

Final Report
SOUTHEAST GEYSERS EFFLUENT PIPELINE PROJECT

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DOE/ID/13428-T1

KEY WORDS

Injection; reservoir management; wastewater effluent; public/private partnership.

PROJECT BACKGROUND AND STATUS

The project concept originated in 1990 with the convergence of two problems: 1) a need for augmented injection to mitigate declining reservoir productivity at The Geysers; and 2) a need for a new method of wastewater disposal for Lake County communities near The Geysers. A public/private partnership of Geysers operators and the Lake County Sanitation District (LACOSAN) was formed in 1991 to conduct a series of engineering, environmental, and financing studies of transporting treated wastewater effluent from the communities to the southeast portion of The Geysers via a 29-mile pipeline as shown in Figure 1. By 1994, these evaluations concluded that the concept was feasible and the stakeholders proceeded to formally develop the project, including pipeline and associated facilities design; preparation of an environmental impact statement; negotiation of construction and operating agreements; and assembly of \$45 million in construction funding from the stakeholders, and from state and federal agencies with related program goals.

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The project development process culminated in the system's dedication on October 16, 1997. As of this writing, all project components have been constructed or installed, successfully tested in compliance with design specifications, and are operating satisfactorily.

A detailed description of the project's development process and current operating status is provided on the project website at www.geysers-pipeline.org.

PROJECT OBJECTIVES

The overall objectives of the project are to demonstrate that large-scale augmented injection is a viable reservoir management practice that can simultaneously convert the community liability of wastewater into a sustainable energy asset.

Technical Objectives

- Mitigation of reservoir productivity declines through augmented injection.
- Use of treated wastewater effluent as an injection fluid.
- Use of a public/private partnership of stakeholders to plan and implement a synergistic solution to their respective problems.

Outcomes Achieved

- Construction of the 29-mile, 20-inch diameter effluent pipeline and associated facilities on schedule and within budget.

- **Delivery of up to 7.8 million gallons per day of wastewater effluent and lake make-up water to the Southeast Geysers for injection.**

Expected Outcomes

- **Recovery of effluent-derived geothermal steam in an amount equivalent to approximately 70 MW of generating capacity, or approximately 625,000 MWh of effluent-derived electricity generation annually.**
- **Operation of the system for 25 years or more.**

APPROACH

The project's approach to problem solving has been distinguished by two characteristics: 1) a public/private partnership that includes all key stakeholders working together on a consensus basis; and 2) a comprehensive and thorough series of reservoir assessment, pipeline engineering, and environmental impact studies to insure that risks have been minimized, and that the constructed project will perform according to specifications. A strong monitoring and evaluation component is being used to verify the degree of success in attaining project goals.

RESEARCH RESULTS

Quantified pipeline operation and reservoir injection results will not be available until the end of the first year of operation in 1998. Thereafter the project will issue periodic performance reports via its website at www.geysers-pipeline.org.

INDUSTRY INTEREST AND TECHNOLOGY TRANSFER

The following geothermal industry organizations participated with LACOSAN in the project:

<u>Organization</u>	<u>Type and Extent of Collaboration</u>
Northern California Power Agency	Co-funder; operator of pipeline control system; steamfield injection operator; power-plant operator.
Unocal Corp.	Co-funder; steamfield operator.
Calpine Corp.	Co-funder; steamfield operator.
Pacific Gas & Electric Co.	Co-funder; power plant operator.

LACOSAN, NCPA, Unocal, and Calpine constitute the membership of the project's Joint Operating Committee (JOC). The JOC will oversee pipeline operation and maintenance, and conduct monitoring and evaluation of the project's performance.

BUDGET

The project's \$45 million construction budget is itemized below by funding source and use of funds:

<u>Funding Source</u>	\$ (Million)	<u>Use of Funds</u>
Industry		
NCPA	6.00	Pipeline const.
Unocal/PG&E	6.00	Pipeline const.
Calpine/PG&E	6.00	Pipeline const.
State		
Calif. Energy Comm. (FY 93-94)	1.00	Design services
Calif. Energy Comm. (FY 95-96)	1.00	Pipeline const.
Federal		
BLM (advanced by NCPA)	3.50	Pipeline const.
DOE (FY 93-97)	7.20	Design, environ., mgmt. services, pipeline const.
EPA (FY 95)	2.00	Pipeline const.
EDA (FY 95)	4.00	Lake pipe & treatment plant construction
County		
Ratepayer indebtedness	<u>8.00</u>	Treatment plant & pipeline const.
Total	44.70	

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California Energy Commission, December 1991, Geysers KGRA Generating and Steam Resources Study, Docket 89-INF-1, Sacramento, CA.

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Figure 1
PROJECT VICINITY & MAJOR COMPONENTS

