal value of [redacted]

2. Cost Sharing

The Program Participants will share the cost of the total proposal value indicated above. ERDA then fund the entire cost of providing the solar portion of the plant except control systems management, startup management and such other minor items as described in this proposal.

The Program Participants propose to perform operation and maintenance of the entire Pilot Plant and share the cost of this activity with ERDA. It is proposed that two of the Program Participants (Edison, Los Angeles) fund [redacted]

Table III-1

Proposal Estimated Cost Summary

Non-Solar Portion of Plant:

Item
Turbine Generator
Cooling Towers
Condenser
Water Treatment
Civil Buildings
Mech. Equipment
Piping and Valves
Inst. and Control
Electrical Equipment
Engr./Startup/Project Management
Sub-Total
Escalation
Total Non-Solar Portion of Plant Capital Cost

Participant Activities on Solar Portion:

Overall Startup Management
Overall Controls Coordination
Total Solar Portion Activities

Other Program Costs:

Participant Services
Land Value
Construction Overheads
Operation and Maintenance (max for 5 years)
Total Other Program Costs
Total Proposal Value

B. COST DETAIL

1. Cost Estimate

The cost estimate for the non-solar plant portion is based on preliminary design data given later in this section. Equipment manufacturers were consulted to obtain estimates for major equipment such as the turbine-generator, cooling tower, and transformers. Site sensitive items such as site preparation, water supply, security, and equipment parameters were based on Edison's information gathered in preparation for the construction of Coolwater Units 3&4 which is currently underway.

For purpose of this proposal, the interface with the solar portion of the facility has been defined as the solar receiver side of the main steam stop valve. The estimate includes the supply and installation of all equipment and systems necessary for electric power generation with steam from either the solar receiver or the thermal storage source. In addition, space has been included in the control building for the solar control equipment. Water supply (both make-up and service) is included for the entire plant. If it is ERDA's desire, at a later date these interface points might be changed.

The estimate is based on the use of union labor from the immediate site vicinity and it uses the wage rates currently in effect in the applicable labor agreements. No specific productivity adjustments for the site have been included based on our experience with installation rates at Coolwater. No remote project housing has been included due to the site's relative proximity (12 miles) to the city of Barstow, California which would provide sufficient living facilities for the construction labor force. Also, due to the accessibility to a railroad and to the interstate highway system, it was not

necessary to allow for special freight charges on incoming equipment. All estimates for balance-of-plant equipment and material include estimates on the basis of being subject to California State Sales Tax.

The estimate for the base proposal contemplates design and start-up by Edison personnel with construction management of the various contractors also by Edison. Projected costs of obtaining the permits and licenses required for construction of the facility are included. The estimated costs of Edison managing overall plant startup and control system coordination are included in the base proposal.

The estimated cost of the offeror's base proposal is based on 1976 costs with escalation shown separately. The time frame for the escalation costs reflects a 1980 operating date for the pilot plant. The escalation provisions used are based on Bureau of Labor Statistics indices judged to be most representative of the work included. Projections of these indices were provided by the Edison Economics Department and based on those figures it is estimated that an escalation rate of 8.1% is representative.

Figure III-1 is Form 633 provided by ERDA as an equivalent to the unavailable GSA Optional Form 60 called for in the PON. It should be noted that this form shows a total proposal value [redacted] which includes an [redacted] in operating and maintenance costs.

2. Design Assumptions as an Estimate Basis

The cost estimate provided in this proposal for the non-solar balance-of-plant is based on the plant description and design assumptions in the following sections.

Inasmuch as the basic purpose of the Pilot Plant is to demonstrate the technical and economic feasibility of the solar option, the non-solar balance-of-plant portion will incorporate no innovations and/or the utilization of equipment for which there is little or no domestic experience. Equipment will be conventional and standard for electric utility industry practice.

a. Plant Size

The basic sizing criteria developed for the Pilot Plant is for the generation of 10 MW of net electrical power on a clear day at 2 PM winter solstice, when drawing energy solely from the thermal receiver system, with no excess thermal energy available at that time for thermal storage charging. Considering this basic criteria, therefore, a surplus of thermal energy will exist during all other times of the year. This surplus thermal energy may be utilized for thermal storage charging, or it may be utilized to generate additional electrical energy. The maximum thermal energy availability exists on a clear day at summer noon, and if at that time thermal storage is fully charged, additional electrical energy will be generated.

The true design point for sizing equipment is therefore the generation of electrical power on a clear day at noon in summer, when drawing energy solely from the thermal receiver system, with no requirement for thermal storage charging.

b. Solar Portion Assumptions

The short time frame afforded by the PON necessitated basing a substantial part of this proposal on previous preliminary design activities. The preliminary design of the McDonnell Douglas Astronautics Company was used, although such use does not indicate a preference over other designs.

c. Plant Cooling

In their preliminary work, McDonnell Douglas assumed a plant would utilize an air-cooled condenser. Steam and feedwater flows and equipment sizes were established on this basis. The Proposing Parties recommend and offer utilizing an evaporative cooling system in lieu of an air-cooled condenser for the following reasons:

(1) Evaporative cooling is a well established technology and, therefore, does not increase the technological risk of the project. Air cooling on the other hand is a relatively unproven technology.

(2) Evaporative cooling provides better plant efficiency because it produces a lower turbine backpressure than air cooling. Better efficiency equates to lower heat input and fluid flow rates to achieve the 10 MW net electrical output. Therefore, evaporative cooling will result in smaller and less expensive equipment in both the solar and non-solar portions and less total heliostat area required.

(3) Adequate cooling water is available at the proposed Coolwater site for evaporative cooling.

(4) Evaporative cooling requires less auxiliary power than air cooling, thereby reducing costs for both the solar portion and balance-of-plant to produce a given net electrical output.

d. Plant Auxiliary Power Requirements

The plant auxiliary power requirements are based on conservative estimates. It is expected that the definitized requirements will be somewhat lower.

e. Plant Orientation

The orientation of the non-solar portion on the plant site is totally dependent on the required solar portion orientation, arrangement and configuration. Orientation does affect plant cost and, of course, performance. The Program Participants intend to work closely with ERDA in defining the required solar portion orientation and arrangement, and thereby develop the non-solar portion orientation and arrangement.

f. Plant Performance and Operating Modes

The plant will operate in several modes. Performance in each of these modes will vary depending on the solar thermal input, the condition of the thermal storage system and the turbine backpressure, as applicable. Since each of these are continuous variables, the plant performance can only be predicted when the end points of the variable ranges are chosen as design points. When this is done, several performance points can be established as follows:

(1) Normal Solar Operation

Normal solar operation will be achieved when the absorbed thermal power at the receiver is sufficient to generate electrical power at the rate of 11.7 MW gross, or 10 MW net. This condition will occur on a clear day at 2 PM winter solstice, and the steam conditions at the turbine-generator inlet will be a flow of 106,000 lb/hr at a pressure of 1465 psia and temperature of 950°F. The turbine cycle heat

rate at a back-pressure of 2.75 in. Hg/abs. will be 9824 Btu/KWH. Under this mode of operation, approximately 25 percent of the steam flow to the turbine will be extracted from intermediate stages for feedwater heating.

At any time that the absorbed thermal power at the receiver exceeds that required to generate the basic criteria net electrical output, the generation will increase correspondingly. The maximum condition will occur on a clear day at summer noon, and electrical power will be generated at the rate of 14.1 MW gross, 12.3 MW net.* Steam conditions at the turbine-generator inlet at this point will be a flow of 133,000 lb/hr at a pressure of 1465 psia and temperature of 950°F. The turbine cycle heat rate at a back-pressure of 5 in. Hg/abs. will be 10,228 Btu/KWH.

