Pyramid Lake Geothermal

Native American Tribe Seeks Development Potential at the Pyramid Lake Paiute Reservation in Nevada

By Ted J. Clutter – GRC Executive Director

lying approximately 35 miles northeast of Reno, the Pyramid Lake Paiute Reservation in northwestern Nevada holds considerable potential for the development and use of geothermal energy. Enhancing that potential are recent Nevada mandates and policies that create demand for clean, sustainable electricity from renewable energy alternatives.

Pyramid Lake dominates the landscape of the Paiute reservation. This liquid sapphire in the desert is 27 miles long, 4 to 11 miles wide, and 346 ft. deep. At an elevation of 3,808 ft., its waters are about 1/6 as salty as the ocean (5,5000 ppm compared to 33,000 ppm). Surrounding the lakeshore is a number of large “tufa” (calcium carbonate) rock formations deposited by geothermal hot springs. These and other provocative indications make the Pyramid Lake Paiute Reservation a serious candidate for geothermal power development.

Pyramid Lake is the outflow basin for the Truckee River from Lake Tahoe in the Sierra Nevada Mountains. There is no outlet to the ocean from the system. According to the Nevada Division of Water Planning, the Middle Truckee River watershed covers 435 square miles, or 285,000 acres, mostly in California.
A remarkable feature of Pyramid Lake is a total lack of development along its shore. Indeed, the Truckee River and Pyramid Lake remain largely in their natural state. Tribal members are proud of their efforts to discourage human incursions along the lakeshore.

The Tribe does allow public access, however, for water skiing, camping, and wildlife observation. Many visit to enjoy the scenery, but even more come to fish for the lake’s legendary Lahontan cutthroat trout (Oncorhynchus clarki henshawi). The trout fatten to record sizes on the cui-ui chub (Chasmistes cujus). Both fish are sacred to the Pyramid Lake Paiute Tribe, and embedded in its very identity. Indeed, tribal members are traditionally known as “cui-ui ticutta,” or “cui-ui eaters.”

Lahontan cutthroat trout were once widespread throughout the basins of the ancient Lake Lahontan, which began drying up 12,000 years ago. The fish adapted to these changes and thrived in the lakes and streams of northwestern Nevada, eastern California and southern Oregon—including Pyramid Lake—that remained after Lake Lahontan disappeared. Yet with recent drought and increasing community and agricultural demands on the watershed, these survivors of the Ice Age are both listed as threatened by the U.S. Fish & Wildlife Service (USFWS).

Maintaining the integrity of the fishery is a lynchpin of conservation efforts in the region. To preserve fish in the Truckee River, a joint USFWS / U.S. Bureau of Reclamation restoration project is underway. To preserve its heritage, the Tribe has set up five power-hungry fish hatcheries at Pyramid Lake to help maintain its trout population. With pumps and chillers to ensure good egg and fingerling production, the Tribe’s annual electricity bill for the hatcheries approaches $140,000!

“The operations use high enough levels of electrical power to warrant an investigation of geothermal energy options to reduce costs,” says a U.S. Department of Energy (DOE) GeoPowering the West Initiative (GPW) report. The assessment found that Pyramid Lake Paiute tribal lands possess identified and potentially economic geothermal resources that could be put to such purpose—and pro-

The landscape of the Pyramid Lake Paiute Reservation in northwestern Nevada is dominated by this pristine and undeveloped blue sapphire in the desert. With the Great Basin Center for Geothermal Energy at the University of Nevada-Reno, the Pyramid Lake Paiute Tribe is conducting assessment and evaluation of its geothermal resources, which hold promise for power generation.
vide substantial revenue from electricity sales to the state-wide power grid.

The Report on Renewable Energy Site Survey at the Pyramid Lake Paiute Reservation was sought by then-Tribal Chairman Alan Mandell. He enthusiastically hosted report authors Roger Hill (Sandia National Laboratories – Albuquerque, NM), Randy Manion (DOE Western Area Power Administration – Lakewood, CO), and geothermal consultant Dr. Jim Combs (Geo Hills Associates – Reno, NV) during a site visit in May 2001.

According to their report, higher power costs, favorable market-forming regulations, demands for “green energy,” and rising environmental concerns favor Paiute geothermal energy development: “Considering new statewide energy policy and regulations, as well as social recognition of the benefits of renewable energy, now is the time to move forward with exploring and assessing the availability of renewable resources on Pyramid Lake Paiute Reservation lands.”

Nevada Governor Kenny Guinn signed the state’s Renewable Portfolio Standard (RPS) in 2001. It mandates that 5 percent of electricity provided by investor-owned utilities or alternative sellers come from renewable energy sources. The standard increases 2 percent every other year until it reaches 15 percent in 2013. The RPS offers new market opportunities for geothermal power that could potentially be produced on the Pyramid Lake Paiute Reservation.

