Grenada Geothermal Resource Development
- Clean Sustainable Baseload Energy -
Geothermal Technology
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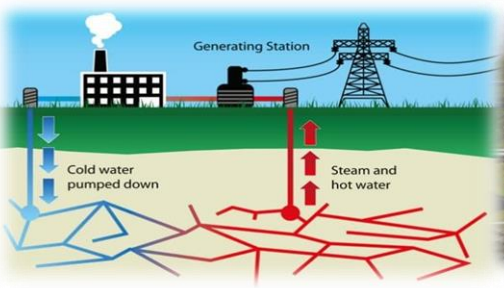


The Economics of Geothermal Energy

Initial construction costs for geothermal power plants are high because geothermal wells and power plants must be constructed at the same time.

But the cost of producing electricity over time is lower because the price and availability of the fuel is stable and predictable. The fuel does not have to be imported or transported to the power plant. The power plant literally sits on top of its fuel source.

Geothermal power plants are excellent sources of **baseload** power. Baseload power is power that electric utility companies must deliver all day long.

Geothermal Energy & the Environment

Geothermal energy is a renewable energy source that does little damage to the environment.

Geothermal steam and hot water do contain naturally occurring traces of hydrogen sulfide (a gas that smells like rotten eggs) and other gases and chemicals that can be harmful in high concentrations.

Geothermal power plants use "scrubber" systems to clean the air of hydrogen sulfide and the other gases. Sometimes the gases are converted into marketable products, such as liquid fertilizer. Newer geothermal power plants can even inject these gases back into the geothermal wells.

Geothermal power plants do not burn fuels to generate electricity as do fossil fuel plants. Geothermal power plants release about 0.20 lbs. Carbon Dioxide per kilowatt hour as compared to 1.969 lbs. by a fossil fuel plant.

Geothermal power plants, on the other hand, emit only about 1 – 3% of the sulfur compounds that coal and oil-fired power plants do. Well-designed binary cycle power plants have no emissions at all.

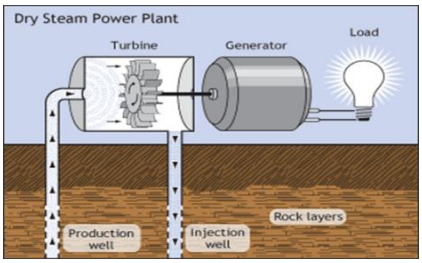
Types of Geothermal Power Plants

All geothermal power plants use steam to turn large turbines, which run electrical generators. In the Geysers area (California), dry steam is used directly in the steam turbines. In other areas of the state, super-hot water is "flashed" into steam within the power plant, and that steam turns the turbine. Essentially, two main types of hydrothermal resources are used to generate electricity:

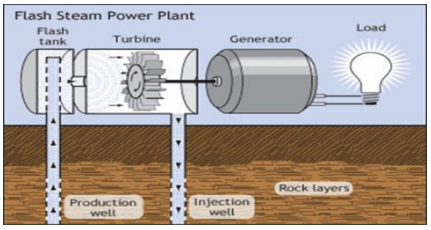
- Dry steam (vapor-dominated) reservoirs, and
- Hot water (liquid-dominated) reservoirs.

Dry steam reservoirs are rare but highly efficient at producing electricity. This is the oldest type of geothermal power plant (first used at Lardarello, Italy in 1904).

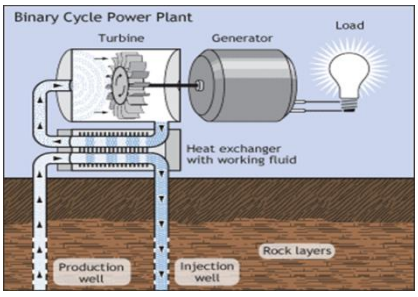
The Geysers in California is the largest and best known dry steam reservoir. Steam is obtained by drilling wells between 7,000 to 10,000 feet deep.



In a dry steam reservoir, the natural steam is piped directly from a geothermal well to power a turbine generator. The spent steam (condensed water) can be used in the plant's cooling system and injected back into the reservoir to maintain water and pressure levels.



Hot water geothermal reservoirs are the most common type. In a liquid-dominated reservoir, the hot water has not vaporized into steam because the reservoir is saturated with water and is under pressure. To generate electricity, the hot water is piped from geothermal wells to one or more separator/s where the pressure is lowered and the water flashes into steam. The steam turns a turbine generator to produce electricity. The steam is cooled, condensed and either used in the plant's cooling system or injected back into the geothermal reservoir.



A binary cycle is a system which has been developed to capitalize the water in a hot water reservoir, not hot enough to flash into steam.

The lower-temperature water (below 400°F) is used to heat a fluid that expands when warmed. The turbine is powered from the expanded, pressurized fluid. The fluid is cooled and recycled to be heated over and over.

The process requires the geothermal fluid and a secondary fluid (hence, "binary") with a much lower boiling point than water to pass through a heat exchanger. Heat from the geothermal fluid causes the secondary fluid to flash to vapor, which then drives the turbines.

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