When the absorbed thermal power at the receiver, and therefore the maximum electrical power generation capability at that condition, exceeds that required by the Program Participants' transmission system load requirements, and if the thermal storage is in need of charging, normal operation will be simultaneous generation of electrical power and charging of thermal storage. The flow of steam will be split, under the control of the operator, a portion directed to the turbine-generator to satisfy the system load requirements, and the balance directed to thermal storage.

(2) Low Solar Power Operation

This mode of operation exists when the absorbed thermal power at the receiver is insufficient to produce the required steam conditions at the turbine-generator inlet to

*This potential establishes the nominal sizing of the turbine-generator as 15 MW gross electrical output.

generate electrical power at the rate of 11.7 MW gross, or 10 MW net. At that time, depending on the Program Participants' transmission system load requirements, the electrical power generated can be increased by supplementing the insufficient thermal receiver system steam flow to the turbine-generator with steam from the thermal storage system.

During this mode of operation, all steam produced in the thermal receiver system will be introduced into the turbine through the high pressure admission port, and the steam produced in the thermal storage system is introduced into the secondary admission port. Feedwater from the deaerator will be split for return to the thermal receiver and thermal storage systems in the same proportion as the steam production in these systems.

(3) Intermittent Cloudiness Operation

During periods when there are excessive transients in insolation due to intermittent or opaque cloud cover, all of the absorbed thermal power at the receiver will be directed to the thermal storage system. At this time, the turbine-generator will be operated solely with steam produced in the thermal storage system, introduced into the secondary admission port. Generation of electrical power under this mode will be at the rate of 7.85 MW gross, or 7 MW net.

The steam conditions at the turbine-generator inlet under this mode of operation are identical to the conditions under the mode of extended operation, and are discussed below.

(4) Extended Operation

During periods when the thermal receiver system is incapable of producing steam, such as during nighttime hours, and the thermal storage system is sufficiently charged, electrical power will be generated in the extended operation mode.

At this time, the turbine-generator will be operated with steam produced in the thermal storage system, introduced into the secondary admission port. Generation of electrical power under this mode will be the same as under the mode of intermittent cloudiness operation; 7.85 MW gross, or 7 MW net. When the thermal storage system is fully charged, Pilot Plant operation can be extended up to 6 hours, as required by transmission system load requirements. Conditions at the secondary inlet port of the turbine-generator will be a flow of 105,000 lb/hr at a pressure of 385 psia and temperature of 525°F. The turbine cycle heat rate at a back-pressure of 2.5 in. Hg/abs. will be 14,392 Btu/KWH.

(5) Thermal Storage Charging Operation

The thermal storage charging operation is defined as the delivery of all absorbed thermal power at the receiver, to the thermal storage system without concurrent generation of electrical power. This may be accomplished at any time during daylight hours to satisfy an expected peak load requirement for an extended period after sunset; however, when required, it will normally be accomplished in the morning hours by delaying startup of the non-solar portion. This mode of operation will also be employed during normal Pilot Plant startup activities until high quality steam is available from the solar receiver system for powering the turbine-generator. A significant advantage of this mode of operation is that, because the turbine-generator is not in operation, the solar portion systems can accept severe insolation transients.

g. Water Treatment

The plant will be equipped with water treatment systems for both makeup and feedwater.

The makeup water will be treated with flocculating materials and coagulant aids and softened by the lime-soda process. It will then be filtered to remove suspended material. Final treatment will be carried out in an evaporator.

The feedwater treatment system will incorporate a full flow in-line condensate polishing demineralizer. This is a requirement in the McDonnell Douglas design which uses a once-through steam generator. It is desirable on drum-type steam generators because of the frequent outages and the resulting tendency for piping and equipment to corrode and develop oxide scale.

h. Turbine-Generator

The turbine will be rated at 15,000 KW, operating at 3600 rpm. It will be of the condensing, non-reheat type, with a single automatic primary admission port, designed for inlet steam conditions of 1465 psia and 950°F, with a mechanical-hydraulic control system. There will be three extraction points for feedwater heating, and the single automatic secondary admission port for 385 psia steam will allow for operation from thermal storage.

The turbine scope of supply will include a turning gear system, lube oil reservoir, two lube oil coolers with copper-nickel tubes and Muntz metal tubesheets, AC and DC oil pumps, and the normal complement of accessories, features and appurtenances.

The generator will be of the synchronous, air-cooled type, rated at 18,750 KVA, and operating at 3600 rpm, three phase, 60 Hertz, 0.80 power factor, 13,800 Volts, and 0.58 short circuit ratio. The static excitation system will include

voltage regulator and excitation cubicle. The generator air coolers will be corner mounted, with copper-nickel tubes and Muntz metal tubesheets.

i. Condenser

The condenser will be the surface, single-pass type, with approximately 10,000 sq. ft. of the tube surface, approximately 11,000 gpm of circulating water flow, and approximately 100,000 lb/hr steam flow. As a result of the Program Participants and ERDA working closely together during the preliminary and final design stages, there will be established the steam and feedwater conditions and flow rates for the turbine-generator to produce the basic criteria net electrical output, when the turbine is operating under the lower back-pressures associated with water-cooled surface condenser application. At that time, the entire circulating water system, consisting of condenser, circulating water pumps, cooling tower and circulating water conduits will be optimized. The results of the optimization will define the condenser parameters, including tube length and material, size, gauge, and condenser surface area.

The condenser scope of supply will include condensate pumps, vacuum pumps and/or steam jet air ejectors, and the normal complement of accessories, features and appurtenances.

j. Cooling Tower

The cooling tower, which will be optimized as part of the circulating water system, as indicated above, will be a two-cell unit of treated fir with PVC fill. Air circulation will be mechanical draft.

k. Low Pressure Heater

The low pressure feedwater heater will be the U-tube type with integral drain cooler. The shell will be carbon steel, with stainless steel or carbon steel tubes, and carbon steel tubesheets.

