

FAIRBANKS DAILY NEW-MINER

Chena Hot Springs Resort helps create innovative geothermal project to fuel its energy needs

By [Stefan Milkowski](#)

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According to Chena Hot Springs Resort proprietor Bernie Karl, it's a powerful time at the resort.

A new piece of equipment there will make the most significant contribution to power generation in the 21st century, he claimed this week.

Not bad for a vacation resort more than 50 miles from the nearest city and off the electric grid.

If you're not convinced this is hot, you could ask Gov. Frank Murkowski, U.S. Sen. Ted Stevens, or U.S. Energy Secretary Samuel Bodman. All of them are scheduled to attend an official unveiling next month.

The resort's Next Big Thing is a tiny power plant designed to run off hot water. Instead of paying \$365,000 a year for diesel fuel and generating power for 30 cents a kilowatt-hour, the resort will pay no fuel costs and generate power for 5 to 7 cents. It's the latest installment in Karl's scheme to make the resort completely self-sufficient.

Creating electricity from geothermal energy isn't new, but making power with water that's only 170 degrees Fahrenheit—scalding but not boiling—is new. The technology could make cooler geothermal waters, which are more common, candidates for electricity generation.

The plant itself is basically a refrigeration system rigged to run backwards. With some tweaking, it can make cheap power from a diesel generator's waste heat, burning trees and shrubs, or from other sources.

Karl thinks this is big.

"Every village in Alaska could be self-sufficient in 10 years," he said.

On Aug. 20, the resort will hold its first Chena Renewable Energy Fair to celebrate the new plant. Murkowski, Stevens and Bodman are scheduled to speak, experts from around the country will present dozens of workshops and vendors will show off their wares. Tours of the plant, greenhouses and other energy projects will be available, as well as free chili and hot dogs, music and prizes, and free transportation from Fairbanks.

The Chena Chiller

The resort's new power plant arrived two weeks ago. It's about the size of a big pickup and consists of a few tanks laid flat and a bunch of pipes, valves and electronics. Instead of relying on steam from the water itself,

which wouldn't be hot enough, the plant works by using the heat from the geothermal water to vaporize a fluid with a lower boiling point. That vapor builds up pressure that drives a turbine and generates power.

The plant was developed through a partnership with Connecticut-based United Technologies Corp., which learned about Chena Hot Springs through the Department of Energy. The company is spending millions of dollars to develop the plant but is charging the resort only \$250,000, the target price for future plants.

The plant will be called the Chena Chiller.

Fred Cogswell, a research engineer with UTC, flew in from Connecticut to set up the prototype. He helped design it and wrote the computer code used to monitor and run it. To keep costs down, the company used as many parts as possible from existing products.

"It's nice to see something actually get out there," he said Tuesday, "and this is potentially something that can make a difference."

One group that thinks it might be the state-run Alaska Energy Authority, which has supported the resort's efforts.

"The UTC technology looks pretty attractive," said Peter Crimp, program manager for alternative energy and energy efficiency.

Crimp noted that most of the state's geothermal resource is located along the Aleutian chain, where there is little demand for power. But, he said, villages could ease their dependence on diesel by looking to the resources they do have, whether that's wind, wood, waves or waste fish oil.

"If there's a way to displace diesel, then we're all for it," he said.

Karl puts a lot of faith in the Chena Chiller.

The plants will be cheap, fast to build and adaptable, he said. The resort is in line to get another 200-kilowatt plant in September and to host the first 1-megawatt version once it's developed. The first 400 kilowatts are more than enough to run the resort, but Karl envisions making 20 megawatts and enticing Golden Valley Electric Association to buy power from him.

"Bernie doesn't do anything on a small scale," said Gwen Holdmann, a sled dog racer and mechanical engineer whose job is to make the resort sustainable.

Last month, GVEA's Steve Haagenson and Tom Irwin took a tour of the resort. Irwin said the utility has crunched some numbers and found that if the resort can come up with 20 megawatts, it might make sense to extend power lines another 30 miles to tap into it.

