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## Case Study Analysis: Mammoth Pacific Power Plant

Alyssa Kagel

Geothermal Energy Association

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*Case study, economics, environment, permitting, community, outreach, monitoring, mitigation*

### ABSTRACT

The expansion of the Mammoth Pacific Power Plant met substantial opposition and scrutiny in the Town of Mammoth Lakes, California. This paper explores the development process, from start to finish, of this 30 MW expansion project, drawing upon firsthand accounts by company and community representatives. This paper details the permitting, construction, and monitoring of the project, and highlights the community response to the plant. In the end, the Mammoth Pacific Complex has proven to be a success, both according to the community and also to the plant personnel.

This case study reveals what took place behind the scenes to bring a power plant online near a small, California community, as indicated by the people involved in that process—both within and outside the developing company. It documents one plant's transformation from one of the most hotly contested to one of the most locally and internationally appreciated power plants in the United States.

### Setting

Travel guides advertise Mono County, California, as “a land of fire and ice” with “extraordinary features [that] attest to the region's active geologic past.<sup>1</sup>” The largest city within Mono County, the Town of Mammoth Lakes, is in an area of intense recreation, from skiing and mountain climbing to

hiking and fishing, and is a land that one local described as Los Angeles' playground. At the time the Mammoth Pacific power plants were developed near the Town of Mammoth Lakes, the type of geothermal technology used<sup>2</sup> was relatively new and unexplored. The effects of such a plant, especially upon such a prime recreation area prized for its natural beauty, were uncertain.

### Plans for Development

The first unit at the Mammoth Pacific Complex, the 10-MW MP-I power plant that came online in 1984, was relatively unknown by constituents of Mono County. But the 1990 expansion, which added two 15 megawatt units to the Mammoth Pacific Complex, bringing the total capacity at the complex to 40 MW, met substantial public scrutiny. These two new facilities, one on private land, known as MP-II, and one on federal (Inyo National Forest) land, known as PLES I, were proposed by Mammoth Pacific, L.P. (MPLP) as expansion projects.

### Public Reaction and Company Response

Once plans for the expansion began, a full five years before permits were issued in 1989, people began voicing concerns related mostly to tourism and environmental impact. With guidance from Mono County Economic Development Director Dan Lyster, the county established the Long Valley Hydrologic Advisory Committee (LVHAC) in 1986 in response to those concerns. Members of LV-HAC included regulatory agencies such as Mono County; the Bureau of Land Management (BLM); the U.S. Forest Service; California Dept. of Fish and

<sup>1</sup> Official Website for Mammoth Lakes (2004). Retrieved October 7, 2005 from <http://www.visitmammoth.com/areainfo/geology.html>.

<sup>2</sup> At a binary geothermal power plant, the type developed at Mammoth, electricity is produced using lower temperature geothermal resources, at 100°C (212°F) to 165°C (330°F). In the binary process, the geothermal water heats another liquid that boils at a lower temperature than the geothermal water. The two liquids are kept completely separate through the use of heat exchangers used to transfer the heat energy from the geothermal water to the “working-fluid.” The secondary fluid vaporizes into gaseous vapor and (like steam) the force of the expanding vapor turns the turbines that power the generators.

Game; California Division of Oil, Gas, and Geothermal Resources; and Mammoth Community Water District; as well as any developer of the resource such as MPLP. The meetings were open to the public and were regularly attended by technical groups, representatives from U.S. Geological Survey (USGS) and local organizations such as the Sierra Club.

At the same time that the LVHAC was formed, MPLP (through its managing partner, initially Pacific Energy and currently Ormat) responded to the concerns voiced by constituents. According to Claude Harvey, Pacific Energy's Senior Vice President in charge of geothermal at the time, without a pointed, timely, and comprehensive response to peoples' concerns, the expansion would never have been permitted.

"When a project is going to be controversial, you've got to get in there and talk to the people directly," notes Harvey. "You've got to knock on doors, show up at town meetings, respond to letters in the local paper. Explain the benefits of a geothermal power plant and the benign nature of the plant. That's what we [Pacific Energy] did, and, if we hadn't done so, the plant simply would not have come online, because we wouldn't have had the necessary public support."

Dwight Carey, an environmental consultant who worked with MPLP during the expansion, notes that MPLP's efforts to integrate into the community have been ongoing, and continue to this day under the efforts of Bob Sullivan, plant manager: "MPLP has made it a point to be a true member of the community - making presentations, inviting tours, sponsoring community events - and generally making sure that people in the community at all levels (both in the economic and environmental community) know what is going on. As a result, the community trusts MPLP, and is not willing to immediately believe the worst if issues or concerns are brought up."

## Permitting

Though the permitting process began in 1986, only after a five-year struggle to obtain permits was permission finally granted for construction. The MP-II expansion project, located on private land, was approved by Mono County with a "conditional use permit," a 22-page document that contained over 100 conditions that had to be met in order for the project to move forward. The PLES I project, located on public land managed by the Inyo National Forest, was approved with a similar extensive list of conditions. Each project was required to pay for its own detailed study (an Environmental Impact Report [EIR] for the MP-II project and an Environmental Impact Statement [EIS] for the PLES I project) that assessed all potential environmental impacts of each project and the potential cumulative impacts of all of the projects.

According to Lyster, these two projects were the most highly conditioned power plant projects in California, with a laundry list of water monitoring activities developed by LVHAC and required by the respective permits. Water monitoring activities, including quality, flow, and temperature monitoring of geothermal resource wells, hot and cold water springs, groundwater wells, and surface waters, were initially conducted by USGS, but subsequently some of those have been transferred to the power company. Additional permit conditions required trans-

planting pine trees, extensive revegetation of disturbed areas, archeological surveys and monitoring, and painting structures with specific colors approved by the agencies.