l. Deaerator

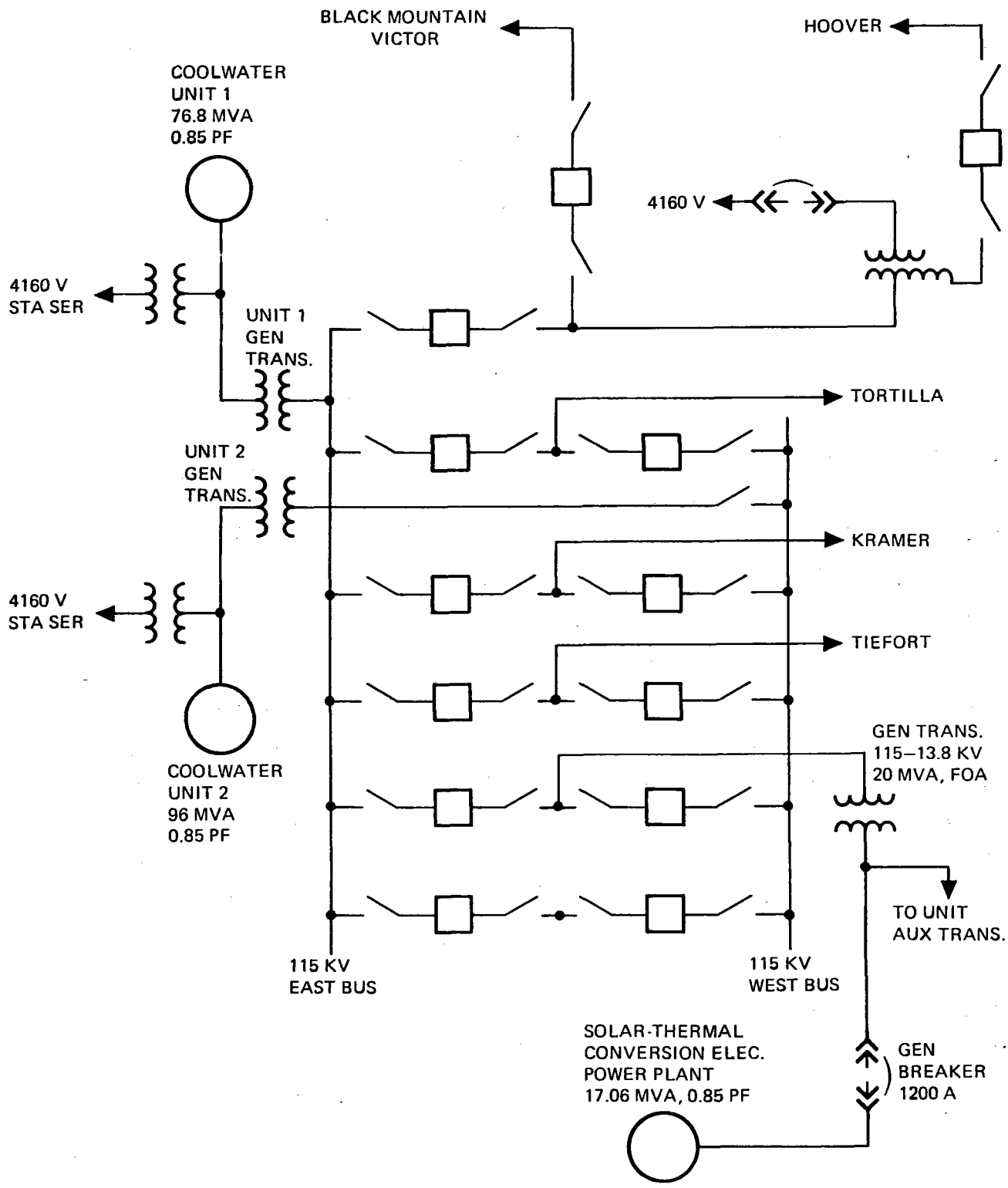
The feedwater deaerating heater will be the spray-tray type with internal vent condenser. The shell will be carbon steel, with stainless steel trays. The storage tank will be sized for 10-minutes operation at rated flow.

m. High Pressure Heater

The high pressure feedwater heater will be the U-tube type with integral drain cooler. The shell, tubes and tube-sheets will be carbon steel. Tube-to-tubesheet joints will be welded.

n. Switching Substation

The proposed plant will utilize the existing 115 kv Coolwater Switching Substation. The substation is located approximately 1-1/2 miles southwest of the Pilot Plant site and is adjacent to the west end of the Coolwater Generating Station. The substation includes power circuit breakers, disconnect switches, transformers, and overhead buses. The Pilot Plant will be connected to the substation buses in a double bus-double breaker configuration as shown in Figure III-2. The substation is connected to the generator step-up transformer with an overhead 115 kv transmission line.



10 MWe SOLAR PILOT PLANT

ELECTRICAL SUBSTATION
ARRANGEMENT

FIGURE III-2

o. Onsite Power System

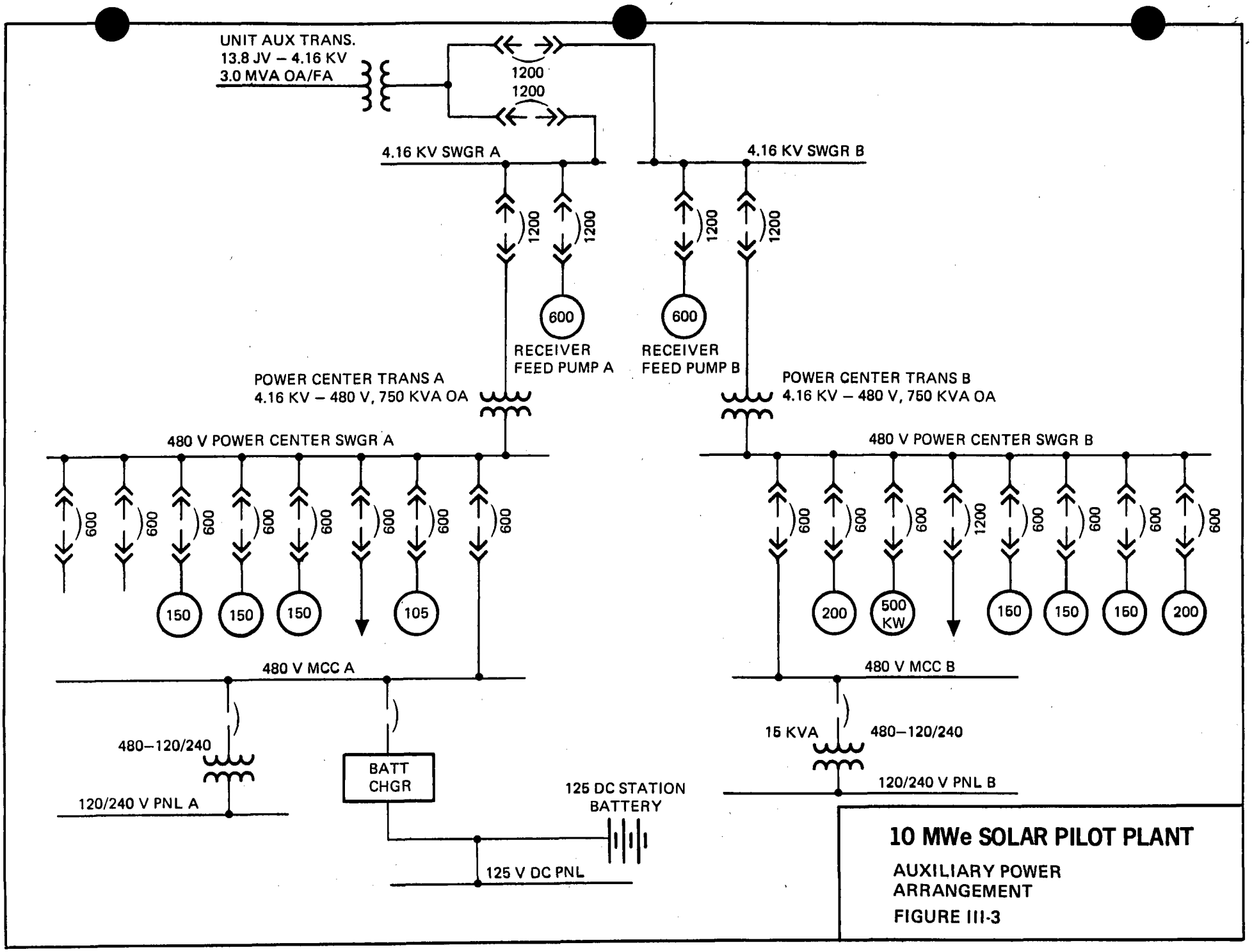
The power plant generator will be rated 18.75 MVA, 13.8 kv, 60 Hz, .80 p.f., 3 phase, 3600 PRM, will be air cooled with pumped oil lubrication, and static excitation system.

The generator step-up transformer will be a 3 phase, outdoor type, oil-immersed self-cooled, rated at 20 MVA, 13.81-115 kv. The transformer will be delta connected on the primary (low voltage) side and wye connected on the secondary (high voltage) side.

