| DOCKETED | |
|---|---|
| **Docket Number:** | 23-AFC-01 |
| **Project Title:** | Morton Bay Geothermal Project (MBGP) |
| **TN #:** | 249913 |
| **Document Title:** | Morton Bay Geothermal Project - Previous Resource Adequacy Testimony |
| **Description:** | N/A |
| **Filer:** | Jerry Salamy |
| **Organization:** | Jacobs |
| **Submitter Role:** | Applicant Consultant |
| **Submission Date:** | 4/28/2023 3:52:03 PM |
| **Docketed Date:** | 4/28/2023 |

# Salton Sea Unit 6 Project
# Geothermal Resource Evaluation

Michael Woods

## Introduction

My name is Michael Woods. During the last 14 years I have been employed by the California Department of Conservation, Division of Oil, Gas and Geothermal Resources (Division) as a resource engineer. Currently, I serve as the Geothermal District Engineer in the El Centro District. I have held this position for one and one half years. A brief resume of my professional qualifications is attached.

My duties as Geothermal District Engineer include: (1) directing the Division's regulatory program in the El Centro district including field surveillance and well permitting activities; (2) performing geological and engineering studies of geothermal resource areas, including resource estimates; (3) preparing material for hearings and meetings, and representing the Division at those hearings and meetings; (4) advising local government and the public on technical matters, both orally and written; and (5) serving as member of the Division's engineering advisory committee.

In accordance with the request by the California Energy Commission that the Division review all well records and related data and present, at hearings, its conclusions on resource availability based on professional expertise of its personnel, I have prepared testimony addressing the commercial availability of the geothermal resources for the proposed CE Obsidian Energy LLC Unit 6 power plant. In preparing this testimony, I reviewed Division well records surrounding the proposed development, the Application for Certification (AFC), several technical articles with estimates of the ultimate power production capability of the field, and data submitted by CE Obsidian Energy LLC at my request.

As a result of my analysis, it is my professional opinion that the proposed expansion of the Salton Sea Geothermal Field can supply sufficient resources in commercial quantities for the life of the Unit 6 power plant.

## Analysis

In reaching my conclusions concerning the adequacy of the resource, I reviewed records maintained by the geothermal unit of the Division, pressure decline data, reservoir modeling data and geologic cross-sections submitted by the operator at my request, and two published articles about resource estimates for the Salton Sea field.

Several test wells have been drilled in the proposed Unit 6 area. Significant among these are observation wells "M" 8 and "IID" 8. Well "M" 8 was drilled in 1981 to a depth of 3,000 feet and is located south of Unit 6, in the existing Region II production area, on the

proposed OB-5 well pad. Well "IID" 8 was drilled in 1990 to a depth of 6,508 feet and is located on Obsidian Butte itself, northwest of the OB-3 well pad. This well is near the northwestern edge of the Unit 6 production area. Neither well was directionally drilled. Pressure and temperature surveys are conducted annually on these wells. Pressure decline for both wells is approximately 8 psi/year. This decline strongly suggests that the Unit 6 area and the existing Region I and II production areas are one continuous reservoir. Cross-sections, from well "IID" 8 to the south through production Region I, and to the southeast through Region II, were shown to me by CalEnergy Operating Corporation at their office. These cross-sections also illustrate the continuity of the reservoir.

Shallow temperature gradient holes drilled in the Unit 6 area include Unocal wells 86-1, 86-2, 84-3 and 84-4, plus CalEnergy well "OBS" 1. To the immediate west and north of Unit 6, in the Salton Sea, are Sandia Corporation wells "RDO" 6K, 7F and 7Y. All of these wells were drilled between 1984 and 1986 to depths of between 100 and 300 feet, and define the western boundary of the shallow temperature anomaly (200°C/km). Wells 86-1, 86-2, 84-4 and "RDO" 6K have gradients above 200°C/km. The others, which lie farther to the west and north, have gradients below 200°C/km.

Information provided by CalEnergy also included the results of reservoir modeling studies, which were performed to best locate the producing and injection wells relative to the thermal boundary and the existing production areas. It was of particular interest to know whether any of the proposed Unit 6 wells, particularly the two southernmost producers, would cause a significant decline in pressure in the two existing production regions. Bottom hole pressures for observation wells "IID" 8 and "M" 8 were modeled twice; first assuming no Unit 6 production and then with the wells in the current proposed locations. Without Unit 6, pressures would continue to decline at about 8 psi/year. With Unit 6, pressures would decline faster, but only about 6 psi/year more, or approximately 14 psi/year total. Over a 30-year period, this decline would not significantly affect well productivity. It is significant to note the close proximity of well "M" 8 to the two southernmost proposed producing wells.

Scale buildup in the well bore and solids precipitation at the surface is a function of temperature and the total dissolved solids (TDS) of the produced water. In some of the undeveloped portions of the field, temperatures as high as 389°C may be encountered, and solids precipitation, causing plugging of the wells, could be a serious problem. However, well "IID" 8 has a TDS of 218,000 parts per million and a bottom-hole temperature of 288°C. The TDS of well "M" 8 is somewhat higher, 280,000 ppm. These numbers are lower than some of the values in the Elmore and Leathers areas, where scaling and solids precipitation at surface are manageable. If necessary, canal water may be added to the produced water before it enters the plant, as is done at Elmore and Leathers.

