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**ENVIRONMENTAL ASSESSMENT
FOR THE
PROPOSED SOLAR TWO PROJECT
BARSTOW, CALIFORNIA**

Prepared By

**Department of Energy
Golden Field Office**

January 1994

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ACRONYMS

ACEC	Area of Critical Environmental Concern
BLM	Bureau of Land Management
CEC	California Energy Commission
CFR	Code of Federal Regulation
DOE	Department of Energy
EA	Environmental Assessment
EIA/EIR	Environmental Impact Assessment/Environmental Impact Report
EPRI	Electric Power Research Institute
ERDA	Energy Research and Development Administration
GO	Golden Field Office
Kw	kilowatt
LADWP	Los Angeles Department of Water and Power
LTTD	low temperature thermal desorption
MSDS	Material Safety Data Sheet
MWe	megawatt electric
MWt	megawatt thermal
NEPA	National Environmental Policy Act
PG&E	Pacific Gas and Electric
R&D	research and development
RD&D	research, development and demonstration
SCE	Southern California Edison
SEGS	Solar Energy Generating Stations
SRP	Salt River Project
STES	solar thermal energy system
TLV	threshold limit value
TSS	thermal storage system

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1.0 INTRODUCTION

The Department of Energy (DOE) and a consortium of utility and regulatory agencies from California, Idaho, Oregon, and Arizona established a formal agreement to fund the proposed conversion of the existing Solar One Facility. The facility included a solar central receiver and a water/steam turbine-generator system which used an oil/rock thermal storage system. The proposed action, Solar Two, would replace these components with an advanced nitrate salt receiver, thermal storage, and steam turbine-generator system. A basic flow schematic of a molten salt, central receiver system is shown in Figure 1.

This Environmental Assessment (EA) evaluates the environmental consequences of the proposed conversion and operation of the existing Solar One Facility in Daggett, CA, near the city of Barstow, to a nitrate salt based heat transfer system, Solar Two. The Solar One site is shown on Figure 2. The EA also addresses the alternatives of different solar conversion technologies and alternative sites and discusses a no action alternative.

One of the problems inherent with solar technology is the inability to produce electricity when the sun is not available. Therefore, to advance this technology, an economic means of storing energy must be developed. A primary objective of the Solar Two Project would be to demonstrate the technical and economic feasibility of a solar central receiver power plant using molten salt as the thermal storage and transport fluid medium. If successful, the information gathered from the Solar Two Project could be used to design larger commercial solar power plants.

Figure 1 Schematic of a Molten Salt Central Receiver System

The principal goal of the Solar Two Project would be to significantly reduce the perceived technical and economic risk associated with the first commercial central receiver power plants. At 10 megawatt electric¹ (MWe), the Solar Two Project would be large enough to address the major technical issues inherent in scale up to a 100 MWe commercial plant size. To accomplish its goal, the project has the following objectives:

- To validate the technical characteristics of the nitrate salt receiver and storage technology.
- To improve the accuracy of economic projections for commercial projects by increasing the data base of capital, operating, and maintenance costs.
- Simulate the design, construction, and operation of the first commercial solar plants.
- Collect, evaluate, and distribute to U.S. utilities and the solar industry the knowledge gained from the project to foster wider utility interest in commercial solar plants.

Participants in this research and development project would benefit from the knowledge to be gained from the development of this promising, environmentally benign, renewable energy technology and from the positive public image associated with solar energy. In the longer term, the environment and the quality of life in communities, businesses, governments, and global society could benefit by using this clean energy technology.

The proposed Solar Two Project schedule includes a one year period for final design, one year for equipment fabrication and installation, six months for start up and check out, one year for system test and evaluation, and two years of power production to simulate a

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¹ Two units of measure are commonly applied to solar power generation. Megawatt electric (MWe) is a measure of the output rate of electrical power. Megawatt thermal (MWt) is a measure of the rate at which heat is produced, or thermal power. The conversion of thermal power, MWt, in equipment such as steam turbines, results in the generation of electrical power, MWe. Typically, about two thirds of thermal energy is lost as steam during conversion to electrical power.

commercial plant. Assuming that an authorization to proceed is received during FY 1994, the project would begin its test period in FY 1995, and its power production phase in FY 1996.

1.1 Purpose and Need

In parallel with the construction and operation of Solar One, a series of studies, funded by DOE and industry, examined central receiver cogeneration plants and the repowering of existing fossil fired power plants. Included in these designs were advanced central receiver concepts which used a single phase receiver fluid. The advantages of the single phase fluid include the following.

- The receiver can be operated at a lower fluid pressure and higher incident flux than a water/steam receiver. This translates into a smaller, more efficient, and lower cost receiver and support tower.
- The single phase fluid can be stored in a large, atmospheric pressure tank. This allows the plant to: a) isolate the turbine-generator from solar energy transients; b) economically store thermal energy collected early in the day for use during peak demand periods; c) increase the plant capacity factor by oversizing the collector and receiver systems and storing the excess thermal energy for electricity generation in the evening; and d) operate the turbine at maximum efficiency.

Although these designs offered significant technical and economic improvements over the water/steam plants, the studies failed to stimulate an immediate market for central receiver systems. Private attempts to commercialize the technology in the first half of the 1980's, notably the 100 MWe Solar 100 Project by Southern California Edison (SCE), the 30 MWe Carrisa Plains Project by Pacific Gas and Electric (PG&E), and the 60 MWe Saguaro Repowering Project, were unsuccessful. Although Federal and state tax credits were available, large technical and financial risks to the investors, decreasing fossil fuel prices, and excess qualifying facility capacity precluded project financing. These risks included uncertainties in the annual plant performance, capital cost, operation and maintenance

expense, and the lack of an industry group willing to underwrite the performance of a commercial project. The impact of all of these difficulties was amplified by the falling price of natural gas.

At 10 MWe, the Solar Two Project would be large enough to address the major technical issues inherent in scale up to the 100 MWe plant size. The Solar Two Project would be the lowest cost development step for the technology. The capital investment by DOE, SCE, the California Energy Resources Conservation and Development Commission, and the Los Angeles Department of Water and Power (LADWP) in the Solar One collector system, receiver tower, turbine-generator plant, and support facilities represents a valuable national asset, and the reuse of these facilities will save money and time. In addition, because the technology development in support of the Solar Two Project is complete, detailed design can begin as soon as there is an authorization to proceed.

1.2 Background

The 10 MWe Solar One Pilot Plant, located near Barstow, California successfully established the technical feasibility of solar central receiver technology. This technological approach to solar power generation utilizes a field of mirrors, called heliostats, surrounding a tower which supports a single central receiver. During operations the mirrors are focused upon the central receiver generating thermal energy. In Solar One, this thermal energy was utilized to produce steam, which was used either in the turbine-generator plant to produce electricity or transferred to an oil/rock thermal storage system for later use. This approach was selected to establish utility confidence in the concept and to minimize technical risks. Solar One started operation in 1982, and its six year test and power production program proved that the technology operates reliably, has very low environmental impact, and has excellent public acceptance.

