

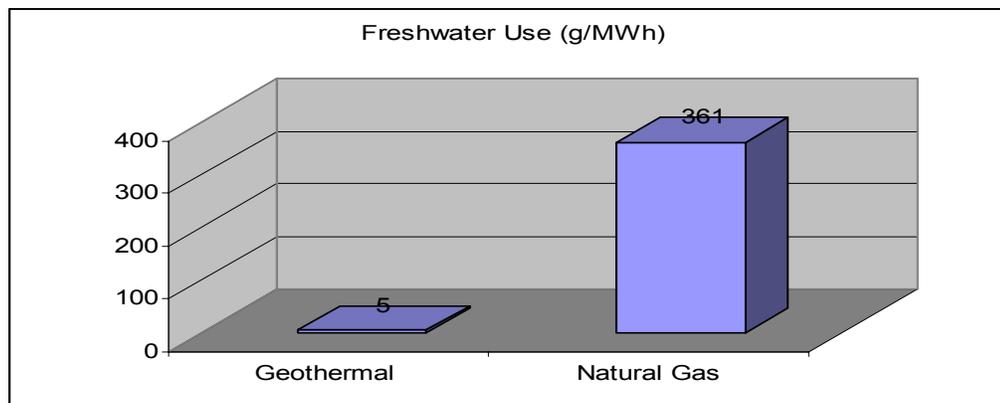


GEA Issue Brief

Geothermal Energy and Water Consumption

- Geothermal operations cooled by evaporation (water-cooled plants) utilize water derived from the geothermal fluid for cooling and therefore can be thought as having a built-in source of cooling water.
- Binary, air-cooled geothermal power plants use no water for cooling. Binary, water-cooled power plants require cooling water.
- Geothermal reservoir fluids are not fresh or potable and cannot be used for other purposes due to their temperature and mineral content.
- In water-cooled plants, fluid not lost to evaporation is injected back into the geothermal reservoir to maintain reservoir pressure. See comparison to a natural gas plant in Figure 1:

Figure 1. Freshwater Use Levels at a Geothermal and Natural Gas Plant¹



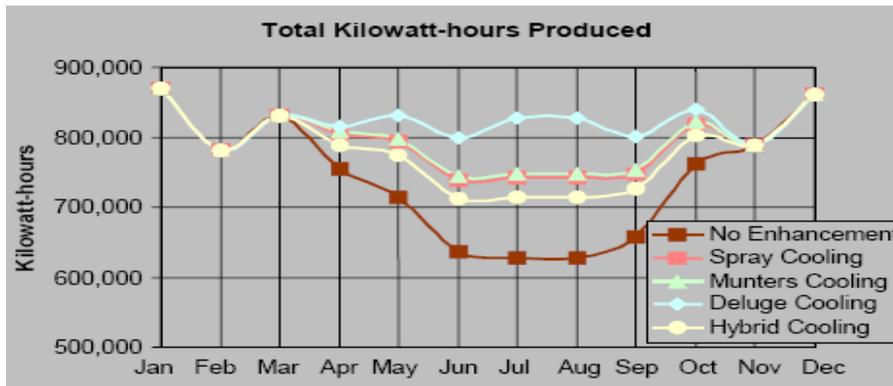
- Water use and consumption figures which are often cited are not necessarily representative of current industry practices, and they often do not differentiate between geothermal fluid and freshwater. For example, the DOE's *Report to Congress on the Interdependency of Energy and Water* uses data from two

¹ Source: Geothermal Energy Association, *A Guide to Geothermal Energy and the Environment*. Freshwater use levels at a geothermal and natural gas plant. The geothermal water use figure does not include geothermal fluid as this is injected back into the reservoir and not withdrawn from freshwater sources. According to the submitted Applications for Certification, the 540-MW natural gas combined-cycle facility would use over 4 million gallons of water per day, while the 48-MW flash geothermal facility would use under 6 thousand gallons per day, even when the plants are adjusted for megawatt capacity.

Northern California Power Agency plants as representative of the industry and fails to differentiate between geothermal fluid and freshwater.

- Advanced cooling technologies can combine aspects of water and air cooling to improve performance of cooling and power systems in geothermal operations. Such hybrid cooling systems can reduce water-cooling requirements while maintaining plant efficiency, as laboratory data show in Figure 2:

Figure 2. Impact of Different Hybrid Evaporative-Air-Cooled Technologies on Power Plant Performance²



- The geothermal industry strictly adheres to federal and state regulations protecting freshwater resources and is committed to developing geothermal resources in a manner that preserves local water resources.

Suggested Additional Reading (available at <http://www.geo-energy.org/>):

- Geothermal 101: Basics of Geothermal Energy Production and Use. This 53-page booklet covers the basics of geothermal energy, from the types of power plants in use to common myths with numerous charts, graphs and pictures.
- A Guide to Geothermal Energy and the Environment. This 87-page booklet covers a wide range of environmental topics as well as provides an introduction to geothermal energy as this resource is being used today.

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² Source: National Renewable Energy Laboratory. The table displays the impact of different hybrid evaporative-air-cooled technologies on power plant performance.