Casing programs have been submitted to this office for the 10 proposed producing wells of Unit 6. All wells are to be completed with 13 3/8" titanium casings. It will be necessary to generate approximately 13.6 million pounds per hour (13,600 kph), or 1,360

kph per well, to supply the 200 MWe power plant. Current 13 3/8" titanium completions in the field average more than this and produce as much as to 2000 kph per well.

Numerous technical articles have been published concerning the resource potential of the Salton Sea. For this presentation I reviewed the two more recent articles, which have the most conservative reserve estimates. The first article, written by W.A Elders in 1989, is a volumetric estimate based on the best available information at the time. The estimated resource was enough to produce 2,500 MWe for 20 years. The 20-year limit is somewhat conservative because it presumes that as the reservoir begins to cool, after continuous production and injection, no additional heat would enter from below 6,000 feet via convection or conduction.

The most recent study was presented at the 2002 Geothermal Resources Council meeting in Reno. This study takes the current electrical output (350 MWe gross) and multiplies this number by the ratio of the total area inside the shallow thermal anomaly divided by the area being produced now. This results in a resource potential of 2,330 MWe. Using the onshore area of the anomaly only, where deep well data is available, the "proven" but partially undeveloped resource is capable of producing 900 MWe.

Applying this method to the proposed Unit 6 production area means taking 350 MWe, dividing by the sum of all current developed areas (4,808 acres), and then multiplying by the proposed Unit 6 area (3,180 acres). The result is 231 MWe, more than the 200 MWe required for the plant. The values for current and Unit 6 acreages come from section 1.2.1 of the Application for Certification.

## Conclusion

Based on the information I have provided, and taking into account that there are additional areas of the Salton Sea field that could be drilled if more resource were needed, information available to me indicates sufficient resources exist to supply the 200 MWe CE Obsidian Energy LLC Unit 6 power plant for its designed 30 year life.

## References

Elders, W. A., 1989, Geothermal Resource Assessment of the Salton Sea Geothermal Field, California: University of California, Riverside. Rept. UCR/IGPP/89-32, 4 p.

Hulen, Jeffrey, Kaspereit, Dennis, Norton, Denis L., Osborn, William and Pulka, Fred, 2002, Refined Conceptual Modeling and a New Resource Estimate For the Salton Sea Geothermal Field, Imperial Valley, California; GRC Transactions Vol. 26.

# SALTON SEA UNIT 6 PROJECT
# GEOTHERMAL RESOURCE EVALUATION

Steve Baker

## INTRODUCTION

CE Obsidian Energy LLC proposes to build and operate a 185 MW (net) geothermal electric power plant, to be located near Obsidian Butte on the southeast shore of the Salton Sea in Imperial County, CA (CEOE 2002b). The purpose of this testimony is to present Energy Commission staff's evaluation of the ability of the geothermal resource at this site to support the project.

## LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

Section 25540.2 of the Warren-Alquist Act allows an applicant to avoid the prerequisite of first filing and obtaining approval of a Notice of Intention if "at the outset of the proceeding, the applicant can reasonably demonstrate [the site] to be capable of providing geothermal resources in commercial quantities."

The Energy Commission's Power Plant Site Certification Regulations require the Commission to "...hold a hearing for the sole purpose of determining whether the proposed site is reasonably capable of supplying geothermal resources in commercial quantities." (Cal. Code Regs., tit. 20, § 1809(a)) These regulations require the project applicant to "present testimony, studies or other evidence in support of its contention that sufficient geothermal resources have been confirmed at the site," and further require Energy Commission staff to "...present its evaluation of the site's resource capabilities." (Cal. Code Regs., tit. 20, § 1809(b))

## ANALYSIS

### *SOURCES OF INFORMATION*

In April 2002, the applicant presented to Energy Commission staff a draft document entitled, "Geothermal Resources for Salton Sea Unit 6 Power Plant Development" (CEOE 2002a). Some of the information in that document was then repeated in the Application for Certification (CEOE 2002b).

Further, the author of this testimony was previously employed by Southern Pacific Land Company, which was an original co-owner of the Salton Sea Unit 1 project, a 10 MW geothermal power plant now owned by the applicant. In that employ, the author was privy to resource evaluation information compiled by Union Oil Company's (later UNOCAL's) Geothermal Division, the operating partner of the Salton Sea Unit 1 project.

## *RECOGNITION AS A GEOTHERMAL RESOURCE*

The Salton Sea region and the Salton Trough are acknowledged as an established geothermal resource by several government entities. The region is designated a Known Geothermal Resource Area (KGRA) by the US Department of the Interior, Bureau of Land Management (BLM) and by the United States Geological Service USGS). The California Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR) has designated the area as a geothermal field. The California Department of Conservation, Division of Mines and Geology recognizes the area as one underlain at shallow depths by thermal waters of sufficient temperature for direct heat application. The Imperial County General Plan Geothermal and Transmission Element designates this area as being planned for development of geothermal resources and geothermal power plants.

## *MAGNITUDE OF THE RESOURCE*

The Salton Sea KGRA encompasses 102,887 acres (160.76 square miles). Of this area, only 4,808 acres (7.5 square miles, or 4.7 percent) is currently developed for the production of electric energy. Ten existing power plants, all owned by the applicant, operate in the KGRA, with a total electrical output of 326.4 MW net. The Salton Sea Unit 6 project will develop a further 3,180 acres (4.97 square miles), generating an additional 185 MW net (CEOE 2002a, 2002b).