A generator breaker will be provided between the generator and the connection to the generator step-up transformer and the unit auxiliary transformer. This breaker will enable the unit auxiliary transformer to be energized from the 115 kv switching substation through the generator step-up transformer during startup of the unit and also under emergency shut-down conditions. The generator breaker will be also used to synchronize the generator to the system and is rated at 1200 amperes, 13.8 kv, 200 MVA.

The 4.16 kv distribution system will consist of a unit auxiliary transformer and two 4.16 kv bus sections and metal-clad switchgear as shown in Figure III-3. The unit auxiliary transformer will be 3 phase, 13.8-4.16 kv, 3 MVA, oil-immersed self-cooled and will be wye connected on the low side and delta connected on the high side. Each 4.16 kv bus section will be connected to the unit auxiliary transformer through a 1200 ampere, 75 MVA, main circuit breaker. The 4.16 kv metal-clad drawout switchgear will feed all loads greater than 200 hp and the 480 volt power center transformers.

The 480 volt distribution system will consist of two power center transformers, two power center switchgear, two



10 MWe SOLAR PILOT PLANT

AUXILIARY POWER
ARRANGEMENT

FIGURE III-3

motor control centers, and a diesel engine generator. The power center transformers will be rated 4.16 kv - 480/277 volt, 750 kva, oil-immersed self-cooled and will be delta connected on the high side and grounded wye connected on the low side.

Each transformer will feed a 480 volt power center switchgear. The switchgear will be low voltage metal enclosed type with drawout power circuit breakers. The power center switchgear will feed all loads 50 to 200 hp and the 480 volt motor control centers.

The 480 volt motor control centers will consist of grouped motor control and feeder compartments. They will supply loads up to 50 hp and feed the 120/240 volt panelboards through two 480-120/240 volt single phase transformers.

125 volt dc station battery system will be provided to carry emergency dc shutdown loads. It also will provide power for dc controls required for the operation of the 4.16 kv switchgear circuit breakers and the 480 volt power center switchgear circuit breakers. The battery voltage will be maintained by a charger fed from the motor control center.

p. Miscellaneous Equipment and Materials

In addition to the above, the following equipment and materials will be provided for the plant.

- Circulating water pumps
- Circulating water system makeup pumps
- Evaporation pond for cooling tower blowdown
- Oily waste sump, including separator and sump pump
- Turbine steam moisture separators

- Turbine lube oil system, including storage tanks, centrifuge, filter pump and transfer pump
- Turbine gland seal steam leakoff system, including drain tank and pumps
- Condensate storage tanks and transfer pumps
- Thermal receiver system feedwater pumps
- Thermal receiver system feedwater booster pumps
- Thermal receiver steam flash tank
- Makeup water treatment system, including clarifier and pumps, flocculant feed pumps, sand filters, caustic and acid storage tanks and feed pumps, evaporator and transfer pumps
- In-line condensate polishing demineralization system
- Ammonia and hydrazine mixing tanks and feed pumps
- Service air system, including compressors, air receiver and aftercoolers with copper-nickel tubes and Muntz metal tubesheets
- Instrument air system, including compressors, air receivers, intercoolers and aftercoolers with copper-nickel tubes and Muntz metal tubesheets, dryers, and prefilters and afterfilters
- Bearing cooling water storage tank, heat exchangers with copper-nickel tubes and Muntz metal tubesheets, and pumps
- Potable water system, including storage tank, pumps, filters, chlorinator and heater

- Service water storage tank and pumps
- Various drainage sumps and sump pumps
- Fire protection system, including pumps, hydrants and hose carts
- Feed pump for auxiliary electric boiler
- Centralized control room for the non-solar portion, with area provided for the solar portion controls
- Distribution panels for various voltages
- Generator circuit breaker, surge protection and grounding cubicles
- Steam piping from thermal receiver system, ASTM A335 Grade P11, 1-1/4 CR - 1/2 MO
- Steam piping from thermal storage system and feedwater piping to thermal receiver and thermal storage systems, ASTM A106 Grade B

Even during periods of good weather, the plant will go through a daily cycle of startup and shutdown. To maximize the utilization of the plant, the startup time must be minimized by incorporating the following features into the design:

(1) Sealing and Blanketing Steam

Provision will be made to supply blanketing steam to the feedwater heaters and turbine and sealing steam to the turbine glands. This will prevent the ingress of air and keep the turbine warm during short outages. Aside from minimizing the startup time, this will also reduce the tendency for the equipment and piping to scale and corrode.

Sealing and blanketing steam will normally be provided by the thermal storage system. A small auxiliary electric boiler will provide the steam when not available from the thermal storage system.

(2) Turbine Turning Gear

The turbine will be provided with turning gear in accordance with normal design practice. As soon as the turbine is removed from service and is still quite hot, it is important that the turning gear keep the rotor moving slowly to prevent its taking a permanent set. When the turbine has cooled sufficiently, the turning gear can be disengaged without risking permanent damage to the turbine. Because the turbine will be kept warm during outages, the rotor can temporarily bow if the turning gear is not used continuously. A temporary bow can be removed by running the turbine at low speed for a period of time before proceeding to synchronous speed; however, this will add to the time required for startup. Therefore, the turning gear will be used continuously during short outages.

C. General Information

As required by the PON, this section includes discussions of the following:

- Description of Program Participants
- Program Participants primary contracts
- What, if any, Government property is desired
- Plans for commercial use of technology
- Plans for continued use of the Pilot Plant
- Decommissioning of the Pilot Plant

1. Description of Program Participants

The principal entities who are parties to the effort proposed are Southern California Edison Company (Edison), Los Angeles Department of Water and Power (Los Angeles) and, the California Energy Resources Conservation and Development Commission (Commission). The Commission is not financially participating in providing the non-solar portion of the plant or its operation or maintenance. As discussed in Chapters I and II Edison will act as the Program Director and agent for the parties in the proposed work.

The energy generated by the Pilot Plant will be delivered through the Edison transmission and distribution system which is interconnected with Los Angeles and others. Energy will be shared by Edison and Los Angeles in proportion to their financial participation, with Edison receiving 80 percent and Los Angeles receiving 20 percent.

The following paragraphs present a description of each of the Program Participants.

Information regarding the Program Participants financial condition may be found in Section G of Chapter II.

a. Southern California Edison Company

Southern California Edison Company (Edison) is an investor owned electric utility which serves over 7.5 million people in an area of Southern California covering about 50,000 square miles. Edison is owned by over 170,000 shareholders and employs about 13,000 people.

Edison has over 13 million KW of generating capacity made up of the following: Hydro-electric, 8%; Gas- and Oil-fueled, 70%; Coal- and Nuclear-fueled, 15%; other 7%. These generating sources are connected to Edison customers and other utility systems by over 9,000 miles of transmission lines and 38,000 miles of distribution lines. Edisons's peak electrical demand in 1975 was over 10 million KW.

In 1975, Edison customers consumed over 51 billion kWh of electrical energy. Table III-2 below summarizes the mix and cost of fuel sources Edison employed in order to meet its customers' needs.

Table III-2

Edison Use and Cost of Energy Resources, 1975

Energy Source	Percentage of Energy by Source	Average Cost per kWh	Total (000)
Oil	46	2.64c	$675,908
Coal	14	.33	25,059
Purchased Power	14	.75	55,983
Natural Gas	13	.89	63,178
Hydro	8	--	--
Nuclear	5	.18	4,698
Total	100	1.50c	$824,826

Edison's operating revenues for 1975 were over $1.6 billion. The sources of these revenues are listed below in Table III-3.

Table III-3

Edison Source of Revenue, 1975

Customer Class	Percentages
Residential	34
Commercial	25
Industrial	23
Public Authorities	9
Resale	6
Agricultural	2
Other	1
	100

b. Los Angeles Department of Water and Power

The Los Angeles Department of Water and Power is the nation's largest municipal utility, serving over 2.5 million people in the City of Los Angeles. The Department employs over 11,000 people.