During its operations, Solar One confirmed that the central receiver technology does not result in significant environmental impacts during operations as was predicted by DOE's

Environmental Assessment, 10 Megawatt Solar Electric Power Pilot Plant, (DOE/EA-0016), and the Final Environmental Impact Assessment/Environmental Impact Report 10 Megawatt Solar Power Pilot Plant (EIA/EIR), generated by the Environmental Improvement Agency of San Bernardino County, California (EIA, 1978).

The Solar One Pilot Plant established the technical feasibility of the central receiver concept, and subsequent studies and analysis show that nitrate salt technology, with its cost-effective thermal storage system, has the lowest energy cost potential of all central station solar electric technologies. Nitrate salt technology development activities in support of the Solar Two Project have been successfully completed through the testing at DOE's Sandia National Laboratories of: two 5 megawatt thermal (MWt) receivers, a 7 MWt thermal storage system, a 3 MWt steam generator, the 750 kilowatt (Kw) Molten Salt Electric Experiment, and a 190 MWt pump and valve loop. In addition, the French built a 2.5 MWe HITEC® salt pilot plant, called Themis, which they operated successfully for three years. Thus, the next step in the commercialization of the technology is to design, construct, and operate a demonstration plant of a size that is large enough to reduce, to acceptable levels, the technical and economic risks in building the first commercial plant.

In recognition of the potential technical, economic and environmental benefit of this technology, DOE entered into a cost-sharing agreement to fund the Solar Two Project, with a consortium of utilities, regulators and other interested industry organizations composed of:

- SCE
- LADWP
- Sacramento Municipal Utility District (SMUD)
- Idaho Power Company
- PG&E
- PacifiCorp
- Arizona Public Service Company
- California Energy Commission (CEC)
- Salt River Project (SRP)
- Bechtel Corporation
- City of Pasadena

- South Coast Air Quality Management District
- Electric Power Research Institute (EPRI).

Implementation of the cost sharing agreement, and the commencement of project activities are contingent upon the completion of the requirements of the National Environmental Policy Act (NEPA).

A Solar Two Cooperative Agreement, between DOE and SCE was signed on April 6, 1993. SCE was designated Project Director by the consortium of utilities and other entities to act in their behalf in accordance with a Participation Agreement or other contractual arrangement between the various contributors. Each contributor of at least 1 million dollars is a voting member of the Steering Committee which has approval rights and provides project direction to SCE. The consortium is responsible for 50 percent of the project funding and DOE is providing 50 percent. The estimated total cost for Solar Two design, construction, test and evaluation, and two years of operations is \$48.5 million.

SCE contracted with the Bechtel Corporation to perform and be responsible for system engineering, contractor and construction management. Bechtel will be directly responsible to SCE for all design and construction activities except those which require Steering Committee action which may be implemented through SCE. Sandia National Laboratory, as the Lead Laboratory for solar thermal and specifically central receiver technology, will provide technical assistance to the project through SCE and DOE.

2.0 PROPOSED ACTION AND ALTERNATIVES

This section describes the conceptual design and operations of the proposed Solar Two Project. The section also discusses alternative technologies, alternative sites, and the no action alternative.

2.1 Proposed Action

The Solar One Pilot Plant, which utilized a water/steam receiver system, represents first generation central receiver technology. The Solar Two Project would convert the Solar One facility to second generation technology based on nitrate salt, central receiver and thermal storage systems. This conversion would involve replacing the existing water/steam receiver, heat transport and oil/rock thermal storage systems with nitrate salt receiver, heat transport, steam generation, and thermal storage systems. A plant layout which identifies the proposed additions to existing Solar One equipment is provided on Figure 3, and Figure 4 details the proposed Solar Two equipment deck.

The action of removal of the unneeded components of the Solar One facility was evaluated, under the DOE NEPA Implementing Procedures (10 CFR 1021), and found to be categorically excluded from further NEPA documentation (Appendix A) and, therefore, will not be discussed in this EA. Removing the heat transfer oil components from the Solar One facility is necessary to reduce environmental risk and comply with regulatory requirements. The removal action is independent from a decision to proceed with the implementation of the Solar Two Project. All aspects of the proposed Solar Two Project would take place within the existing 130 acres of SCE land fenced for Solar One.

The only modification required to convert the Solar One Facility to Solar Two would be the change of the Solar One million-gallon heat storage tank, which was filled with approximately 240,000 gallons of Caloria oil and approximately 4,532 tons of gravel and 2,266 tons of sand, to a dual tank heat storage system using 940 tons of nitrate salt. The

Figure 3 Plant Layout

Figure 4 Salt Equipment Deck Component Arrangement

two nitrate salt thermal storage tanks would contain salt at 550 °F and 1,050 °F (288 °C and 566 °C) to permit operation of the turbine plant from storage at rated output for up to four hours. The tanks would be approximately 45 feet in diameter and 20 feet tall. The 550 °F "cold" tank would be made of carbon steel and the 1,050 °F "hot" tank would be made of stainless steel. The initial charging of the system with molten salt would be accomplished with an electric heater. No fossil fuels would be used or stored on site.

The proposed Solar Two Project has been conceptually designed to maximize investment risk mitigation for future commercial plants, while utilizing available equipment from Solar One to minimize the research and development (R&D) expense, and includes the following.

- The existing Solar One collector field, tower, turbine-generator, balance of plant and controls would be utilized.
- A 43 MWt cylindrical nitrate salt receiver would be located on the existing tower and receiver structure to replace the water/steam receiver.
- An additional 11,500 m² of reflective area of new heliostats, requiring approximately 10 acres, would be added to the south side of the existing 90 acre heliostat field to: balance the receiver flux distribution so that it is representative of the flux distribution on a commercial receiver; avoid the excessive morning receiver startup times common to the Solar One plant; and to provide additional energy for charging storage.
- A dual-tank nitrate salt thermal storage system with four hours of capacity would be added to demonstrate 1) the ability to decouple the collection of solar energy from the generation of electricity, 2) the potential for the plant to meet an evening winter peak load, and 3) the dispatch characteristics of a commercial power plant.
- A 30 MWt nitrate salt steam turbine-generator would be added to generate steam at full turbine conditions using the thermal energy in the nitrate salt.
- A nitrate salt heat transport system, consisting primarily of pumps, piping, valves and instrumentation, would facilitate the reliable collection, storage and retrieval of thermal energy.
- The existing turbine plant would be upgraded through 1) the addition of a fifth feedwater heater, which would improve the thermal to electric conversion efficiency, and 2) modifications to reduce the electric parasitic power consumption.