## Construction

The expansion construction followed a breathtaking pace—the shortest amount of time Harvey had ever seen—so that the plants could reap the benefit of an investment tax credit. The company that designed the power plant, started by Harvey and Ben Holt, provided much of the financial backing for the project. Efficient, state-of-the-art facilities were operating just a year after construction began, in December 1990. Today, 15 years later, the plants continue to produce power, few hydro-logic impacts, and minimal emissions or aesthetic impacts.

Notes Harvey, "you'd never find a hotel that blended so well into this pristine environment." A hotel wouldn't contribute as much money to the economy, and it certainly wouldn't provide electricity to the grid, he adds.

MPLP took steps that showed their willingness to integrate into the community. For example, they paid special attention to preserving and adding to the bicycle paths, they utilized costly and efficient technology to minimize noise, and they ensured that roads were accessible in the wintertime.

Harvey, who, before his tenure with Pacific Energy had built many power plants—including coal, natural gas, and nuclear facilities—says that the Mammoth Plants "involved the longest, biggest, and most arduous permitting process" he's ever gone through. "I never got into [a project] as hot and controversial as Mammoth during my 40 years of experience, and that's ironic because the Mammoth plant was the most environmentally benign I've ever worked on."

Richard Campbell, one of the primary engineers for the units at Mammoth, helped design a power plant that is not only environmentally benign, but also unobtrusive. He and the company he worked for, Ben Holt Company, designed low-lying, camouflaged facilities that are difficult to spot even from a major highway overlooking the plant. The company also put silencers in place to limit noise pollution.

Based on Campbell's design, the MP-I plant became the first of its kind to utilize air-cooled technology, rather than the water-cooled technology used by geothermal power plants before it. While water-cooled units emit generally harmless but noticeable steam plumes, air-cooled units have no visible emissions and minimal operating losses of geothermal fluid or gases. Besides reducing the aesthetic impact, air-cooled binary cycle technology requires no cooling water—a particularly important consideration in the Mammoth area where water availability is limited.

## Results of Monitoring Activity

After years of monitoring, with the Mammoth power plants continually pumping at 12,500 gallons per minute, there have been few adverse impacts attributed to plant development. Even so, all monitoring efforts continue on a regular basis, and most are made available once a quarter to any interested parties. With continued efficient management practices, the

plant will likely stay online many years into the future.

Carey measures the success of the plant based on the minimal impact over the last 15 years of operations: “none of the dire predictions about the worst case impacts of the expansion projects came true. The projects aren’t that visible; no adverse impacts to the hot springs in Hot Creek or the hatchery or the Owens tui chub have been documented; deer are grazing amongst the wells; no spills have adversely affected the creeks; and tourism is doing well.” People slowly but surely began to realize that not only did the Mammoth Plants produce no negative impacts, it actually produced community benefits.

## Benefits

One such benefit is employment. Construction of the plant required a few hundred workers; current operation requires 21 full-time employees, with additional seasonal employees. The plants provide some of the best jobs in the Town of Mammoth Lakes, with a population of around 7,000. Both the original managing partner, Pacific Energy, and the current managing partner, Ormat Nevada, Inc., have made a commitment to hiring locally, with most full-time employees entering the geothermal field from a variety of backgrounds. Past jobs of current Mammoth employees include ski patrolman, miner, bartender, and volunteer fireman. Ormat provides the considerable training needed for these highly skilled positions, and workers are encouraged to stay with the company long-term. Indeed, most of them do.

“A number of our employees have been with us for 20 years,” says Sullivan. “I myself have been with the company for over almost 15 years.”

Another benefit of the Mammoth Pacific geothermal plant is its low environmental impact. The MPLP plants produce minimal air emissions. A study shows that the pine trees sur-

rounding the geothermal plants emit more greenhouse gases than the fugitive emissions from the power plants themselves. The effect on the deer population, which was one of the concerns of the California Department of Fish and Game when it sued Mono County to prevent the approval of the MP-II project, was found to be one half of one deer over the entire lifetime of the plant. Hawks have flocked to the area near the plants, and can be seen using the thermal currents to assist in soaring. In 1991, the California State Assembly passed a resolution commending the MPLP on the start-up of two of its geothermal power facilities in Mono County, recognizing its use of clean energy without “environmentally damaging emissions.” In addition, for four consecutive years (2000-2004), MPLP received from the California Department of Conservation an award for its outstanding environmental record at its Mono County geothermal facilities.<sup>3</sup>

Another significant benefit has been the financial contributions of the power plant. MPLP has been designated a “good neighbor,” by many locals, including Lyster, for making donations to local groups in the area. MPLP built a new community center from the proceeds of the power plants. According to Sullivan, MPLP is one of the largest taxpayers in the county, supplying over half a million dollars last year alone.

## MPLP: A Success Story

The Mammoth Pacific Complex, which supplies power enough for approximately 40,000 homes, has provided many socioeconomic benefits. MPLP’s involvement at all levels—including monitoring, individual responses to citizens’ concerns, sponsorship of community events, funding of community centers, and construction of aesthetically pleasing facilities—demonstrates its commitment to Mono County. Despite initial challenges, MPLP has emerged as a true success story for the geothermal community.

<sup>3</sup> U.S. DOE (Jan 2006). *Geothermal Technologies Program*. Retrieved October 14, 2005, from [http://www.eere.energy.gov/geothermal/geopower\\_calif\\_awards.html](http://www.eere.energy.gov/geothermal/geopower_calif_awards.html).