The Department has about 5.7 million kW of generating and resource capacity made up of the following:

Hydro-electric 23%; Gas- and Oil-fueled, 60%; Coal-fueled, 11%; Purchases and transfers, 6% net. These generating sources are connected to the Department's customers and other utility systems by 2,160 miles of transmission lines and 14,284 miles of subtransmission and distribution circuits. The Department's peak electrical demand in 1976 was over 3.8 million kilowatts.

During the year ending June 30, 1976, the Department's customers consumed over 15 billion kWh of electrical energy. Table III-4 below summarizes the mix of fuel sources the Department employed to meet its customers needs, and Table III-5 presents the sources of revenues.

Table III-4

Los Angeles Use of Energy Resources,
year ending June 30, 1975

Energy Source	Percent Use
Purchased	33
Oil	32
Coal	13
Natural Gas	12
Hydro	10
Total	100

Table III-5

Los Angeles Sources of Revenue,
year ending June 30, 1975

Customer Class	Percentage
Residential	34
Commercial	44
Industrial	17
Public Authorities (including Water System)	4
Other Utilities	1
	100

c. California Energy Resources Conservation and Development Commission

The State Energy Resources Conservation and Development Commission was created by the California Legislature in 1974, and consists of five, full-time members appointed by the Governor. Its budget for the current fiscal year is $13 million.

The Commission has duties in the forecasting and assessment of energy needs, energy conservation, research and development of alternate energy sources, and approval of power plant sitings.

The Energy Assessment Division forecasts California's energy requirements, predicting how much the state will use of the various energy forms. It will then analyze the impact of these energy requirements on California's economic structure. The division will also ensure that environmental considerations are incorporated into the Commission's decisions.

The Conservation Division establishes regulations to slow the growth rate of energy use. The Commission has adopted regulation certifying intermittent gas ignition devices to replace pilot lights in new cooking ranges, clothes dryers, forced air central furnaces, wall heaters, and swimming pool heaters. The Commission has also adopted energy conservation standards for new commercial, industrial, and public buildings in California. The division is looking at ways to encourage use of more efficient appliances, to restrict promotion that encourages more energy use, and to require improvements in building design and insulation. The Research and Development Division is charged with accelerating the development alternates to fossil fuel particularly solar and geothermal. It will help develop these new sources to the point of commercial viability.

GENERAL INFORMATION

The Energy Facilities Siting Division weights the technological and environmental advantages and disadvantages of all new proposed thermal electric facilities over 50 MWe in size, except those for which construction is planned to begin between now and January of 1978.

The Public Advisory Office encourages public participation in commission activities by seeing that interested parties and the general public have notice of all commission meetings and hearings. It also suggests ways for such groups and the general public to participate in commission proceedings. The division also does research in the areas of conservation and efficiency, transportation, fuels and utility systems. One quarter of the Division's current budget of $3.9 million is being spent on solar projects.

The Office of Governmental Affairs promotes communication between local, state and federal government agencies concerned with energy. Specific priorities include identification and contact with those directly involved with local energy distribution such as municipal and private electric utilities. Second, it maintains a roster of federal and local government employees involved with energy problems and assists local governments in coordinating their activities with those of the commission. Third, it is studying local rules and regulations that may interact with commission work. Fourth, it provides coordination with the Department of Finance, Resources Agency and the Governor's Office on energy questions of mutual concern. Fifth, it analyzes and makes recommendations to the commission on proposed legislation.

Thus, the Commission provides a single agency focus within State government for energy planning, siting, and the development of new energy sources. It has a specific mandate to encourage public participation in all of its work.

2. Primary Contact

Southern California Edison Company will manage the work outlined in this proposal. Any comments or questions by ERDA personnel regarding the business or technical aspects of the proposal should be directed to the Program Director, Mr. J. Lynn Rasband. Mr. Rasband's address and telephone number are

Mr. J. Lynn Rasband, Program Director
P. O. Box 800
Rosemead, California 91770
(213) 572-1096

3. Government Property Desired

No government property is needed in order to provide the work scope outlined in the proposal, with the exception of the need for ERDA to supply the entire solar portion of the Pilot Plant.

4. Purchase Price of Energy

It is proposed that the value of the electricity generated be determined based on an evaluation of the actual recorded and projected operating costs when the facility becomes operational.

5. Commercialization Plans

It is expected that the Pilot Plant will serve as a test base for subsystem and component development in support of

the expected follow-on projects in ERDAs plans leading to a prototype commercial scale solar thermal power plant. This usage of the Pilot Plant will complement work being carried out at the Albuquerque thermal test facility. During the test and evaluation period, experimental objectives will normally take precedence over routine power generation objectives, consistent with the overall objectives of ERDA in learning as much as possible from the Pilot Plant.

Operating experience gained through the Pilot Plant will be of exceptional value to the eventual commercialization of this technology. Also, experience gained in the design, manufacture and construction of components will provide direction in developing the technology as an economically feasible component of the Program Participants' power systems.

A concerted effort will be made to assure that the technology and experience is shared with others in the industry by involving them in the project. At the initiation of Edison and other utilities, the Electric Power Research Institute is setting aside funding to provide for Pilot Plant evaluation data to be analyzed and disseminated among interested utilities. The Program Participants are committed to the objective of providing for proper documentation of the project and its test results, and will work closely with ERDA, EPRI, and others to this end. In addition, the Energy Commission will be responsible for a major effort to establish technology dissemination projects serving the needs of California, as detailed in Section II-H.

6. Plant Usage

If the Pilot Plant is demonstrated to be an efficient, reliable source of electrical energy Edison reserves the right

to negotiate purchase of the solar portion from ERDA. If such a purchase takes place the Pilot Plant would be utilized as a system resource much the same way as any other generating station. If the Pilot Plant cannot be used as a firm source of power it is proposed to be decommissioned as discussed in the following section.

7. Decommissioning

Subsequent to the test and evaluation period the Program Participants may recommend to ERDA that Pilot Plant operations be discontinued. The recommendation will be based on the facility operation cost, the ability of the Pilot Plant to produce electrical energy, the value of the facility for further test and evaluation, and Edison plans for use of the site. The resulting decommissioning activities will include dismantling and salvage disposal of as much equipment and material as feasible.

Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Reply to:

DOE Solar One Project Office
Post Office Box 366
Daggett, CA 92327

Mr. Joseph N. Reeves
Program Manager, Solar One
Research and Development
Southern California Edison Co.
Post Office Box 800
Rosemead, CA 91770

MAR 14 1984

Subj.: Release of SCE Site/Partnership Proposal and Associates' Technology Transfer Plan for Inclusion in Solar One Project Bibliography

Dear Joe:

The Solar One Project Bibliography prepared by Burns & McDonnell for the Electric Power Research Institute is scheduled to be published March 23, with initial distribution by the end of the month. We are already making preparations for an update of the Bibliography at the end of the Experimental Testing and Evaluation phase (July 31, 1984), to include (a) Project documents produced since the mid-1982 cutoff for the present edition, and (b) as-built drawings, test procedures and a small number of documents from earlier years that appear to be of interest to the Solar Central Receiver community.