- Portions of the existing master control system would be replaced with a currently distributed process control design because the hardware and software support for the existing equipment is no longer available.

As was described previously, the construction and operation of all existing facilities was addressed in *DOE's Environmental Assessment, 10 Megawatt Solar Electric Power Pilot Plant*, (DOE/EA-0016), and the *Final Environmental Impact Assessment/Environmental Impact Report 10 Megawatt Solar Power Pilot Plant* (EIA/EIR), generated by the Environmental Improvement Agency of San Bernardino County, California (EIA, 1978).

A nitrate salt, similar to HITEC® Solar Salt manufactured by Coastal Chemical Company, would be used for the Solar Two Project. The Material Safety Data Sheet (MSDS) for HITEC® identifies the chemical and physical properties of the salt as approximately 60 percent sodium nitrate and 40 percent potassium nitrate. Review of the MSDS, and documentation for other solar salts similar in composition, indicates that HITEC® Solar Salt may have toxic effects only if directly ingested. The salt is also an irritant, if inhaled in large quantities, but is not considered toxic via this exposure route. As an oxidizer, HITEC® is considered potentially reactive with combustible materials, organic compounds, and acids.

Adverse health effects are generally not observed unless the salt is ingested in large quantities. According to the manufacturer, the acute, oral, lethal dose to 50 percent of an exposed population (LD₅₀) for HITEC® is four grams of salt per kilogram of body weight. For comparative purposes, the acute oral LD₅₀ would be reached if a 100 pound person ingested 0.4 pounds of HITEC® salt. The inhalation threshold limit value (TLV) of 10 mg/m³ indicates that the salt is an irritant if inhaled. However, this value is considered a default value for nontoxic "particulates not otherwise classified" by the American Conference of Governmental Industrial Hygienists (ACGIH, 1993). These so-called "nuisance" dusts

have a long history of little adverse effect on lungs and do not produce significant organic disease or toxic effect when exposures are kept under reasonable control. For reference purposes, indoor dust levels of 0.1 mg/m³ are readily visible.

Both components in the salt mixture are considered Class I oxidizers. Class I is the least hazardous of the four classes established by the National Fire Protection Association and is defined as "an oxidizing material whose primary hazard is that it may increase the burning rate of combustible materials." Although the salt is not combustible and cannot burn by itself or explode by impact, nitrates can emit toxic nitrogen oxides when involved in a fire. HITEC® is also reactive with acid compounds and can generate toxic nitrogen oxide gases if the two chemicals are mixed. As a result of these chemical incompatibilities, precautionary measures to segregate the salt from storage or use near combustible materials, organics, and acids would be exercised. The project design specifies that the entire inventory of HITEC® Solar Salt would be contained in the thermally insulated tanks, thus precluding storage problems for the bulk of the material. If salt spills occur, the material would be allowed to cool and returned to the system after purification.

Combustible materials on site would be limited to the turbine oil reservoir, a wood structured cooling tower, limited combustibles stored in the steel and concrete warehouse, and lubricants stored in an open air storage shelter. Each of these materials would be located within 50 feet of a fire hydrant. No combustibles would be located adjacent to the molten salt system to prevent initiation of a fire in the event of a release of molten salt.

The Solar Two Project would operate with solar energy systems (collector and receiver) serving solely to charge the thermal storage. The energy conversion systems (steam generator and turbine plant) would operate exclusively on energy withdrawn from thermal storage. This fundamental feature of the Solar Two Project would make the time and rate of electricity generation independent of the time and rate of solar energy collection, including cloud transients. In addition, the proposed Solar Two Project is designed to provide four hours of thermal energy storage. This storage capacity would allow a shift in the period

during which solar energy is collected and electricity is generated. Figure 5 illustrates the applicability of this storage capacity to evening peak load. Nitrate salt thermal storage system have been shown to be very efficient, therefore, Solar Two is expected to deliver to the turbine over 97 percent of the energy input to storage.

2.2 Alternative Technologies and Sites

DOE and its predecessor agency, the Energy Research and Development Administration (ERDA), were authorized by numerous laws to conduct research, development and demonstration (RD&D) projects aimed at effective solar energy utilization. DOE has ongoing a variety of solar thermal energy system (STES) RD&D projects, in addition to the central receiver technology, demonstrated by Solar One, and proposed for the Solar Two Project. Currently the program is conducting RD&D projects on, and three types of concentrating collectors - central receiver, parabolic dish, and parabolic trough. Each concept is at a different stage of development. These potential alternatives to the STES proposed for the Solar Two Project have been, and are being evaluated, under separate research and development projects. However, current DOE analyses indicate that the central receiver technology is the only solar conversion technology that can economically achieve more than 25 percent capacity factor without emissions and fossil hybridization. Additionally, DOE/HQ and the lead labs for solar thermal conversion have identified the central receiver technology as having the lowest potential generation costs among the range of alternatives identified in the EA. This cost advantage has been independently recognized by the utilities that have joined the consortium and provided funding commitments. For these reasons technology alternatives to the proposed action will not be discussed further in this EA.

The Daggett site was selected for Solar One from among nine sites based on an evaluation of environmental, technical and cost criteria. This selection process was documented in DOE\EA-0016 and the EIA/EIR. No other existing facility or site offers the

Figure 5 Load Following Capability of Central Receiver Plants

same technical, economic, and environmental opportunity to the proposed Solar Two Project. Establishment of the Solar Two Project at a site other than the Daggett site would result in significant costs to recreate existing Solar One equipment, which would be used for the Solar Two Project, and result in environmental impacts associated with the land clearing for the heliostat field, which have already been incurred at the Daggett site. For this reason no other sites are considered reasonable for the Solar Two Project.

2.3 No Action

Failure to undertake the proposed Solar Two Project would stop or delay potential commercial deployment of the central receiver, molten salt, solar thermal power generation technology. As a result, the potential environmental benefits represented by this technology, such as reduced air emissions from those generated by conventional fossil fuel derived electric power, would not be realized.

The selection of the no action alternative would subsequently result in the termination of activities and site remediation. However, under all alternatives, DOE is committed to the removal of all facilities and equipment and restoration of the site at the completion of project activities.

3.0 AFFECTED ENVIRONMENT

DOE and the San Bernardino County Environmental Improvement Agency evaluated the environmental impacts from the construction and operation of the Solar One Facility in DOE/EA-0016 and the EIA/EIR. These documents thoroughly characterized the existing environment and determined that the Solar One action would not cause significant environmental impacts. The no impact conclusions of the Solar One assessments were supported by contacts with Federal, state, county, and local agencies having responsibility for land use, biota, cultural resources, air and water quality, and other areas relevant to the assessment of environmental impacts. The six-year operational experience of Solar One supported the no impact conclusions of the DOE and San Bernardino County assessments.