## *ESTIMATES OF RESOURCE CAPACITY*

### THE APPLICANT'S ESTIMATES

The applicant believes that the Salton Sea KGRA contains proven reserves of 680 MW, probable reserves of 1,200 MW, and possible reserves of 2,300 MW (CEOE 2002a, pp.2-3).

The estimate of probable reserves is based, in part, on a third-party resource evaluation performed by GeothermEx, Inc., which identified 1,200 MW of reserves solely within that portion of the Salton Sea field dedicated to the Salton Sea Unit 6 project. The estimate of possible reserves is concurrent with an estimate by the Energy and Geoscience Institute at the University of Utah, which points to the possible existence of sufficient energy within the Salton Sea KGRA to produce 2,330 MW net output (CEOE 2002a, Attachment A, p. 3).

### STAFF'S ESTIMATE

In 1984, Union Oil Company's Geothermal Division produced an estimate of potential geothermal energy resources under Union Oil's holdings at the Salton Sea. (At that time, Union Oil Co. and Magma Energy Co. were the two major resource holders at the Salton Sea KGRA; both these companies' holdings have since been acquired by the applicant.)

That estimate pointed to the likelihood that the geothermal energy currently existing under only that portion of the Salton Sea KGRA subject to Union Oil's holdings in conjunction with Southern Pacific Land Co. (not counting the recharge, over time, of thermal energy and liquids) was approximately equal to the energy in five billion

barrels of oil. Adding to this additional lands under Union Oil control, but outside the agreement with Southern Pacific Land Co., this number would grow to the energy equivalent of approximately 7.5 billion barrels of oil. Further adding to this those lands under the control of Magma Energy Co. would expand the estimates considerably further.

Using the figure of 7.5 billion barrels of oil equivalent, and assuming an energy conversion efficiency of 35 percent, Union Oil's estimates of energy reserves under only that land controlled by Union Oil Co. would sustain the generation of 18,000 MW of electrical production for 30 years (not counting recharge over time). Adding the lands not under Union Oil control could increase this estimate to 25,000 MW for 30 years.

Staff recognizes the great disparity between this estimate and the applicant's estimate, and offers this explanation. First, the Union Oil Co. estimate was performed with less information on the resource. Many test wells have since been drilled, and more sophisticated modeling techniques have been brought into play to allow better estimates of the resource. Second, staff believes that applicant's estimates are extremely conservative. Staff believes the true capacity of the resource lies somewhere between these two estimates.

## CONCLUSION

Energy Commission staff fully supports the applicant's claim that the Salton Sea resource contains sufficient energy resources to support the Salton Sea Unit 6 Project.

## REFERENCES

CEOE (CE Obsidian Energy LLC). 2002 a. Draft Geothermal Resources for Salton Sea Unit 6 Power Plant Development. Submitted to California Energy Commission staff, April 2002.

CEOE (CE Obsidian Energy LLC). 2002 b. Application for Certification, Salton Sea Unit 6 Project (02-AFC-2). Submitted to the California Energy Commission, July 29, 2002.

CALIFORNIA
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1516 Ninth Street
Sacramento, CA 95825-5512
800-822-6228
www.energy.ca.gov

# NOTICE OF HEARING ON GEOTHERMAL RESOURCE AVAILABILITY

SALTON SEA GEOTHERMAL PROJECT
APPLICATION FOR CERTIFICATION
DOCKET NO. 02-AFC-2

**Important Notice to Public & Agencies:**

The Salton Sea Geothermal Project Committee (Committee) is reviewing an Application for Certification (AFC) by CE Obsidian Energy LLC to construct a geothermal power plant project near Calipatria in Imperial County. Public Resources Code section 25540.2 exempts the applicant from the Notice of Intention process as a necessary precedent to the Application for Certification upon a demonstration that commercial quantities of geothermal resources are available for the project.

**Hearing topic:**

Availability of commercial quantities of geothermal resources for the project.

Following the Informational Hearing (noticed separately), the Committee will conduct a hearing to determine whether there are commercial quantities of geothermal resources for the proposed power plant. Commercial quantities of a geothermal resource means "enough geothermal steam or hot water resources from a sufficient number of wells to support a reasonable conclusion that a proposed power plant will be able to achieve the applicant's estimated gross capacity over the life of the project." (Title 20, Calif. Code of Regs., section 1804(a).

**The public and interested agencies are welcome to attend and make comments on this topic.** Written comments (original & 11 copies) on the proposed project may be submitted to the Energy Commission, Docket Unit (02-AFC-2), 1516 - 9th Street, Sacramento, CA 95814 prior to November 15, 2002.

**Documents:** The Applicant's information concerning the commercial availability of geothermal resources is found in its AFC filing. In addition, following independent analysis, the staffs of the Energy Commission and the California Department of Oil and Gas (CDOG) will prepare a written statement assessing the commercial availability of geothermal resources.

The Applicant's commercial resource information and the Energy Commission/CDOG staffs' statement be available November 15, 2002, in a printed version, as well as on the Energy Commission Web Site for downloading:
**[www.energy.ca.gov/sitingcases/saltonsea/documents]**

A printed copy of the Staff/CDOG statement may be obtained by contacting Staff's Project Manager, Robert Worl, at 916-651-8853 or e-mail at: **[rworl@energy.state.ca.us].**

**Hearing - Date & Place:**

**Tuesday, November 19, 2002**
**Following the Informational hearing, Est. time 5:00 p.m.**

**Calipatria High School, Wirt Auditorium**
**501 West Main Street**
**Calipatria, California 92233**
**(Wheelchair accessible and map attached).**

**Hearing Procedures:**

The purpose of the hearing is to establish the record upon which the commercial availability of geothermal resources can be decided, through the taking of oral, written or documentary evidence under oath from the Applicant, Commission staff, and others.