In the latter category is the original SCE proposal in response to ERDA Program Opportunity Notice (PON) DSE 76-1. The PON is listed as item STMPO-48 in the Bibliography, and a copy is enclosed for your reference and retention (Encl. 1). While the SCE proposal is not currently logged in the Bibliography, I feel it is of sufficient interest (as the pioneering effort towards Government/private-sector cooperation in this technology area) to warrant its inclusion in the Bibliography and forwarding to the DOE Technical Information Center and the National Technical Information Service for archiving and distribution on microfiche to interested parties. Before doing so, I would like to offer you the opportunity to review and, if necessary, excise any information (e.g., cost information or personnel data) you might consider inappropriate for general release. I am, therefore, including a copy of the two volumes of the proposal for your review, together with a copy of the SAN Form 70, required for patent clearance (a formality in this instance, since the technical data had already been circulated by ERDA) and dissemination by TIC. I would propose to meld the two volumes into a single document, to be archived as the second document in the Cooperative Agreement series - DOE/SF/10501-002 (STMPO ~~-560~~ 563 - at TIC/NTIS, and abstracted in the Bibliography update. (Encls. 2).

Bibliography item STMPO-40 is the Associates' Technology Transfer Plan of April, 1980 (DOE/SF/10501-004), another key document in the Project's history. This has not as yet been forwarded to TIC; to do so I will need a similar Patent Clearance Request (SAN Form 70) signoff, again, I believe, a formality. A Copy of this Plan is also included for your reference (Encl. 3).

Your cooperation in looking these over and obtaining the necessary signature (and checkoff of Line 5) on the Form 70's, and in returning them to this office, would be greatly appreciated. You may, if you wish, keep the copies of the enclosures provi-

ded; alternatively, you may wish to return them with any changes or deletions you wish to have made in the copies sent to TIC. If you should uncover any extra original copies of Enclosures 2 or 3 in your files, however, I would appreciate at least one of each, since TIC prefers their reproducible to be as nearly original as possible.

The process described for signoff and release will also be required over the coming weeks for approximately thirty-five sets of Non-Solar Facilities specifications cited in the Bibliography (as we are doing with MDAC, MMC and Stearns-Roger for the DOE Solar Facilities); we are also clearing and forwarding the monthly Operations and Maintenance Reports and Visitors' Center Reports as they appear, to be included in the Bibliography update. I hope to have all of the documents currently listed in the Bibliography at TIC, and arrangements made so that future documents can be entered in the update, before I leave the Project at the end of September.

Thank you for your assistance and cooperation in providing full documentation of the Solar One Project.

Encls.: ERDA PON DSE 76-1

SCE Proposal, 2 vols. w/SAN Form 70

Assoc. Tech. Transfer Plan, w/SAN Form 70

Sincerely yours,

S. D. Elliott, Jr., Director,
DOE Solar One Project Office

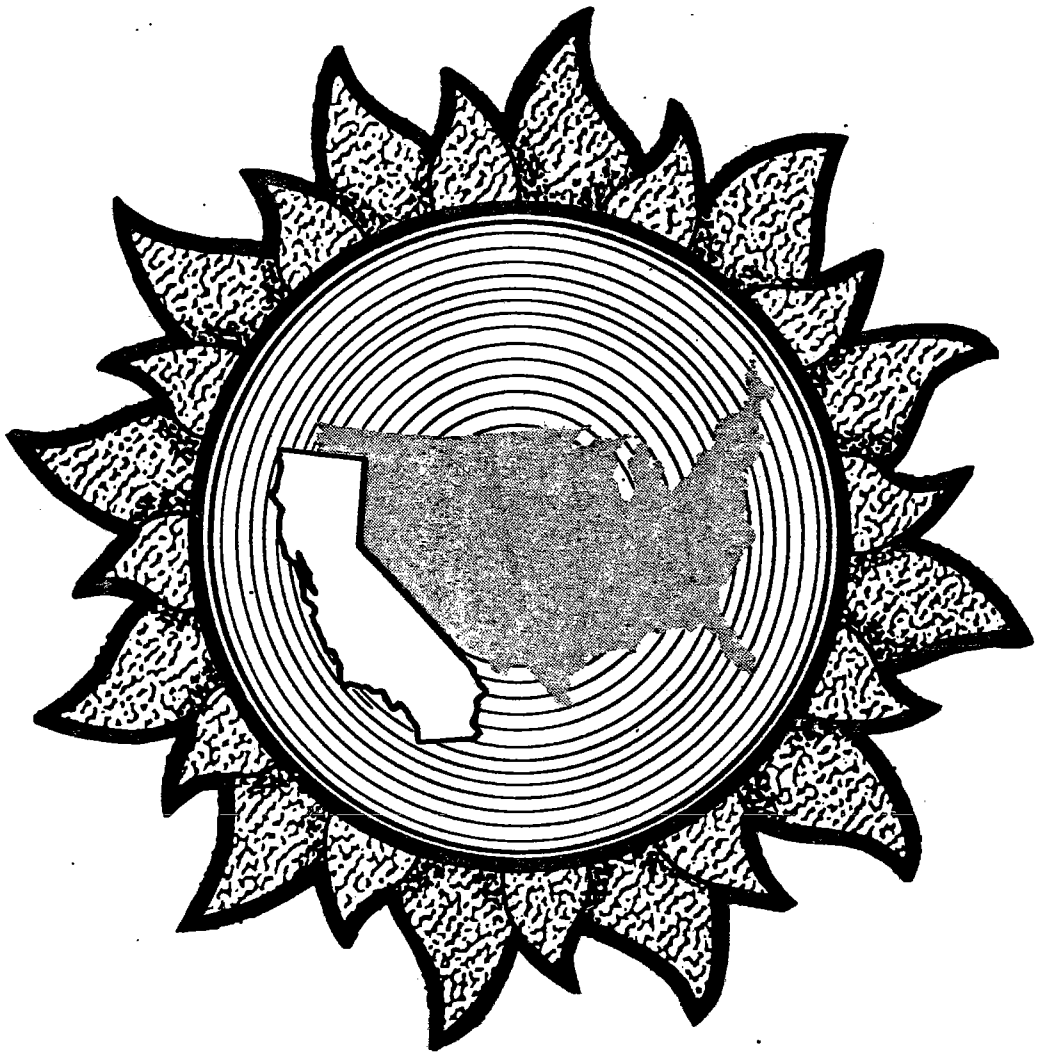
cc: Sunny Cherian, DOE/HQ (CE-314)
Bob Hughey, DOE/SAN (FGS)
Mary Soderstrum, Burns & McDonnell