A brief description of the potentially affected environment in sufficient detail to address impacts from the Solar Two Project is provided in this EA. The proposed action would not generate or utilize toxic or hazardous materials, and would not have any liquid or solid discharges to the environment under routine or accidental conditions. Therefore, the scope of the affected environment discussion is limited to aspects of land use, biota, and cultural resources, which could be impacted from land disturbance activities. For a more detailed discussion of the results of the detailed environmental characterization studies which supported the construction and operation of Solar One, the reader is referred to DOE/EA-0016 and the EIA/EIR.

3.1 Land Use

The project area is located three miles east of the community of Daggett, near the city of Barstow, in western San Bernardino County in the Mojave Desert. Figure 2 provided a location map of the existing Solar One site. The Solar One facility occupies approximately

130 acres of SCE's 2,337 acre property. It is located about 1/2 mile northeast of the existing SCE Cool Water Power Plant on the SCE-owned Cool Water Ranch. The Solar Two Project would be located at the existing Solar One plant site.

The land uses immediately surrounding the site consist of the existing, but inoperative Cool Water Coal Gasification Power plant, the SCE Cool Water Power Plant, a rail loop, the Airco facility, SCE above-ground fuel tanks, SCE evaporation ponds, Solar Energy Generating Stations (SEGS) I and II, the closed SCE slag pit, alfalfa fields, an experimental waste heat greenhouse, farming residences, and desert land and the Mojave River to the north.

The closest residence is approximately one mile from the southern boundary of the site. Developed areas in the desert region surrounding the project site include Daggett, Yermo, Newberry Springs, and Barstow. Daggett, population 1,200, is the closest community to the proposed project, at three miles to the west. Yermo, population 1,400, is three miles to the north, Newberry Springs, population 1,200, is approximately 10 miles to the east, and the City of Barstow, the largest incorporated city in the project area, population 22,000, is approximately 10 miles to the west.

The site is located above the 100 year floodplain. Is not prime or unique farmland and contains no wetlands. No change in existing zoning would be required for the Solar Two Project.

3.2 Biological Resources

The project location is south of the Mojave River and between the Calico Mountains (to the north) and the Newberry Mountains (to the south). The predominant natural community of this region is Mojave creosote bush scrub, which is dominated by creosote bush (*Larrea tridentata*) and burrobush (*Ambrosia dumosa*). Prior to clearing for the construction of Solar

One, the site had been partially used for alfalfa production. Currently, no native communities and no agricultural cultivation exist within the boundaries of the 130 acre Solar One site because land surfaces are maintained in a cleared state beneath the heliostat field.

In addition to the characterization studies conducted for Solar One referenced in DOE/EA-0016 and the EIA/EIR, the entire area of SCE's Cool Water Generating Station and surrounding fee-owned lands, including the current site of the proposed Solar Two Project, was surveyed for biological resources in June 1992. This survey was conducted in support of permitting for the Cool Water Coal Gasification Project, and covered an area that included, but was larger than that of, the Solar Two Project area (CEC 1992). These studies did not reveal the presence of any sensitive biological resources within the fenced area of the existing Solar One site. A search of the California Diversity Database was also conducted and did not reveal any known additional sensitive, threatened or endangered species in or near the project area. In addition, no areas classified as an Area of Critical Environmental Concern (ACEC) by the Bureau of Land Management (BLM) would be disturbed or otherwise impacted by the proposed project. No ACEC's occur in the vicinity of the proposed Solar Two Project. Specific citations of the published technical reports which support these conclusions are provided in Appendix B.

3.3 Cultural and Historic Resources

The entire area of SCE's Cool Water Generating Station and surrounding fee-owned lands, including the site of the Solar Two Project, have been the subject of previous cultural resource investigations undertaken in support of historical and paleontological permitting for Solar One, the Cool Water Coal Gasification Project, the Cool Water 10 MW parabolic Solar Trough Project, the Luz SEGS 1 and 2 Project, and the Texaco Cool Water Coal/Sludge Gasification Project. In addition, a number of studies focused on two high-voltage transmission line corridors which cross the southeastern portion of the SCE lands. The

cultural resource investigations identified no historic sites on the Solar One site. Specific citations of the published technical reports which support these conclusions are provided in Appendix B.

No surface fossils were encountered on the Solar One site, prior to the initiation of construction. During site grading in 1979, the Solar One site was monitored by paleontologist from the San Bernardino County museum. This work resulted in the recovery of 28 fossil taxa including reptiles, amphibians, birds, and a variety of mammals ranging from rodents and lagomorphs, to horses and camels. A single human skeleton believed to have been an accidental drowning rather than a burial was also recovered during paleontological monitoring of the Solar One site grading (Reynolds 1980). No prehistoric sites remain on the proposed Solar Two Project site (Lerch 1990).

4.0 ENVIRONMENTAL IMPACTS

Operational experience with Solar One demonstrated that the solar central receiver technology does not cause environmental impacts. The conversion of Solar One to Solar Two and operations of the proposed Solar Two Project would not release hazardous materials to the environment. The proposed Solar Two Project would only vary from Solar One in the use of nitrate salts for heat exchange and storage. Nitrate salts are only toxic if ingested in very large quantities, ($LD_{50} = 0.4$ pounds for a 100 pound person), and the salts are only an inhalation irritant at very large concentrations. Therefore, normal operating procedures would be sufficient to protect workers from ingestion or any potential inhalation irritation from the nitrate salts during the initial charging of the system. After the storage tanks are filled, the nitrate salt would be totally contained within the Solar Two system in molten form, presenting no toxic hazard potential to the workers, the public, or the environment.

Land disturbance from the Solar Two Project would be limited to the addition of 11,500 m² of heliostats which would be constructed on approximately 10 acres of previously cleared land within the boundaries of the existing site. Process equipment modifications would occur within the area currently containing Solar One equipment. Since 50 to 75 percent of the construction workforce of 130 to 200 workers would be recruited locally, and construction would last only one year, no impacts are anticipated on area traffic or to the local infrastructure. The operational work force of 30 to 35 workers, would be equivalent to that used for Solar One which had no impact on traffic or the local economy.

Water needs for the proposed Solar Two Project would be met from available on site resources. The Solar Two Project would require no additional resources over those committed previously to Solar One. Sanitary wastes would be managed on site utilizing the existing septic system permitted for Solar One. At the termination of the project, the nitrate salts would be recycled into the commercial market and the remainder of the facility would be recycled by commercial salvagers as non-hazardous scrap. It is likely that only foundation materials would be disposed in a solid waste landfill.

