Soda Lake Geothermal Field and Plant

This 3-D model represents the Soda Lake Geothermal Plant, which will be providing 20 megawatts or nearly 50% of the electricity used at the University of Utah. The U entered into a 25-year power purchase agreement with Utah-based Cyrq Energy, which owns and operates the geothermal plant and Rocky Mountain Power, which owns and maintains the infrastructure that transmits power to the U.

The underground part of the model is at a scale of 100:1, while the power plant is at a scale of 50:1. Soda Lake is located in west central Nevada and has two geologic characteristics that make it ideal for geothermal energy production. First, the Earth's crust is relatively thin there, which adds extra heat to the subsurface. Second, young faults provide conduits for hot water to bring that extra heat closer to the surface of the Earth. Thanks to these ideal geothermal conditions there are over 15 geothermal projects within 100 miles of Soda Lake.

The oldest rocks shown in this model are at the bottom, and become younger towards the top. Rocks like those in the subsurface at Soda Lake are exposed in the mountain ranges of Nevada, but are buried two miles below the surface here. These color-coded subsurface layers represent volcanic (green and brown) and sedimentary rocks (yellow and blue) that were emplaced over the past 30 million years. These layers are fractured and tilted along normal faults (shown in gray) that form where the Earth's crust is extending or pulling apart, which is actively happening across the basin and range from Salt Lake City westward to Reno, Nevada.

At the Soda Lake Geothermal Field, the normal faults provide pathways (red arrows) for hot water to flow upwards from the older rocks into younger, shallower rocks. The Soda Lake Geothermal Field contains another buried geologic surprise—a 5.1-million-year-old cinder cone (the brown blob). Although the heat brought by this volcano has long since dissipated, this feature shows that the area has experienced high heat flow for millions of years.

Heat in the subsurface is converted into renewable electricity that powers the University of Utah. The narrow red tubes extending downwards from the land surface represent geothermal production wells that are pumped to produce hot water at the surface. These four wells ranging in depth from 805-9,000 feet, pull hot (from 290˚ F to >365˚F) water out of the faults and rocks and bring it to the surface where it is piped to the geothermal plant. There, the hot water passes through heat exchangers to transfer the water's heat to a secondary fluid (isopentane), which boils and is sent to the turbines which spin a generator to make electricity. This electricity is then sent to Utah along NV Energy and Rocky Mountain Power transmission lines. A geothermal plant that uses a second fluid in this way is called a binary plant. The isopentane is then condensed using air cooled condensers (the tall structures in the model) that use 56 fans to drive away the waste heat. The cooled geothermal water is reinjected underground using the geothermal injection wells, represented by the blue tubes connected to the surface. From there, the water is reheated by the hot rocks and eventually returns to the production wells via underground pathways. The binary plant at Soda Lake was manufactured and assembled on site by Ormat Technologies Inc.

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