SCE-T-10

ENCLOSURE 2/1

VOLUME I

CENTRAL RECEIVER SOLAR 10-MEGAWATT PROPOSAL OF PARTNERSHIP



SCE Southern California Edison Company

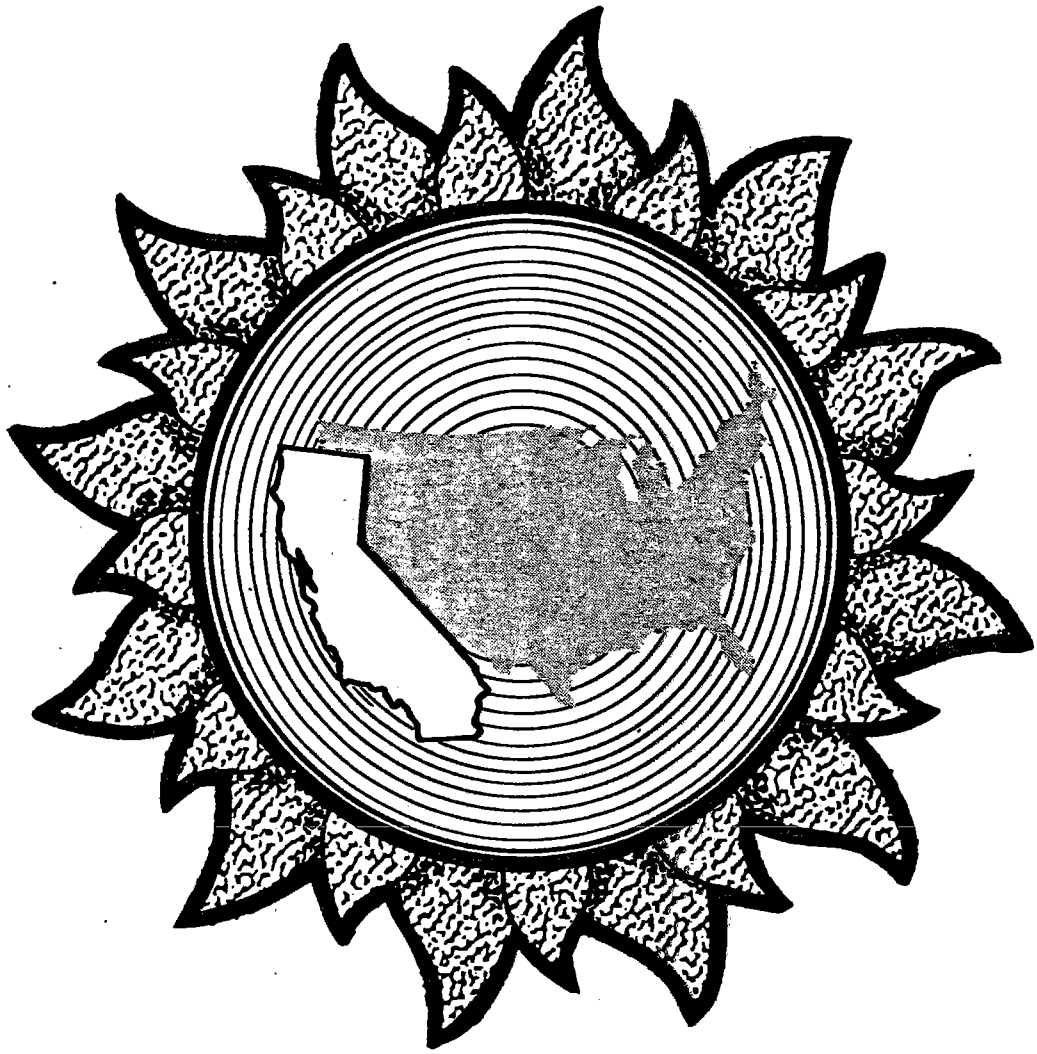
Los Angeles Department of Water and Power
California Energy Resources Conservation and Development Commission

September 15, 1976

ENCLOSURE 2/2

SCE-C-10
VOLUME II

CENTRAL RECEIVER SOLAR 10-MEGAWATT PROPOSAL OF PARTNERSHIP



SCE
Southern California Edison Company

Los Angeles Department of Water and Power
California Energy Resources Conservation and Development Commission

September 15, 1976

DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

Prime Contract No.	COOPERATIVE AGREEMENT DE-FC03-77SF10501
Subcontract No.	(N/A)
Report No.	DOE/SF/10501-2 (STMPO-566)
Date of Report	SEPTEMBER 15, 1976
Name & Phone No. of DOE Technical Representative	S. D. Elliott, Jr. (619) 254-2672

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: DOE Solar One Project Office
Post Office Box 366
Daggett, CA 92327

1. Document Title:
"CENTRAL RECEIVER 10 MEGAWATT PROPOSAL OF PARTNERSHIP"

2. Type of Document: ☐ Technical Report, ☐ Conference Paper, ☐ Journal Article, ☐ Abstract or Summary, ☐ Copy of Oral Presentation, XX Other (please specify): PROPOSAL

3. In order to meet a publication schedule or submission deadline, patent clearance by (Routine) would be desired.

SENDER IS TO CHECK BOX #4 OR #5 BELOW.

☐ 4. I have reviewed (or have had reviewed by technically knowledgeable personnel) this document for possible inventive subject matter (Subject Inventions) and that no inventions or discoveries (Subject Inventions) are deemed to be disclosed in this document except as stated below:

a. Attention should be directed to pages _____ of this document.

b. This document describes matter relating to an invention:

i. Contractor Invention Docket No. _____.
ii. A disclosure of the invention was submitted to DOE on _____ (date)
iii. A disclosure of the invention will be submitted shortly _____ (approximate date)
iv. A waiver of DOE's patent rights to the contractor:
☐ has been granted, ☐ has been applied for; or ☐ will be applied for _____ (date)

☐ 5. This document is being submitted, but no review has been made of this document for possible inventive subject matter.

6. Remarks: Please return clearance to Project Office.

Reviewing/Submitting Official: Name (Print/Type) _____
Title _____
Signature _____ Date _____

TO: INITIATOR OF REQUEST

FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

☐ No patent objection to above-identified release.

☐ Please defer release until advised by this office.

Signed _____ Date Mailed _____

SAN FORM 70 10/80

DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

Prime Contract No.	COOPERATIVE AGREEMENT DE-FC03-77SF10501
Subcontract No.	(N/A)
Report No.	DOE/SF/10501-002 (STMPO-563)
Date of Report	SEPTEMBER 15, 1976
Name & Phone No. of DOE Technical Representative	S. D. Elliott, Jr. (619) 254-2672

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: DOE Solar One Project Office
Post Office Box 366
Daggett, CA 92327
ATT: S. D. Elliott

1. Document Title: SOLAR
"CENTRAL RECEIVER, 10 MEGAWATT PROPOSAL OF PARTNERSHIP"

2. Type of Document: ☐ Technical Report, ☐ Conference Paper, ☐ Journal Article, ☐ Abstract or Summary, ☐ Copy of Oral Presentation, ☒ Other (please specify): PROPOSAL

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iv. A waiver of DOE's patent rights to the contractor:
☐ has been granted, ☐ has been applied for; or ☐ will be applied for _____ (date)

☐ 5. This document is being submitted, but no review has been made of this document for possible inventive subject matter.

6. Remarks: Please return clearance to Project Office.

Reviewing/Submitting Official: Name (Print/Type) Joseph N. Reeves JOSEPH N. REEVES
Title SOLAR ONE PROGRAM DIRECTOR
Signature Southern California Edison Date 4/11/84

TO: INITIATOR OF REQUEST

FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

☐ No patent objection to above-identified release.

☐ Please defer release until advised by this office.

Signed _____ Date Mailed _____

DOE OFFICE OF PATENT COUNSEL (ROC)

Doug

Deletions marked in yellow.

JNR

Do not release standard

3185 miles of 230 kV lude a
1000 MW tie east thr and a 3000 MW
tie into northern Ca west.
Edison also owns 50% le-long
800 kV DC transmissi

The Pilot P s system
through existing sub lwater site.

The Edison system is also interconnected at four points with the Los Angeles system. The Los Angeles distribution system consists of 2,566 miles of transmission lines (above 34.5 kV).

3. System Integration and Testing

Output from the Pilot Plant will be distributed through the system described above when electricity is generated. A comprehensive testing program will be developed and carried out in cooperation with ERDA. Environmental factors will also be included in this program.

4. Operation and Maintenance

The entire Pilot Plant will be operated and maintained for two to five years following successful startup and acceptance.