There are no threatened or endangered species or critical habitat on site. The site is above the 100 year floodplain and contains no wetlands and is not prime or unique farmland. No cultural or historic resources exist on the proposed site.

Accidental release of the nitrate salt from the Solar Two could occur from a breach in the system. In the event of such a release, the non-combustible molten salt would immediately cool to a solid and be contained within concrete dikes and curbing, thus preventing release to the environment. The solidified salt would be removed and recycled into the system. Because the nitrate salts are non-flammable, the fire hazard presented by the oil system used for heat storage during Solar One, would not exist for the Solar Two Project. Even though nitrate salts have the potential to release toxic nitrogen oxide gases if involved in a fire or exposed to acids, there would be no accident scenario by which such toxic gases could be released, since all components of the Solar Two system in proximity to the molten salt system would be assembled of non-combustible materials and no acids would be used on site.

5.0 CUMULATIVE AND LONG-TERM IMPACTS

The implementation of the proposed Solar Two Project would continue the industrial use of the Solar One site consistent with current zoning established for the area. Although the proposed addition of more heliostats to the existing Solar One field would represent about a 10 percent increase in the size of the heliostat field, the new heliostats would be installed on land cleared and graded for Solar One and within the existing site fencing, and therefore, would not represent any cumulative impacts.

The Solar Two Project would not cause any long term environmental impacts because upon project termination, all materials would be subject to recycle as commercial scrap or disposed in a non-hazardous solid waste landfill. The knowledge gained from the proposed action may result in positive long term environmental impacts if the technology is commercially deployed. Commercial application of the Solar Central Receiver Technology for electric generation could replace some fossil fuel derived power, and subsequently cause a reduction in the emission of air pollutants.

6.0 CONCLUSIONS

The proposed Solar Two Project would utilize the same solar collection technology that was successfully demonstrated without environmental impact during the operation of Solar One. The use of molten nitrate salts as the heat transfer and storage media effectively eliminates the risk from fire presented by the thermal oil system used in Solar One. The nitrate salts are only toxic at very high levels of ingestion and a lung irritant if inhaled at high concentrations. Once the thermal system is charged there will be no source of personnel exposure during normal operations. In the event of a breach of containment the molten salt would immediately solidify and be returned to use upon cooling. No release to the environment would occur since the entire production facility would be diked or bermed.

Reasonable technological and locational alternatives to the proposed action do not exist. DOE committed to the central receiver technology as one of several elements of its STES program by conducting the Solar One Project. The Solar Two Project is the next logical step to demonstrate enhancements to Solar One. These enhancements are necessary to demonstrate the commercial viability of central receiver power plant technology. Without a successful demonstration by Solar Two, commercial application would probably not occur.

7.0 AGENCIES AND PERSONS CONSULTED

Because the site proposed for the Solar Two Project was extensively characterized for Solar One, only limited agency consultation has been necessary for the Solar Two Project. SCE, as the head of the utility consortium, is in consultation with the San Bernardino County Planning Department to fulfill State requirements under the California Environmental Quality Act (CEQA). Because the county generated the Solar One EIA/EIR, they determined that a Departmental Review will be sufficient CEQA documentation to authorize the project. Since the proposed action is only a modification of the previously approved Solar One Project which did involve all relevant agencies, no additional agency consultations are necessary for the Solar Two Project.

During the preparation of the NEPA and CEQA documentation for Solar One, numerous agencies, organizations, and individuals were contacted to support the characterization of the site. References to these contacts are detailed in DOE/EA-0016 and the EIA/EIR.

8.0 REFERENCES

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APPENDIX A

**CATEGORICAL EXCLUSION FOR
DEMOLITION OF THE SOLAR I THERMAL STORAGE SYSTEM**

Department of Energy

Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

May 27, 1993

Gary D. Burch, Director
Solar Thermal and Biomass Power Division
CE-132, Forrestal

SUBJECT: GOLDEN FIELD OFFICE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)
DETERMINATION - DEMOLITION OF THE SOLAR I THERMAL STORAGE SYSTEM
[93086]

Please be advised that the proposed action has been reviewed against the DOE-NEPA Final Rule as published in the Federal Register on April 24, 1992. Following this review it has been determined that the proposed action is categorically excluded under Subpart D of the Rule and can proceed without further NEPA review. EH-25 has been notified of this determination as required.

The DOE-NEPA Final Rule requires that all DOE actions be reviewed before work begins for potential environmental impact and that a NEPA Determination be made. The Golden Field Office (GO) has been delegated by the Assistant Secretary the authority to make these determinations. As Program Manager, you are being notified through this letter that a determination has been made for this activity.

Signature of this letter constitutes my approval and written record of this determination. Please contact Jeffrey Baker of my staff at 303-231-1284 with any question regarding this determination.

Sincerely,

A handwritten signature in cursive script that reads "Paul K. Kearns".

Paul K. Kearns, Ph.D.
Acting Manager

cc: C. Borgstrom, EH-25, FSTL, w/DOE CH 560
J. Meeker, GO, w/DOE CH 560

ENVIRONMENTAL EVALUATION NOTIFICATION FORM (DOE-CH 560)

Contractor/Laboratory: Golden Field Office (GFO)

Project/Activity Title: Demolition of the Solar I Thermal Storage System 73086

B&R Number _____ Total Estimated Cost \$1.3 million

DOE Program Secretarial Officer (SO) Energy Efficiency and Renewable Energy (EE)

Contractor Project Manager: _____ Signature: _____

Contractor NEPA Reviewer: _____ Signature: _____

- A. Project/Activity Description: Include new project/activity, modification, purpose, need, DOE involvement if not under program direction, site and area location map, construction requirements, control equipment, technical and site alternatives considered, etc. Summary should be as brief as possible. It is not necessary to attach Statements of Work or Field Work Proposals.

Project will involve the removal and recycling of a non-hazardous heat transfer oil, Caloria HT 43™, and the demolition and disposal to recycle, salvage and landfill, of non-hazardous steel piping, tanks and heat exchangers, from the existing Solar I facility, a solar thermal electric pilot plant. A summary description of the proposed action is attached. The heat transfer oil has been tested, and the State of California has certified that the oil is classified as a non-hazardous exempted used oil, suitable for sale as product or to licensed recyclers. The project intends to sell the oil for use in a commercial boiler as substitute fuel, and utilize a commercial operator of a low temperature thermal desorption (LTDD) unit to treat the sand and gravel media used for heat storage prior to its incorporation into asphalt. The sand and gravel would be suitable for disposal in a landfill after treatment, however, the project and the State would rather the materials be recycled than disposed.

- B. Brief Description of Affected Environment: State whether previously disturbed, occupied or vacant. Indicate in a few words the type cover (e.g. grassland, woods, natural, landscaped), or habitat types known. Description should cover limits of area which may be reached by any effluent or immediate viewshed. Indicate the drainage or other surface water present in the area.