Witnesses may appear either in person to testify under oath and may be subject to cross-examination or by declaration. A party sponsoring an expert witness, either by declaration or in person, shall establish the witness' qualifications.

## Assistance:

**800-822-6228**
(toll free in California)

**916-654-4489**

Members of the public may participate in all phases of the licensing process in a variety of ways. If you need information concerning public participation, please contact Roberta Mendonca, the Energy Commission's Public Adviser, at 916-654-4489, toll free in California, at 800-822-6228, or by e-mail at: **[pao@energy.state.ca.us].**

If you have a disability and need assistance to participate in this proceeding, please contact Lou Quiroz (916) 654-5146 or **[lquiroz@ energy.state.ca.us]** at least five days before the hearing.

**Contacts:**

Technical questions concerning the project should be addressed to the Energy Commission Staff's Project Manager, Robert Worl, at 916-651-8853 or e-mail at: **[rworl@energy.state.ca.us].**

Questions of a legal or procedural nature should be directed to Garret Shean, the Hearing Officer, at 916-654-3893 or e-mail at: **[gshean@energy.state.ca.us].**

Media inquiries should be directed to Claudia Chandler, Assistant Executive Director for Media and Public Communications, at 916-654-4989 or by e-mail at: **[energia@energy.ca.gov].**

**Dated: October 31, 2002**

**ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION**

/s/
WILLIAM J. KEESE
Chairman and Presiding Member
Salton Sea AFC Committee

/s/
ROBERT PERNELL
Commissioner and Associate Member
Salton Sea AFC Committee

Mailed to Lists - 7156, 7157 & 7158

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1516 NINTH STREET
SACRAMENTO, CA 95814-5512
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# NOTICE OF PUBLIC INFORMATIONAL HEARING & SITE VISIT

SALTON SEA GEOTHERMAL PROJECT
APPLICATION FOR CERTIFICATION
DOCKET NO. 02-AFC-2

The California Energy Commission is the State agency granted exclusive authority to review and license proposals to construct and operate large electric power plants. CE Obsidian Energy, L.L.C., has filed a proposal to construct a geothermal power project near Calipatria in Imperial County. A Committee of the Commission will begin the regulatory review process by conducting a Public Informational Hearing and Site Visit as described below:

**Purpose of Hearing:**

The Informational Hearing and Site Visit are the initial steps of the Commission's public power plant certification process, which contains requirements equivalent to those under the California Environmental Quality Act (CEQA) to review all relevant environmental and engineering aspects of the proposed project.

At the Informational Hearing, members of the general public, landowners, and representatives of other governmental agencies will have an opportunity to obtain information and offer comments on the proposal. The Applicant will explain its plans for developing the proposed site and related facilities. The Energy Commission staff will explain the regulatory review process and staff's role as independent experts in analyzing the project. The Applicant and the staff will also discuss possible issues that may be significant during the remainder of the proceeding.

**Site Visit Date & Place:**

The Informational Hearing will be preceded by a Site Visit at 12 Noon. Persons intending to attend the Site Visit should gather at the

Calipatria High School parking lot. The Applicant will provide bus transportation.

**November 19, 2002**
**Beginning at 12 Noon.**

**Calipatria High School**
**501 West Main Street**
**Calipatria, California 92233**

**Reservations Required: (by November 15, 2002)**

Persons planning to attend the Site Visit should make a reservation for bus transportation with the Commission's Public Adviser at 916-654-4489 or toll free at 800-822-6228 or via e-mail [pao@energy.state.ca.us] no later than Friday, November 15, 2002.

**Hearing Date & Place:**

**November 19, 2002**
**Beginning at 3:00 p.m.**


**Calipatria High School, Wirt Auditorium**
**501 West Main Street**
**Calipatria, California 92233**

**Project Description:**

On July 29, 2002, CE Obsidian Energy filed an Application For Certification (AFC) to construct and operate a geothermal steam turbine electric generating facility. The project is proposed for an 80-acre parcel located six miles northwest of Calipatria, within the unincorporated area of Imperial County, California. The new geothermal power facility would generate approximately 185 megawatts.

The project would consist of a resource production facility, a power generation facility, a new 161 kV switchyard, and ancillary

facilities including ten geothermal production wells, seven brine injection wells, and two electrical transmission lines. Cooling and potable water for the project would be supplied by Imperial Irrigation District from an existing canal approximately 500 feet from the project site via a buried 10-inch pipe, and treated on-site. Annual water use is estimated at 293 acre-feet. The plant is planned to insure that no wastewater will leave the site. The electric transmission system would consist of two separate lines, totaling 31 miles, connecting the project with separate segments of the Imperial Irrigation District (IID) transmission system. Both lines will be built as 230 kV, and operated at 161 kV.

The Salton Sea Known Geothermal Resource Area (KGRA) encompasses 100,887 acres, with only 4,808 acres currently developed. The proposed project would develop another 3,180 acres. The Salton Sea KGRA currently sustains 10 electric generation projects, delivering approximately 326 MW. the proposed project would bring the total to 511 MW of a 680 MW proven reserve.