Surface manifestations at Pyramid Lake and surrounding areas reveal the geothermal potential of the region, where large tufa structures and venting geysers have developed throughout the geologic past. The large pyramid-shaped tufa structure on the eastern shore gave the lake its name. It is still active and can be seen emitting steam on cold winter days. “Tufa structures above the lake are linear in arrangement, indicating alignment with faults, and appear to be coincident with earlier releases of geothermal water at the surface,” said the DOE report.

Clusters of hot wells and springs are found at Needles, Nixon, and Little Valley near the lake. Divers have reported subsurface hot springs near Needle Rocks. The temperature of geothermal springs there has been reported at 151° F to 208° F. In the early 1960s, Western Geothermal, Inc. drilled three geothermal wells in the area. The deepest was 5,888 ft., with a maximum-recorded temperature of ~240° F.

Enhancing the potential of geothermal development at the Pyramid Lake Paiute Reservation is its favorable location for power transmission. “Tribal lands lie at a crossroads of electrical transmission lines, a natural gas pipeline corridor, and other infrastructure that could offer synergistic or complementary benefits,” said the DOE report. Transmission lines that cross the reservation boundaries are important as a collection point for electrical energy, which can then be transmitted across northern Nevada and possibly California.
Sierra Pacific Power Co. provides electricity to the reservation and its residents, with distribution lines at Nixon and Sutcliffe. Lands north of Sutcliffe have no electrical infrastructure, and therefore remain undeveloped. This area in particular appears to have excellent potential for geothermal resources exploration and development. Two 345-kilovolt (kV) lines cross the reservation southeast of Nixon, where they intersect a 500-kV DC line (the Pacific-Intertie).

"These transmission lines offer the excellent possibility for accessing energy markets with locally generated electricity from renewable resources like geothermal," said the DOE report. "AC transmission lines west of the lake might offer possibilities for future interconnection, depending on the eventual siting of any geothermal generating plants."

Since the DOE recommendations in 2001, geothermal resources and their development have been turned over to Pyramid Lake Paiute Tribe Department of Water Resources Director John W. Jackson. Under his leadership, the tribe is working to gain a better understanding of their geothermal energy resources, and what it will take to develop power generation as a means of tribal advancement. The Tribe likes the concept of renewable energy," said Jackson. But given our heritage, "Key factors in decision-making will be preservation of Pyramid Lake’s environmental, cultural and archaeological integrity."

As recently as 10,000 years ago, Nevada was considerably wetter than today, and much of the land was covered with lakes and expansive grasslands formed during the last Ice Age. The largest of the lakes were the prehistoric Lake Lahontan in northwestern Nevada and Lake Bonneville, which covered most of northwestern Utah and extended into northeastern Nevada. As the massive ice sheet receded northward, the land dried, withering once abundant vegetation. Nevada’s water resources were imprisoned in shrinking desert lakes and locked beneath sedimentary layers in numerous elongated valleys.

Today, Pyramid Lake, Walker Lake, Lake Winnemucca and the Carson Sink in west-central Nevada are the only remaining clues to the existence of ancient Lake Lahontan. Surrounding these few remnants of the last glacial epoch, watermarks etched high above present lake levels provide fleeting evidence of Nevada’s ancient past. (Nevada Division of Water Planning)

Following on the DOE report’s recommendation that further actions be taken to evaluate and assess Pyramid Lake Paiute geothermal resources, the agency provided a 2004-05 research grant of $980,000 from its Tribal Energy Program. The funding supports a tribal grant to the Great Basin Center for Geothermal Energy, University of Nevada-Reno, with Dr. Mark Coolbaugh as principal investigator. Shuman Moore, High Desert GeoCulture, LLC (Reno, NV) has been retained under the contract as a geothermal consultant, and the worldwide law firm Holland & Knight is charged with all aspects of regulation and permitting.

The project’s primary area of exploration is the Smoke Creek Desert, in the northern reaches of the reservation far from Pyramid Lake. “The project includes remote sensing, spectral analysis, gravity and magnetic assessments,” described Jackson. Though he would not reveal any data prior to release of a project report later this year, he said, “There’s hot water all over—all we have to do is find the right places to drill.”

The DOE-funded geothermal resources evaluation and assessment project also includes an historical data search, and development of a GIS geothermal database to help determine resource potential and location of exploratory slimhole wells. “We are working to determine if geothermal power production is economically feasible, but more importantly, if it is a sound investment in the future of our culture and the environment,” Jackson concluded.