5. Project Reviews and Technological Developments

The Program Participants will work closely with ERDA in reviews and surveillance of project activities to assure an integrated team effort. Also, an up-to-date awareness will be

etc -7

DOE F 1325.8
(7-79)

U.S. DEPARTMENT OF ENERGY

memorandum

DATE: MAY 25 1984

REPLY TO ATTN OF: S. D. Elliott, Jr., Director, DOE Solar One Project Office

SUBJECT: Submission of Solar One Project Document: Proposal in Response to Program Opportunity Notice DSE (ERDA) 76-1, by Southern California Edison Co. and Associates

TO: Roger S. Gaither, DOE/SAN (OPC)
William D. Matheny, DOE/TIC Document Control

Enclosed are copies of the proposal prepared by Southern California Edison Company, the Los Angeles Department of Water and Power, and the California Energy Commission, in response to ERDA PON DSE 76-1; this proposal was selected for award of Cooperative Agreement DE-FC03-77SF10501.

Primary Document No.	Secondary No.	Title
DOE/SF/10501-002	(STMPO-563)	"Central Receiver Solar 10 Megawatt Proposal of Partnership"

This document has been reviewed by the SCE Program Manager, at whose request certain privileged or obsolete cost information, and information concerning proposed Project personnel, has been deleted; in addition, the material in the two original volumes has been consolidated into a single document.

One copy of this document, accompanied by a SAN Form 70 prepared by the SCE Program Manager, is provided for review and clearance by the SAN Office of Patent Counsel. Upon completion of review, please return a copy of the clearance to the Project Office; the review copy of the proposal may be forwarded to Mr. Mike Lopez, DOE/SAN (FGS).

Two copies of this document, accompanied by a completed DOE Form RA-426, are provided to the DOE Technical Information Center for archiving, announcement and forwarding to the National Technical Information Service.

S. D. Elliott, Jr.

Encl.: 1 Report, 3 copies:
1 copy w/SAN Form 70
2 copies w/ DOE Form RA-426

cc: M. Lopez, DOE/SAN (FGS)
D. Holz, DOE/SAN (ISEA)
M. Soderstrum, Burns & McDonnell
J. Reeves, SCE R&D

DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

Prime Contract No.	COOPERATIVE AGREEMENT DE-FC03-77SF10501
Subcontract No.	(N/A)
Report No.	DOE/SF/10501-002 (STMPO-563)
Date of Report	SEPTEMBER 15, 1976
Name & Phone No. of DOE Technical Representative	S. D. Elliott, Jr. (619) 254-2672

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: DOE Solar One Project Office
Post Office Box 366
Daggett, CA 92327
ATT: S. D. Elliott

1. Document Title: SOLAR
"CENTRAL RECEIVER 10 MEGAWATT PROPOSAL OF PARTNERSHIP"

2. Type of Document: ☐ Technical Report, ☐ Conference Paper, ☐ Journal Article, ☐ Abstract or Summary, ☐ Copy of Oral Presentation, XX Other (please specify): PROPOSAL

3. In order to meet a publication schedule or submission deadline, patent clearance by (Routine) would be desired.

SENDER IS TO CHECK BOX #4 OR #5 BELOW.

☒ 4. I have reviewed (or have had reviewed by technically knowledgeable personnel) this document for possible inventive subject matter (Subject Inventions) and that no inventions or discoveries (Subject Inventions) are deemed to be disclosed in this document except as stated below:

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iii. A disclosure of the invention will be submitted shortly _____ (approximate date)
iv. A waiver of DOE's patent rights to the contractor:
☐ has been granted, ☐ has been applied for; or ☐ will be applied for _____ (date)

☐ 5. This document is being submitted, but no review has been made of this document for possible inventive subject matter.

6. Remarks: Please return clearance to Project Office.

Reviewing/Submitting Official: Name (Print/Type) Joseph M. Reeves JOSEPH N. REEVES
Title SOLAR ONE PROGRAM DIRECTOR
Signature Southern California Edison Date 4/11/84

TO: INITIATOR OF REQUEST

FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

☐ No patent objection to above-identified release.

☐ Please defer release until advised by this office.

Signed _____ Date Mailed _____

DOE Form RA-426
(10/80)

U.S. DEPARTMENT OF ENERGY

OMB NO. 038-R0190

DOE AND MAJOR CONTRACTOR RECOMMENDATIONS FOR ANNOUNCEMENT AND DISTRIBUTION OF DOCUMENTS

See Instructions on Reverse Side

1. DOE Report No.	2. Contract No.	3. Subject Category No.
DOE/SF/10501-002 (STMPO-563)	DE-FC03-77SF10501	UC-62

4. Title
"CENTRAL RECEIVER SOLAR 10 MEGAWATT PROPOSAL OF PARTNERSHIP"

5. Type of Document ("x" one)
- ☐ a. Scientific and technical report
- ☐ b. Conference paper: Title of conference _____
  _____ Date of conference _____
  Exact location of conference _____ Sponsoring organization _____
- ☒ c. Other (specify planning, educational, impact, market, social, economic, thesis, translations, journal article manuscript, etc.) Proposal

6. Copies Transmitted ("x" one or more)
- ☐ a. Copies being transmitted for standard distribution by DOE–TIC.
- ☐ b. Copies being transmitted for special distribution per attached complete address list.
- ☒ c. Two completely legible, reproducible copies being transmitted to DOE–TIC. (Classified documents, see instructions)
- ☐ d. Twenty-seven copies being transmitted to DOE–TIC for TIC processing and NTIS sales.

7. Recommended Distribution ("x" one)
- ☐ a. Normal handling (after patent clearance): no restraints on distribution except as may be required by the security classification.

Make available only ☐ b. To U.S. Government agencies and their contractors. ☐ c. within DOE and to DOE contractors. ☐ d. within DOE. ☐ e. to those listed in item 13 below.

- ☒ f. Other (Specify)

8. Recommended Announcement ("x" one)
- ☒ a. Normal procedure may be followed. ☐ b. Recommend the following announcement limitations:

9. Reason for Restrictions Recommended in 7 or 8 above.
- ☐ a. Preliminary information. ☐ b. Prepared primarily for internal use. ☐ c. Other (Explain)

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Does this information product disclose any new equipment, process or material? ☒ No ☐ Yes If so, identify page nos. _____

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("x" one ☐ a. DOE patent clearance has been granted by responsible DOE patent group.
☒ b. Document has been sent to responsible DOE patent group for clearance.

11. National Security Information (For classified document only; "x" one)

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13. Additional Information or Remarks (Continue on separate sheet, if necessary)

14. Submitted by (Name and Position) (Please print or type)

S. D. Elliott, Jr., Director, DOE Solar One Project Office

Organization

Post Office Box 366, DAggett, CA 92327 (619) 254-2672

Signature S D Elliott Jr Date MAY 25 1984

DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

Prime Contract No.	COOPERATIVE AGREEMENT DE-FC03-77SF10501
Subcontract No.	(N/A)
Report No.	DOE/SF/10501-002 (STMPO-563)
Date of Report	SEPTEMBER 15, 1976
Name & Phone No. of DOE Technical Representative	S. D. Elliott, Jr. (619) 254-2672

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: DOE Solae One Project Office
Post Office Box 366
Daggett, CA 92327
ATT: S. D. Elliott

1. Document Title:
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3. In order to meet a publication schedule or submission deadline, patent clearance by (Routine) would be desired.

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☐ 5. This document is being submitted, but no review has been made of this document for possible inventive subject matter.

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Reviewing/Submitting Official: Name (Print/Type) Joseph N. Reeves JOSEPH N. REEVES
Title SOLAR ONE PROGRAM DIRECTOR
Signature Southern California Edison Date 4/11/84

TO: INITIATOR OF REQUEST

FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

M. Lopez, SAN

☒ No patent objection to above-identified release.

☐ Please defer release until advised by this office.

LCC
6/6/84

Signed L. E. Cunningham Date Mailed 6/7/84

COPY FOR CONTRACTOR'S (SENDER'S) FILES AFTER OPC RELEASE