**More Information:**

In order to assist participants in understanding the project, the Commission Staff will prepare and file by November 15, 2002, an ***Issue Identification Report*** summarizing the potential major issues in the proceeding. Copies of this document may be obtained by calling the Commission's Project Manager, Robert Worl, at (916) 651-8853 or through the Commission's Web Site at

**www.energy.ca.gov/ sitingcases/saltonsea/**

[www.energy.ca.gov/sitingcases/saltonsea]

The environmental and engineering details of the proposed project are contained in the Application for Certification (AFC). Copies of the AFC are available at the Calipatria Branch Library, 225 W. Main, Calipatria, CA 92233 and the El Centro Public Library, 539 State St., El Centro, CA 92243

**Assistance:**

**800-822-6228**
**(toll free in California)**

**916-654-4489**

Members of the public may participate in all phases of the licensing process in a variety of ways. If you need information concerning public participation, please contact Roberta Mendonca, the Energy Commission's Public Adviser, at 916-654-4489 or, toll free in California, at 800-822-6228, or by e-mail at: [pao@energy.state.ca.us]

Information concerning the status of the project, notices and other relevant documents are available on the Commission's Web Site at: [www.energy.ca.gov/sitingcases/saltonsea]

If you have a disability and need assistance to participate in the Informational Hearing and/or Site Visit, please contact Lou Quiroz at least five (5) days before the hearing at 916-654-5146 or email at: [lquiroz@energy.state.ca.us]

**Contacts:**

Technical questions concerning the project should be addressed to the Energy Commission Staff's Project Manager, Robert Worl, at 916-651-8853 or e-mail: [rworl@energy.state.ca.us]

Questions of a legal or procedural nature should be directed to Garret Shean, the Hearing Officer, at 916-654-3893 or e-mail at: [gshean@energy.state.ca.us]

Media inquiries should be directed to Claudia Chandler, Assistant Executive Director for Media and Public Communications, at 916-654-4989 or by e-mail at: [energia@energy.ca.gov]

Date online: November 1, 2002

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

WILLIAM J. KEESE
Chairman and Presiding Member
Salton Sea AFC Committee

ROBERT PERNELL
Commissioner and Associate Member
Salton Sea AFC Committee

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512

August 7, 2002

Dick Thomas, Geothermal Officer
California Department of Conservation
Division of Oil, Gas, and Geothermal Resources
801 K Street, MS 20-20
Sacramento, CA 95814

RE: Salton Sea Geothermal Unit 6 Project (02-AFC-2)

Dear Mr. Thomas,

I am writing to request California Division of Oil, Gas, and Geothermal Resources review of an application that we have received for a proposed geothermal power plant to determine whether the proposed site is capable of providing geothermal resources in commercial quantities. On July 29, 2002, CE Obsidian Energy, LLC submitted an application for certification (AFC) to the California Energy Commission proposing construction of a 185 megawatt (MW) electric generation facility, powered by geothermal energy from the Salton Sea Known Geothermal Resources Area. Pursuant to the Warren-Alquist Act and the Commission's regulations, the applicant seeks an exemption from the notice of intention process and requests a six-month review of its AFC (Pub. Resources Code §§ 25540.2, 25550; Cal. Code Regs., tit. 20, §§ 1809, 2021-2031).

The applicant is entitled to an exemption from having to submit a notice of intention to the Energy Commission if the applicant makes a reasonable demonstration that the proposed site is capable of providing geothermal resources in commercial quantities (Pub. Resources Code § 25540.2(a)). CE Obsidian Energy has provided information with its AFC that it contends demonstrates that its proposed site has commercial quantities of geothermal resources (see below).

Under our regulations, the applicant is required to present this information at a public hearing held for the purpose of determining whether the proposed site is reasonably capable of supplying geothermal resources in commercial quantities (Cal. Code Regs., tit. 20, § 1809(a)). Commission staff must also present its evaluation of the site's resources. In addition, our regulations provide a role for your division's review of the application and all filed well records and the presentation of your conclusions at the hearing. Robert Worl of my staff will contact your division to make sure you have all the information needed from us and to arrange for your division's participation, in whatever manner you choose, at the hearing.

The hearing on whether the site has commercial quantities of geothermal resources will be held at the Commission's regularly scheduled Business Meeting on Wednesday, August 28, 2002, beginning at 10:00 AM. If the Commission determines that the applicant has not demonstrated that the site is reasonably capable of producing geothermal resources in commercial quantities, the applicant may withdraw the application or request that the application be treated as a Notice of Intention.

Enclosed with this letter is a CD version of the Obsidian Energy AFC. The application has also been posted on our website at: http://www.energy.ca.gov/sitingcases/saltonsea.

Information specifically discussing the geothermal resources can be found in the following sections of the AFC:

- Section 1.2: Executive Summary
- Section 2.0: Project Objectives and Needs
- Section 3: Facility Description and Location
- Section 5.2: Geologic Hazards and Resources
- Section 5.17: List of Related Projects and Summary of Impacts
- Appendix J: Geotechnical Report

Questions regarding this request may be directed to Robert Worl at (916) 651-8853, or via email: rworl@energy.state.ca.us. I appreciate whatever assistance you and your staff are able to provide us.

