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VIDEO TRANSCRIPT – GEOTHERMAL ENERGY

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Video length: 7 minutes, 36 seconds

NARRATOR: If you live in California, you can't help but worry about geology, and with good reason. 90 percent of the world's earthquakes and 75 percent of its volcanoes occur along a tectonically volatile area called the Pacific Ring of Fire, which encircles the Pacific Ocean from the Andes Mountains in South America all the way to the tropical islands of Micronesia. California lies perched along the eastern edge of this ring, and that's usually a cause for hand wringing. But as it turns out, even this cloud has a silver lining.

COLLIN WILLIAMS: In California, we have, of course, this major plate boundary we call the San Andreas Fault system. And along the San Andreas Fault system, there are places where the Earth's crust is being pulled open, and magma and heat have been able to come up in the near surface.

NARRATOR: And that's a good thing. These days we hear a lot about renewable energy, like solar and wind. But did you know that geothermal energy provides more electricity to California than all the solar panels and wind turbines in the state combined?

So if you're wondering where our grandchildren will be getting their electricity, they may be harvesting it from a geothermal field.

COLLIN WILLIAMS: A geothermal field is an area of the Earth where there's a volume of rock that has hot water in it that can be tapped by wells to -- generally to produce electric power.

NARRATOR: Geothermal. The word literally means Earth heat. And that's exactly what it is. A geothermal field is a place where we can actually mine the heat from the Earth, much the same way that we drill for oil. Geophysicist Colin Williams is an expert in figuring out where on the planet to find these naturally occurring reservoirs of underground heat.

COLLIN WILLIAMS: Geothermal sites are typically found where there are active tectonic processes such as volcanoes that bring heat up into the shallow parts of the Earth's crust.

NARRATOR: One of California's hot spots is located just 72 miles north of San Francisco in the rugged mountains northwest of Calistoga. The Geysers is a naturally occurring geothermal reservoir that's been developed and operated since 1955 by several energy companies, including Unocal, PG&E, and most recently, Calpine Corporation. Today, the Geysers is the largest producer of geothermal electricity in the world.

This 40 square mile area is dappled with hot springs and steam vents called fumeroles. But there are no actual geysers here. The land was misnamed by earlier settlers in the 1800s, and the name has stuck ever since. John Farison is an engineer for Calpine, a San Jose based company that owns and operates 19 of the 22 power plants at The Geysers.

JOHN FARISON: Most power plants in the world run on steam, and the difference here is that the Earth is our boiler making the steam and supplying the steam. We don't -- we don't need to fire with fossil fuels or nuclear to create that heat. We're taking the heat right out -- right out of the Earth.

NARRATOR: So how does this big boiler actually work? The interior of the Earth can be divided into three main parts. The outermost layer is the thin, rocky crust. Below that is the 1800 mile thick mantle. 4000 miles deep at its center is the core.

Very hot molten rock called magma, which is formed by the partial melting of the mantle or crust, rises toward the surface radiating into the surrounding solid rock and transforming trapped rainwater in the ground into steam.

JOHN FARISON: So when you drill a well in here we hit the rock. It has steam in the fissures under pressure. It's now found a path to the surface through that well bore, and so it whistles up the well bore. And we give it a path to the power plant where we convert it into electricity.

NARRATOR: If it sounds simple, that's because fundamentally it is. But finding and tapping the steam in the rock can be tricky and costly. The average depth of Calpine's 350 steam wells at The Geysers is about 8000 feet. A typical steam well can take up to 90 days to drill at a cost of about $5 million.

Nearly 100 miles of steel piping snakes through hills and along roadways delivering steam from wells to 22 different power plants. Here in the plant, the steam expands through the turbine blades and spins the turbines ,which drives generators, which creates electricity that flows onto California's power grid. The total output of The Geysers is 850 megawatts of electricity.

That's enough power to meet the needs of 850,000 homes, or roughly the amount of homes in all of San Francisco, Oakland and San Jose combined. So why not amp up the development of even more geothermal energy? For starters, you can't drill just anywhere for Earth heat. First you have to find it.

COLLIN WILLIAMS: We can find geothermal fields -- first off, there are what we call surface manifestations -- mostly things like hot springs, geysers.

When there aren't surface manifestations like hot springs, we can use various geophysical and geological techniques to look in the subsurface and try to find the geothermal reservoirs that are there.

NARRATOR: All types of power production have their pros and cons. Wind is clean but doesn't always blow. Cold burns hot but dirty. But as a resource that generates electricity around the clock, without significant greenhouse gas emissions or damage to the environment, geothermal's few drawbacks seems relatively manageable.

And while still considered a renewable energy source, if not managed properly over time, a geothermal resource may run out of steam.

COLLIN WILLIAMS: Conventional geothermal resources are not inexhaustible. The reservoirs that we tap for geothermal energy have a certain amount of water in them. If you draw the water out of the reservoir and don't replace it you exhaust the resource by depleting the water.

NARRATOR: Now Calpine is looking to expand. In May, 2007, the company launched a five year, $200 million initiative designed to further increase production at The Geysers

by tapping new and deeper wells. And the rest of the world seems to be following suit. Geothermal power plants are producing more than 9700 megawatts of electricity in 24 countries, supplying power to about 60 million people, mostly in developing nations.

And in countries like Iceland and the Philippines, geothermal energy is being developed to supply the majority of their electricity needs. And the promise of new technology has also renewed commercial interest in geothermal research and exploration.

Given the rate of global population growth, no one source of renewable energy will be able to completely replace fossil fuels. But the continued refinement of sustainable energy technologies, including geothermal, will ensure that we can power the future for generations to come.