The proposed action would occur at the site of the existing Solar I facility, which operated from 1982 through 1986. The construction and operation of Solar I was evaluated by the Environmental Improvement Agency of San Bernadino County, CA, in the *Final Environmental Impact Assessment/Environmental Impact Report, 10 Megawatt Solar Power Pilot Plant*, June, 1978, and by DOE in the *Environmental Assessment, 10 Megawatt Solar Electric Power Pilot Plant*, (DOE/EA-0016). The site is located on cleared land in the Mojave Desert, approximately 10 miles east of Barstow. Prior to clearing the site had been utilized for alfalfa cultivation. Barren soil surface is maintained under the 90 acres of heliostats with limited invasion by native weeds. The areas adjacent to the site are a mix of heavy industrial and rural agriculture. The site is relatively flat, less than 2 foot relief, and located adjacent to the existing floodplain of the dry Mojave River. Drainage is by sheet flow across the site with no surface water present in the area. The proposed demolition would involve existing structures, and since there would be no discharges or releases to the environment, would not affect other onsite or offsite areas.

C. Environmental Considerations: If the proposed project/activity represents a commitment to a course of action that would ultimately require a positive response in one or more of the areas below, identify question numbers and provide explanation on a separate sheet attached to this form.

Will the project/activity, either during construction or operation, result in changes and/or disturbances to the following entities?

	YES	NO
1. Threatened/Endangered Species or Critical Habitats	—	<u>X</u>
2. Floodplains/Wetlands	—	<u>X</u>
3. Archaeological/Cultural Resources	—	<u>X</u>
4. Prime, Unique or Important Farmland	—	<u>X</u>
5. Non Attainment Areas	—	<u>X</u>
6. Class I Air Quality Control Region	—	<u>X</u>
7. Other Protected Species (Wild Burros, Migratory Birds)	—	<u>X</u>
8. Special Sources of Groundwater, (Sole Source Aquifer, etc.)	—	<u>X</u>
9. Navigable Air Space	—	<u>X</u>
10. Coastal Zones	—	<u>X</u>
11. National Parks, Wild and Scenic Rivers, etc	—	<u>X</u>
12. Public Controversy on Environmental Matters	—	<u>X</u>
13. Depletion of a Non-Renewable Resource	—	<u>X</u>
14. Impacts to Workers	—	<u>X</u>

Will the project/activity involve any of the following regulated substances or activities?

	YES	NO
15. Clearing or Excavation	<u>X^(a)</u>	—
16. Dredge and/or Fill	—	<u>X</u>
17. Noise	<u>X^(b)</u>	—
18. Pesticide Use	—	<u>X</u>
19. Hazardous or Priority Pollutant Emissions	—	<u>X</u>
20. Hazardous Waste	—	<u>X</u>
21. Liquid Effluent	—	<u>X</u>
22. Mixed Waste	—	<u>X</u>
23. Radioactive Waste/Contaminated Soil	—	<u>X</u>
24. Asbestos Emissions or Waste	—	<u>X</u>
25. Toxic Substances (PCBs)	—	<u>X</u>
26. Domestic Waste	—	<u>X</u>
27. Chemical Storage/Use	—	<u>X</u>
28. Radiation Exposures	—	<u>X</u>
29. New or Modified Federal/State Permits Required	—	<u>X</u>
30. Underground Injection	—	<u>X</u>
31. Underground Storage Tanks	—	<u>X</u>
32. Petroleum Storage	<u>X^(a)</u>	—
33. State NEPA Law	—	<u>X</u>

^(a) Equipment removal will involve limited excavation of underlying soils. Some spilled Caloria oil may be encountered. All oil contaminated soil, even though non-hazardous, would be removed and subject to LTDD prior to incorporation into asphalt. The area of disturbance is within the existing cleared equipment area. Clean fill will be acquired from offsite commercial suppliers.

^(b) Demolition activities would generate some noise, however, onsite workers would be protected if necessary according to normal OSHA worker protection requirements, and since there are no offsite residents within 2 miles, no offsite noise impacts are expected.

^(c) The Caloria HT 43™ is a petroleum derived heat exchange oil, having a BTU/gallon value similar to Number 2 fuel oil. The thermal storage system was safely operated and has stored the oil for more than a decade. Onsite fire suppression capability exists and would be available during the proposed demolition. The oil has tested as non-hazardous, and been certified by the State as used oil exempted from regulation.

May 13, 1995

SOLAR I DECOMMISSIONING

Site Description and History

The ten mega-watt Solar Thermal Central Receiver Pilot Plant, commonly known as Solar I, is a cooperative effort between the US Department of Energy (DOE) and a group of investors called the Associates, composed of Southern California Edison Company (SCE) and the Los Angeles Department of Water and Power. Solar I is located in San Bernadino County, California, twelve miles east of the city of Barstow, Figure 1.

DOE provided the funding for the design, construction, and start-up of the solar-related system and the Associates provided the funding for the design, construction, and start-up of the conventional power plant systems. The plant site is operated by SCE with the technical assistance of government contractors.

The experimental power plant completed its two-year test and evaluation phase on July 31, 1984, at which time it began its three-year power production phase. Solar I incorporated a unique thermal storage system (TSS) which utilized a non-hazardous, heat transfer oil, Caloria HT 43™, and a one million gallon storage tank, filled with gravel and sand, as thermal mass. Testing of the TSS was performed with government funding and was completed during the two-year test and evaluation phase. The TSS continued operation on a limited basis into the three-year power production phase to take advantage of its cost effectiveness in generating auxiliary steam, rather than its original purpose of storing thermal energy for later power generation.

On August 30, 1986, a pressure build-up in the thermal storage tank caused a tank rupture and a fire that lasted for approximately 11 hours and 20 minutes. The TSS was not used after the fire. The project has determined that there is no further research or demonstration purpose to be served by the TSS and, therefore, proposes to remove the system components to reduce project risks and support future research and demonstration needs.

10 MWe SOLAR PILOT PLANT
Location Map
Figure 1

**Areas Included
in Decommissioning**

**SOLARI
THERMAL STORAGE SYSTEM**

Plan View

FILE NO. SLR1-P1

DATE 1/20/93

FIGURE NO.

2

Remediation/Demolition Evaluation

GO has prepared an engineering and cost evaluation of remedial alternatives for the decommissioning of the Solar I TSS. Decommissioning of the Solar I TSS is currently scheduled to be completed in 1993. The evaluation also considered regulatory requirements, potential human health and environmental risks, and remedial objectives related to the project in addition to assessing remedial cost estimates, material quantity data, and numerous approaches to decommissioning the TSS. As part of this effort the heat transfer oil was sampled and analyzed and found to be non-hazardous. The results of the laboratory analyses were forwarded to the State of California, Department of Toxic Substances Control for certification. The State confirmed that the oil is classified as "used oil" and is exempted from regulation by the Department of Toxic Substance Control.