Sincerely,

KEVIN M. KENNEDY
Energy Facilities Siting Program Manager

cc: Mike Woods, El Centro Office, Division of Oil, Gas, & Geothermal Resources
Jeff Hansen, MidAmerican Energy Holding Company

Enclosure: Salton Sea Unit 6 Project Application for Certification CD-ROM

CE Obsidian Energy LLC
A Limited Liability Company



**Geothermal Resources for Salton Sea Unit 6 Power Plant Development**
**April 2002**

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Imperial County is situated in the Salton Trough, a 3,100-square mile structural depression that extends from the Transverse Range on the north and the Gulf of California on the south. The Peninsular Range forms the western boundary, and the Colorado River forms the eastern boundary. The Salton Trough is an active rift valley where sedimentation and natural tectonic subsidence are nearly in equilibrium. The California Division of Mines and Geology recognizes the Salton Trough as an area underlain at shallow depths by thermal water of sufficient temperature for direct heat application. Separate anomalies are distributed throughout the Salton Trough, with hotter fluids suitable for electric generation. *See* Imperial County General Plan, Geothermal/Transmission Element, pp. 4-5.

The Salton Sea field has been known to have significant reserves since oil and gas companies first discovered the field in 1958 during exploration. The Salton Sea Known Geothermal Resource Area (KGRA), as defined by the BLM, includes 161 square miles (102,887 acres). A "known geothermal resource area" is an area in which the geology, nearby discoveries, competitive interests, or other indicia would, in the opinion of the Secretary of the Interior, engender a belief in those who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose. *See* 30 U.S.C. 1001.

The Salton Sea is a known geothermal resource area as defined by the United States Geological Service. The United States Geological Survey has designated nine KGRAs in Imperial County, including the Salton Sea. *See* Imperial County General Plan, Geothermal/Transmission Element, p. 5. The California Division of Oil, Gas and Geothermal Resources has also designated the Salton Sea as a geothermal field. *Id.* at 7.

Development of the resource was slow in the 1960's and 1970's due to the technical challenges associated with processing of the unusually aggressive hyper-saline brine. Unocal Geothermal, Magma Power Company and various governmental agencies overcame these challenges. Commercial operation of the Salton Sea field began in 1982 at Unocal's Unit 1 power plant and in 1986 at Magma's Vulcan plant. Since then, four additional generating units have been added in the original Unocal development area, and four additional generating units in the original Magma area (*see* Table 1 below). Both of the original development areas and all plants in the field are now operated by CalEnergy and are managed as a single business unit.

Table 1- Salton Sea Development History

| Plant | [Net MW] | Start-Up Date |
|---|---|---|
| Unit 1 | 10.0 | 1982 |
| Vulcan | 34.0 | 1986 |
| Del Ranch (Hoch) | 38.0 | 1989 |
| Elmore | 38.0 | 1989 |
| Unit 3 | 49.8 | 1989 |
| Leathers | 38.0 | 1990 |
| Unit 2 | 20.0 | 1990 |
| Unit 4 | 39.6 | 1996 |
| Unit 5 | 49.0 | 2000 |
| Turbo Expander | 10.0 | 2000 |
| Total Existing | 326.4 | |

Only 4,808 acres of the 102,887 acres of the Salton Sea KGRA are currently developed, and that acreage supports the generation of approximately 350 gross (326.4 net) MW. The proposed Salton Sea Unit 6 (SSU6) Power Plant Project will add 3,180 resource acres to development, and will support nearly 200 gross MW of additional electric power generation.

Figure 1 below shows that reservoir temperatures increase to the northwest of the developed field. The SSU6 Project will be developed to the northwest of the current line of development through the field, and should have a hotter than average resource quality. A large part of the Salton Sea geothermal field lies under the waters of the Salton Sea. In fact, the hottest part of the resource is located under the sea. The SSU6 Project would develop the remaining acreage on the shallower western end of the field that is still on land, between the developed part of the field and the hotter part of the field under the sea. However, the inaccessible acreage that is offshore does provide pressure support to the field and additional longevity to the developed part of the field. Without the SSU6 Project, the Salton Sea field would be substantially under-developed.

Figure 2 below shows that the SSU6 Project area is flanked to the southwest by current production from Units 1-5, to the southeast and east by production from the Vulcan and Hoch power plants, and to the northeast from the Elmore power plant. To the northwest, the SSU6 Project area is flanked by the exploration test well IID-8. Successful testing of IID-8 established proven reserves in the field out to the tip of Obsidian Butte. The current production area of Units 1-5 and Vulcan/Hoch define the southern and southeastern boundaries. However, no such limit is apparent northwest and north of the proposed site. The hottest well in the field, IID-14, is drilled north/northwest of the proposed site on Red Island. The Obsidian Butte area developed for the SSU6 Project contains proven reserves. The temperatures are hotter in the direction of development, and the development area is surrounded by production or successful test wells.

CE Obsidian Energy LLC classifies the Salton Sea field as having proven reserves of 680 MW, comprised of 350 MW that are currently proven and producing, and 330 MW that are proven but undeveloped. The SSU6 Project will use only 200 MW of the proven undeveloped reserves. CE Obsidian Energy LLC believes that the Salton Sea field has probable reserves of 1,200 MW, and possible reserves of 2,300 MW. GeothermEx, Inc. (GeothermEx) has performed third-party

reservoir engineering evaluations of the field, and concluded that 1,200 MW of reserves are available within the portion of the Salton Sea field dedicated to the SSU6 Project. The Imperial County General Plan, Geothermal/Transmission Element, identifies the Salton Sea as a KGRA with an estimated capacity of 1,400 MW.

