

Geothermal bubbles up as clean energy solution

Industry abuzz after years of stagnation

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LOS ANGELES TIMES
RENO, NEV.

Not far from the blinking casinos of this gambler's paradise lies what could be called the Biggest Little Power Plant in the World.

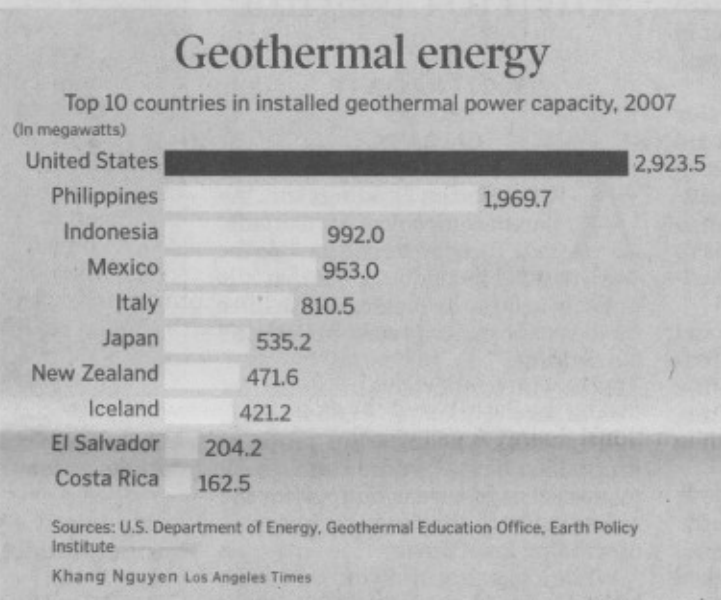
Tucked into a few dusty hectares across from a shopping mall, it uses steam heat from deep within the Earth's crust to generate electricity. Known as geothermal, the energy is clean, reliable and so abundant that this facility produces more than enough electricity to power every home in Reno, population 221,000.

"There's no smoke. Very little noise," said Paul Thomsen, director of policy and business management for **Ormat Technologies Inc.**, which owns the operation. "People don't even know it's here."

Geothermal energy may be the most prolific renewable fuel source that most people have never heard of. Although the supply is virtually limitless, the massive upfront costs required to extract it have long rendered geothermal a novelty. But that's changing fast as this old-line industry buzzes with activity after decades of stagnation.

Billionaire Warren Buffett has invested big. Internet giant **Google Inc.** is bankrolling advanced research. Entrepreneurs are paying record prices for drilling leases in places such as Nevada, where they're prospecting for heat instead of metals.

"This is the new gold rush," said Mark Taylor, a geothermal analyst with the consulting firm **New Energy Finance** in



Washington. He credits high fossil fuel prices and concerns about global warming with jump-starting the U.S. industry, along with federal tax credits and state laws mandating the wider use of renewable energy.

Global investment in geothermal was around \$3 billion US last year, Taylor said. Although that's a blip compared with the estimated \$16 billion funnelled into wind and solar, it's still a 183 per cent increase over 2006. In a difficult year for alternative energy funding, the industry snagged \$600 million through the first six months of 2008, Taylor said.

Much of that new investment is in the United States, the world's leader in geothermal energy. More than 80 per cent of the country's 3,000 geothermal megawatts lies in California. The Geysers, a network of 22 geothermal plants about 115 kilometres north of San Francisco in the Mayacamas Mountains, is the largest geothermal complex on the planet. **Calpine Corp.** owns the largest part of it.

The area around the Salton Sea in California's Imperial County is another hot spot. **CalEnergy Generation**, a subsidiary of Buffett's **Mid-Ameri-**

can Energy Holdings, owns and operates 10 plants there. It plans three additional facilities in the next few years, CalEnergy president Steve Larsen said.

Nevada, the nation's No. 2 geothermal producer, has 45 new projects underway, said Lisa Shevenell, director of the Great Basin Center for Geothermal Energy at the University of Nevada in Reno. An August lease sale of Nevada lands by the Bureau of Land Management brought in a record \$28.2 million.

"I've been at this 25 years, and I've never seen anything like it," said Shevenell, a research hydrologist. "Money is falling out of the sky."

Geothermal has been harnessed for industry since at least the 1820s. Operators tap natural reservoirs of scalding water and steam trapped deep underground, drilling wells to bring the heat to the surface to power turbines that feed electricity generators.

Costing about four to seven cents a kilowatt-hour, ac-

ording to Taylor, geothermal is competitive with wind power and significantly cheaper than solar. Geothermal facilities occupy a fraction of the space required by wind and solar farms. The energy is also more reliable. Plants crank electricity round the clock, irrespective of whether the sun is shining or the wind is blowing.

Greenhouse gas emissions are minimal in geothermal operations, and the size of the fuel supply defies imagination. There is 50,000 times more heat energy contained in the first 10 kilometres of the Earth's crust than in all the planet's oil and natural gas resources, according to the environmental organization Earth Policy Institute.

The challenge is extracting it. Geothermal energy production requires three things: heat from the Earth's core, fractured rock to make it easy to reach, and water to transport the heat to the surface.

Some say the key to harnessing this energy source on a massive scale lies with a technology known as enhanced geothermal systems, or EGS for short. The idea is to engineer the necessary conditions by pumping water into the Earth's crust and fracturing the hot rocks below. Heat from the Earth warms the water, whose resulting steam is channelled back to the surface, powering turbines to create electricity. The water is then pumped back underground.

Though still in its infancy, EGS has the potential to open up much of the planet to geothermal development. Tiny plants are already online in France and Germany. More than 30 EGS companies are engaged in exploration and development in Australia.