The Solar I TSS is composed of: a central storage tank filled with sand, gravel, and heat exchange oil; concrete containment areas; piping and equipment used for heat storage and auxiliary power generation during operation of Solar I, Figure 2. Four components of concern have been addressed as separate issues including: 1) heat exchange oil; 2) oily sand and gravel; 3) concrete and oil-contaminated soil; and 4) piping and equipment.

Appropriate technologies for removal and disposal of the components from the site have been evaluated according to criteria, including level of risk reduction, permanence, regulatory compliance, time frame for implementation, and cost.

Three alternatives were evaluated with respect to oil disposal including: 1) sale as Caloria oil or other oil product, 2) recovery of the oil's energy value as an alternative fuel, and 3) incineration. The selected alternative is to identify a buyer for the oil, such as Southern California Edison (SCE), who would use the oil as an alternative fuel in their existing boilers. The combustion of the oil as a fuel, would eliminate future potential risks and appears to be administratively feasible. It may prove to be the most cost effective method of oil disposal.

Eleven technologies were evaluated for the oil-contaminated sand and gravel, including landfill disposal with no treatment, in situ and ex situ soil flushing, in situ and ex situ solvent extraction, in situ and ex situ biotreatment, low temperature thermal desorption, solidification/stabilization and incineration. Based on its effectiveness in risk reduction, implementability and cost, low temperature thermal desorption has been selected over biotreatment as the most promising alternative for sand and gravel treatment and disposal. The sand and gravel would then be used by the low temperature thermal desorption (LTTD) company to make asphalt, after certification of cleanliness.

Comparison of the alternatives for demolition and salvage of components for the tank materials, piping, and associated equipment was also performed. With the possible exception of the electric motors and the variable speed controls, demolition and salvage of the TSS equipment and associated materials as scrap was determined to be more cost effective than the dismantling and resale of the individual components of the TSS. Because the concrete is not contaminated, landfill disposal is the selected alternative for concrete. Delineation of potentially contaminated soils cannot occur until overlying equipment and pads are removed. Identifiable oil-contaminated soils, if present, would be removed and treated in a similar manner as the sand and gravel.

APPENDIX B

SUPPORTING BIBLIOGRAPHY

APPENDIX B

The following represent key references cited in the DOE/EA-0016 and the EIA/EIR which supported the characterization of the affected environment and the conclusions that Solar One would/did not impact land use, biota, or cultural/historical/archaeological resources. Since these same "no impact" conclusions are valid for the proposed Solar Two Project, this reference list is provided for the readers' information.

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- Jenson, William A., 1984, Notes: *Archaeologic and Paleontologic Survey of the Luz Solar Trough, Phase II*. MS 84-9.1, on file at San Bernardino County Archaeological Information Center.
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-

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**FINDING OF NO SIGNIFICANT IMPACT
FOR THE SOLAR TWO PROJECT, BARSTOW, CA**

AGENCY: Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The Department of Energy (DOE) and a consortium of utility and regulatory agencies from California, Idaho, Oregon, and Arizona established a formal agreement to fund the proposed conversion of the existing Solar One Facility near Barstow, California, to a more advanced technology. The existing facility includes a solar central receiver, water/steam generator system which uses an oil/rock thermal storage system. The proposed Solar Two facility would replace these components with an advanced nitrate salt receiver, thermal storage, and steam generator system. The environmental consequences of the proposed conversion of the existing Solar One Facility and operation of Solar Two have been evaluated in an environmental assessment (DOE/EA-0911). The EA also addresses alternatives of different solar conversion technologies and alternative sites and discusses a no action alternative. The EA demonstrates that the construction and operation of Solar Two is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an environmental impact statement is not required and DOE is issuing this Finding of No Significant Impact.

COPIES OF THE EA ARE AVAILABLE FROM:

Deborah A. Turner, NEPA Compliance Officer
Environment, Safety and Health/Operations Division
U.S. Department of Energy, Golden Field Office
1617 Cole Boulevard
Golden, CO 80401
(303) 231-1284

FOR FURTHER INFORMATION CONTACT:

Carol Borgstrom, Director
Office of NEPA Oversight
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington D.C. 20585
(202) 586-4600 or (800) 472-2756

BACKGROUND:

The 10 megawatt electric (MWe) Solar One Pilot Plant, located at Daggett, near Barstow, California, successfully established the technical feasibility of solar central receiver technology. This technological approach to solar power generation utilizes a field of mirrors, called heliostats, surrounding a tower which supports a single central receiver. During operations the mirrors are focused upon the central receiver generating thermal energy. In Solar One, this thermal energy was utilized to produce steam, which was used either in the turbine-generator plant to produce electricity or transferred to an oil/rock thermal storage system for later use. This approach was selected to establish utility confidence in the concept and to minimize technical risks. Solar One started operation in 1982, and its six year test and power production program proved that the technology operates reliably, has very low environmental impact, and has excellent public acceptance.

During its operations, Solar One confirmed that the central receiver technology does not result in significant environmental impacts during operations as was predicted by DOE's "Environmental Assessment, 10 Megawatt Solar Electric Power Pilot Plant" (DOE/EA-0016) of June 1978, and the "Final Environmental Impact Assessment/Environmental Impact Report, 10 Megawatt Solar Power Pilot Plant" (EIA/EIR) of July 1978, generated by the Environmental Improvement Agency of San Bernardino County, California.

The Solar One Pilot Plant established the technical feasibility of the central receiver concept. Subsequent studies and analysis show that nitrate salt technology, with its cost-effective thermal storage system, has the lowest energy cost potential of all central station solar electric technologies as an intermediate load plant. The next step in the commercialization of the technology is to design, construct, and operate a nitrate-salt demonstration plant of a size that is large enough to reduce, to acceptable levels, the technical and economic risks in building the first commercial plant.

In recognition of the potential technical, economic and environmental benefit of this technology, DOE is entering into a cost sharing agreement to fund the Solar Two Project, with a consortium of 14 utilities, regulators and other interested industry organizations. The consortium is responsible for 50 percent of the project funding and the DOE is providing 50 percent.

PROPOSED ACTION:

The Solar One Pilot Plant, which utilized a water/steam receiver system, represents first generation central receiver technology. The Solar Two Project would convert the Solar One facility to second generation technology based on nitrate salt, central receiver and thermal storage systems. This conversion would involve replacing the existing water/steam receiver, heat transport and oil/rock thermal storage systems with nitrate salt receiver, heat transport, steam generation, and thermal storage systems. All aspects of the proposed Solar Two Project would take place within the existing 130 acres of Southern California Edison (SCE) land fenced for Solar One.