Figure 3 below is a graphical representation of the reserve potential of the field as estimated by Jeff Hulen of The Energy and Geoscience Institute at the University of Utah (EGI), in a recent proposal from the EGI to the U.S. Department of Energy for further study of high-temperature hydrothermal systems in the Salton Trough.

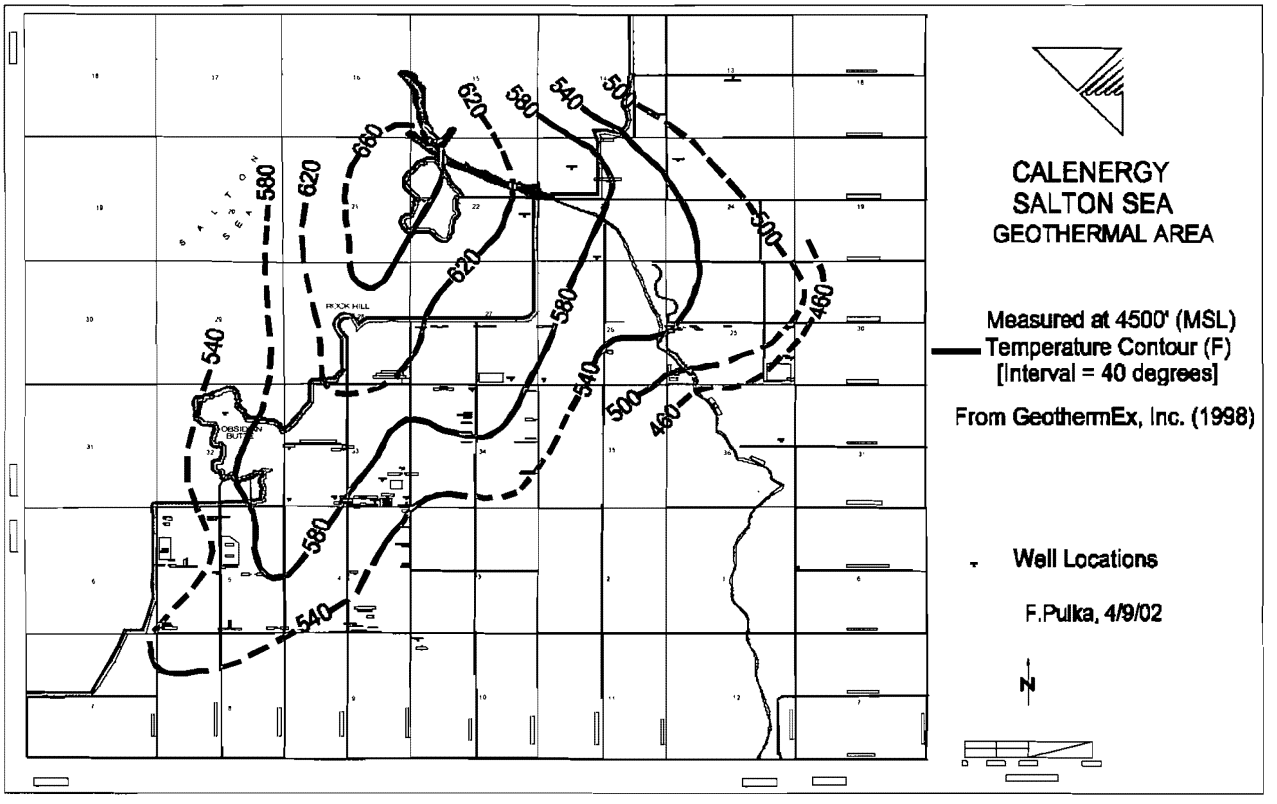


Figure 1: Temperature contours at 4000-foot depth under initial conditions (area of shallow heat anomaly shaded).