"Geothermal's a great way to go," he said. "If anybody can pull it off, quite frankly, Bernie can, and we're pulling for him."

Karl said he sees the new plant operating in Alaska villages, being adapted to harness power from the sun and biomass, and cranking out power in all 50 states.

A few days after the first Chena Chiller arrived at Chena Hot Springs, Karl traveled to Washington, D.C., to testify before the Senate Energy and Natural Resources Committee.

Speaking in favor of federal funding for geothermal research, he claimed that hot water brought up from oil wells in Texas alone could provide 5,000 megawatts of electricity—enough to power 5 million homes. The plants could be operating within 24 months, he claimed.

Karl said he challenged the senators to come up with half the money needed to drill a 20,000-foot hole next to the Smithsonian Institution to provide electricity, heat, and cooling for the whole city. Karl would pay the other half.

“They were quite surprised,” he said.

The grand scheme

To Karl and Holdmann, the new power plant is part of a much greater vision.

Karl considers the resort a microcosm of the world with 65 employees, hundreds of guests a day, and its own water and sewage systems, power generation and roadway. If the resort can become sustainable, it will act as something of classroom to teach the world a few lessons.

Less than a week after Karl took over the hot springs in 1998, he drilled a hole to tap the hot springs, and now every building at the resort—from the 20,000-square-foot Moose Lodge to 300- square-foot cabins—is heated by the hot water.

In 2004, the resort installed a test greenhouse heated by geothermal energy. As temperatures outside tumbled well below zero, the temperature in the greenhouse stayed nearly tropical, a temperature difference of 130 degrees.

In other words, it worked.

So this year the resort has a new greenhouse, four times the size, that Karl hopes will provide tomatoes, lettuce, green beans, peppers, cucumbers and more to the resort throughout the year.

Once the growing techniques are perfected, he said, “It’ll be a model for every village in the state.”

The same geothermal energy used to heat the greenhouse is used to keep the resort’s ice museum cold. The museum has been open for two years running, thanks largely to Holdmann, who said she won an award from the Geothermal Resources Council for the museum’s chiller, a mess of pipes and valves in the back of a cargo container.

“It’s all manually controlled,” she said, “and it didn’t come with a manual.”

Holdmann's job is to develop things, not run them, so she put together a binder called "Absorption Chilling For Dummies" and moved on to the next project.

This spring she converted her 16-year-old Dodge pickup to run on used vegetable oil from the resort's restaurant.

The effort to make the resort sustainable is spurred by a belief Holdmann and Karl share—that Americans are gluttons for energy, making up 5 percent of the world's population and using 25 percent of its energy.

"We're hogs," Karl said. "Shame on us."

Karl's vision is matched by an ability to innovate.

He estimated he gained that growing up in the Illinois corn fields in a family of 16. He got one pair of shoes a year and had to make them last. Cardboard patches failed in the rain, so he learned to use linoleum.

"That's kind of what I've been doing my whole life," he said, "looking for something better than cardboard."

According to Irwin, that's just what's needed.

"You need out-of-the-box, entrepreneurial thinkers to make things happen," he said, "and (Karl) is one."

Karl believes the pollution associated with burning fossil fuels is making people sick and harming the water, air and earth. He said people should use hydrogen for fuel.

So that's the next step at the resort.

Karl wants to use excess energy from the geothermal plants to separate hydrogen from water to use in fuel cells. He wants all the resort's vehicles—including the shuttles, the snowmachines and even the airplane—to be running on hydrogen by the end of the first quarter of 2007.

Holdmann said she'd pass on the hydrogen airplane's maiden voyage. She admits that when she first met Karl, she thought he was nuts.

But even if his ideas are far out, she said, "he accomplishes a lot of what he talks about doing."

Staff writer Stefan Milkowski can be reached at smilkowski@newsminer.com.