The proposed Solar Two Project has been conceptually designed to minimize investment risk for future commercial plants, while utilizing available equipment from Solar One to reduce the research and development (R&D) expense. The only significant modification required to convert the Solar One Facility to Solar Two would be the change of the Solar One million-gallon heat storage tank, which was filled with approximately 240,000 gallons of Caloria oil and approximately 4,500 tons of gravel and 2,700 tons of sand, to a dual tank heat storage system using 940 tons of nitrate salt. The two nitrate salt thermal storage tanks would contain salt at 550 °F and 1,050 °F (288 °C and 566 °C) to permit operation of the turbine plant from storage at rated output for up to four hours. The tanks would be approximately 45 feet in diameter and 20 feet tall. The 550 °F "cold" tank would be made of carbon steel and the 1,050 °F "hot" tank would be made of stainless steel.

The Solar Two Project would operate with solar energy systems (collector and receiver) serving solely to charge the thermal storage. The energy conversion systems (steam generator and turbine plant) would operate exclusively on energy withdrawn from thermal storage. This fundamental feature of the Solar Two Project would make the time and rate of electricity generation independent of the time and rate of solar energy collection, including cloud transients. In addition, the proposed Solar Two Project is designed to provide four hours of thermal energy storage. This storage capacity would allow a shift in the period during which solar energy is collected and electricity is generated. Nitrate salt thermal storage systems have been shown to be very efficient. Solar Two is expected to deliver to the turbine over 97 percent of the energy input to storage, compared with 50 percent of energy input for the Solar One system.

ENVIRONMENTAL IMPACTS:

Operational experience with Solar One demonstrated that the solar central receiver technology does not cause significant environmental impacts. The conversion of Solar One to Solar Two and operations of the proposed Solar Two Project would not release hazardous materials to the environment. The proposed Solar Two Project would only vary from Solar One in the use of nitrate salts for heat exchange and storage. Nitrate salts are only toxic if ingested in very large quantities, [lethal dose to 50 percent of an exposed population (LD_{50}) = 0.4 pounds for a 100 pound person], and the salts are only an inhalation irritant at very large concentrations. Therefore, normal operating procedures would be sufficient to protect workers from ingestion or any potential inhalation irritation from the nitrate salts during the initial charging of the system. After the storage tanks are filled, the nitrate salt would be totally contained within the Solar Two system in molten form, presenting no toxic hazard potential to the workers, the public, or the environment.

Land disturbance from the Solar Two Project would be limited to the addition of 11,500 square meters (m^2) of heliostats which would be constructed on approximately 10 acres of previously cleared land within the boundaries of the existing site. Process equipment modifications would occur within the area currently containing Solar One equipment. The one year construction period would utilize 130 to 200 workers, of which 50 to 75 percent would be local residents. The expected work force for the Solar Two construction is approximately half of the work force analyzed for Solar One construction, which resulted in no impacts on area traffic or to the local infrastructure. The operational work force of 30 to 35 workers would be equivalent to that used for Solar One which had no impact on traffic or the local economy.

Water needs for the proposed Solar Two Project would be met from available onsite resources, as analyzed for the Solar One Project. The Solar Two Project would require no additional resources over those committed previously to Solar One. Sanitary wastes would be managed on site utilizing the existing septic system permitted for Solar One. At the termination of the project, the nitrate salts would be recycled into the commercial market and the remainder of the facility would be recycled by commercial salvagers as non-hazardous scrap. It is likely that only foundation materials would be disposed in a solid waste landfill.

There are no threatened or endangered species or critical habitat onsite. The site is above the 100 year floodplain and contains no wetlands and is not prime or unique farmland. No cultural or historic resources exist on the proposed site.

Accidental release of the nitrate salt from the Solar Two Project could occur from a breach in the system. In the event of such a release, the non-combustible molten salt would immediately cool to a solid and be contained within concrete dikes and curbing, thus preventing release to the environment. The solidified salt would be removed and recycled into the system. Because the nitrate salts are non-flammable, the fire hazard presented by the oil system used for heat storage during Solar One, would not exist for the Solar Two Project. Even though nitrate salts have the potential to release toxic nitrogen oxide gases if involved in a fire or exposed to acids, there would be no accident scenario by which such toxic gases could be released, since all components of the Solar Two system in proximity to the molten salt system would be assembled of non-combustible materials and no acids would be used onsite.

ALTERNATIVES CONSIDERED:

Alternative Technologies. The DOE and its predecessor agency, the Energy Research and Development Administration (ERDA), were authorized by numerous laws to conduct research, development and demonstration (RD&D) projects aimed at effective solar energy utilization. The DOE has ongoing a variety of solar thermal energy system (STES) RD&D projects, in addition to the central receiver technology, demonstrated by Solar One, and proposed for the Solar Two Project. Currently the program is conducting RD&D projects on three types of concentrating collectors - central receiver, parabolic dish, and parabolic trough. Each concept is at a different stage of development. These alternatives to the STES proposed for the Solar Two Project have been, and are being evaluated under separate development projects and, therefore, were not discussed further in the EA.

Alternative Sites. The Daggett site was selected for Solar One from among nine sites based on an evaluation of environmental, technical and cost criteria. This selection process was documented in DOE/EA-0016 and the EIA/EIR. No other existing facility or site offers the same technical, economic, and environmental opportunity to the proposed Solar Two Project. Establishment of the Solar Two Project at a site other than the Daggett site would result in significant costs to recreate existing Solar One equipment, which would be used for the Solar Two Project, and result in environmental impacts associated with the land clearing for the heliostat field, which have already been incurred at the Daggett site. For this reason no other sites are considered reasonable for the Solar Two Project.

No Action. Failure to undertake the proposed Solar Two Project would stop or delay potential commercial deployment of the central receiver, molten salt, solar thermal power generation technology. As a result, the potential

environmental benefits represented by this technology, such as reduced air emissions from those generated by conventional fossil fuel derived electric power, would not be realized.

DETERMINATION:

The operating experience of the Solar One facility demonstrated that the central receiver technology is an effective solar conversion process that causes no significant environmental impacts. The Solar Two project would only modify the method by which solar energy is stored from the oil/rock Solar One system to a molten salt system. The analyses in the EA demonstrate that under normal operations or accident conditions the Solar Two Project would not result in significant environmental impacts.

Based on the information and analyses provided in the EA, DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act. Therefore, the preparation of an environmental impact statement is not required and DOE is issuing this Finding of No Significant Impact.

Issued in Washington D.C., this 10th day of February, 1994.

Tara O'Toole, M.D., M.P.H.
Assistant Secretary
Environment, Safety and Health

DATE

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END