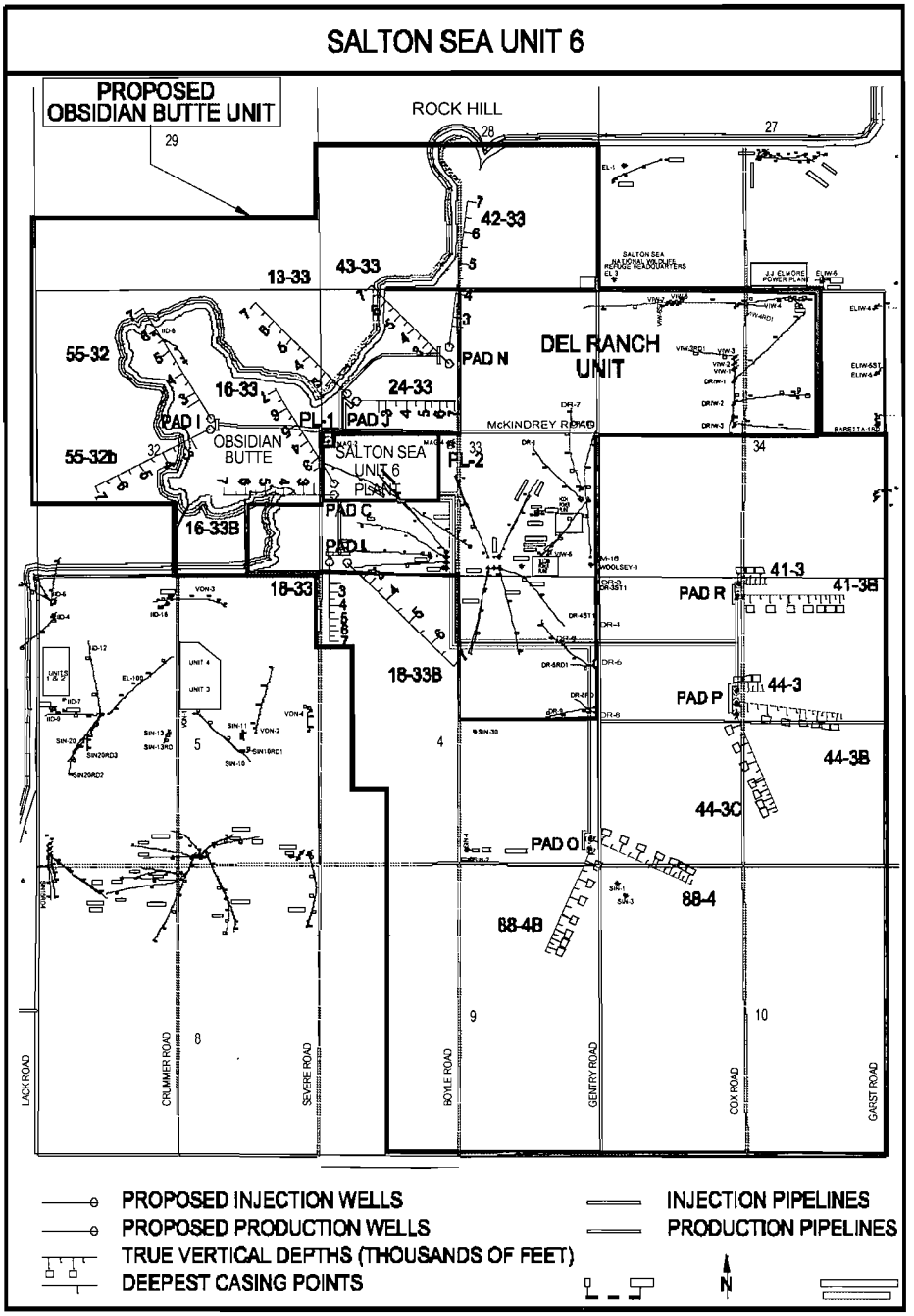


Figure 2: Proposed Unit 6 Wellfield Layout

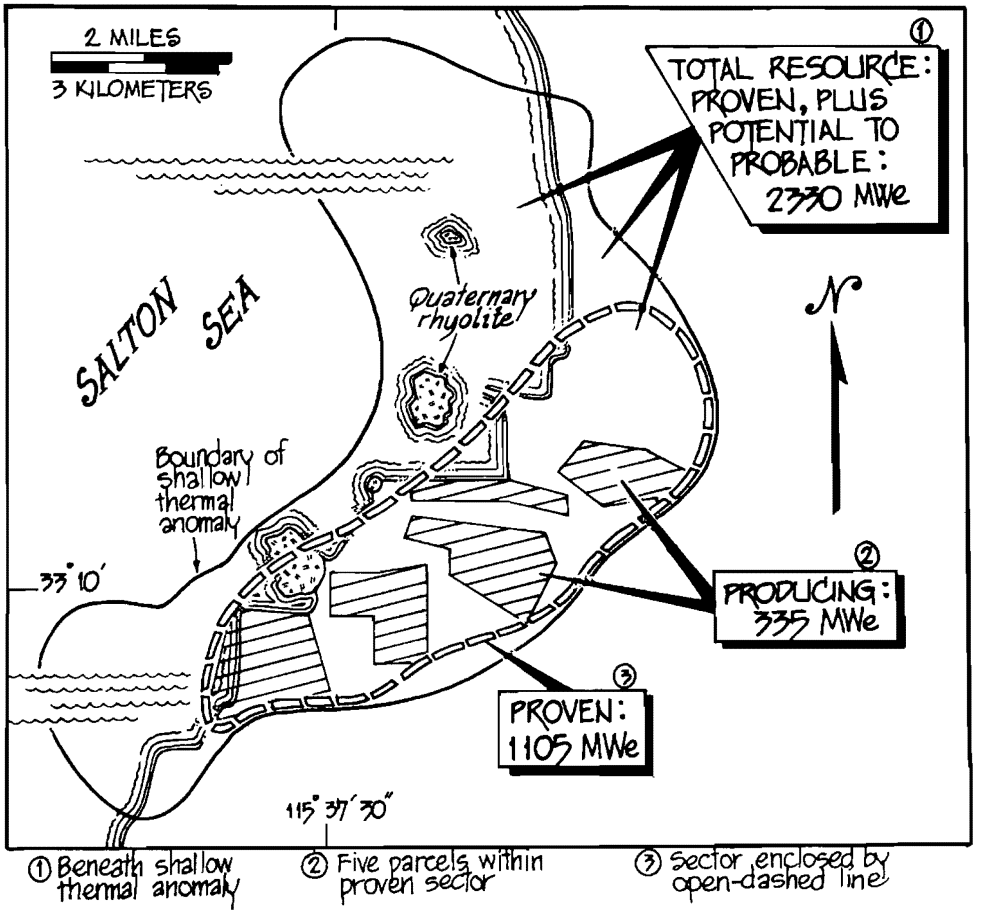


Figure . Resource assessment of the Salton Sea geothermal field. One MWe is considered to satisfy the electric-power needs of 1000 households, or about 4000 people. By this measure, 2325 MWe could support the electric-power needs of 9,300,000 people.

Figure 3: Source: Energy and Geoscience Institute, January 2002.