GEOTHERMAL ENERGY ASSOCIATION

Geothermal Basics
Geothermal Events
Geothermal Energy Finance Forum NYC 2011
GEOTHERMAL WEB

Geothermal Basics - Mythbusters

Today, geothermal developers face many obstacles, and one of them is inadequate public understanding of geology, hydrology, and the related sciences that underlie geothermal energy. Here are the truths behind some of the most prevalent myths about geothermal energy:

Myth #1: Geothermal Energy is Experimental and Not Yet Widely Used

Truth:While we are able to use only a small fraction of the resource with today's technology, geothermal resources have been in use for more than 10,000 years, according to archaeological evidence.

The Paleo-Indians first used geothermal hot springs for warmth, cleansing, and minerals through direct use. Major district-wide heating and individual direct use projects have been in continuous, successful long term operation at Boise, Idaho (since 1892) and at Klamath Falls, Oregon. The first large-scale geothermal electricity generating plant opened at Larderello, Italy in 1904 and continues to operate successfully. The first commercial U.S. geothermal power plant producing power to the utility grid opened at The Geysers in California in 1960, producing 11 MW of net power. The Geysers system continues to operate successfully today and represents the largest single sources of renewable energy in the world. The U.S. has some 3,000 MW of electricity connected to the grid.

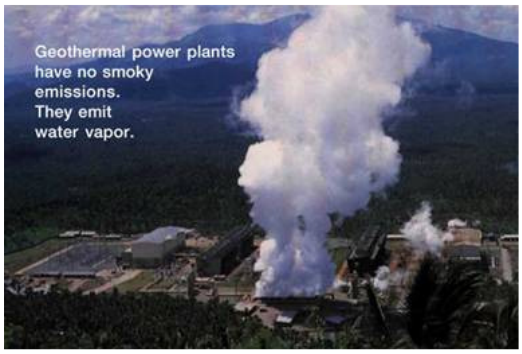
As the world's largest producer of geothermal energy, the U.S. generates a yearly average of 15 billion kilowatt hours of power, comparable to burning about 25 million barrels of oil or 6 million short tons of coal per year. Geothermal energy is used for electrical power production in 21 countries, and supplies significant amounts of electricity to countries such as the Philippines, where 27% of electricity derives from geothermal sources. Even so, this worldwide use represents only a fraction of the potential power that could be generated from geothermal resources. As technology continues to advance, the expected cost and risk of using geothermal resources will continue to decline while the geothermal contribution to our energy needs will continue to expand.

Myth #2: Geothermal Resources are Nonrenewable

Truth: The visible plumes seen rising from water cooled geothermal power plants are actually water vapor emissions (condensed steam), not smoke, and are caused by the evaporative cooling system.

No combustion of fuels occurs to produce electricity at a geothermal facility. Air cooled systems emit no water vapor, and thus blend easily into the environment. In a water cooling process, 50% or more of the geothermal water that enters the cooling tower is emitted to the atmosphere as water vapor, while the remainder recycles back into the geothermal reservoir. Geothermal water vapor emissions contain only trace amounts of the pollutants typically found in much greater quantities in coal and gas power plant emissions. See also section 6.2.

Figure 28: Steam Rising from a Geothermal Power Plant



Myth #3: Geothermal Power Plants Emit Smoke

Truth: No contamination of groundwater has occurred as a result of geothermal activity.

Today every effort is made by the geothermal industry to minimize the effects of geothermal development on local water regime and surface features. Geothermal water is injected back into geothermal reservoirs using wells with thick casing to prevent cross-contamination of the water with groundwater systems. A well casing is composed of thick specialized pipe surrounded by cement in order to prevent any contamination as the geothermal water is put back into the reservoir. Once the water is returned to the geothermal reservoir, it is reheated by the Earth's hot rocks and can be used over and over again to produce electricity.

Besides voluntary mitigation efforts on the part of developers, certain geothermal activities, such as injection, are regulated by the EPA to coincide

with the Underground Injection Control Program requirements and the BLM and state well construction requirements. These federal regulations were instituted with the specific intent of protecting groundwater resources. In the U.S., according to federal regulations, only the lower-temperature geothermal waters that are of drinking-water quality and that do not disrupt ecosystems might be allowed to flow into streams or lakes. Most geothermal applications, including all higher-temperature geothermal systems, require that the water be injected back into the geothermal reservoir.

Myth #4: Natural Geothermal Surface Features are Used During Geothermal Development

Truth: While surface features such as geysers or fumaroles are typically useful in identifying the locations of geothermal resources, these features are not used during geothermal development.

Instead, drilling that extracts geothermal resources takes place close to these features. In fact, it is impossible to extract geothermal resources, for the purpose of large scale utility development, from geothermal surface features themselves. Further, while almost all geothermal resources currently developed for electricity production are located in the vicinity of natural geothermal surface features, much of the undeveloped geothermal resource base may be found deep under the Earth without any corresponding surface thermal manifestations.

Whether or not geothermal water will manifest on the surface depends on the natural "plumbing" underground which may or may not connect geothermal resources to the surface of the Earth. At Glass Mountain in California, for example, there is only a single, very weak thermal manifestation at the surface, yet extensive geothermal resources have been identified underground. Resources that are more difficult to identify, without surface expression, are less likely to be explored given the limitations of today's technology. While the size and extent of geothermal surface features can be a rough guide to the size of a geothermal resource, a considerable amount of uncertainty still exists.

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