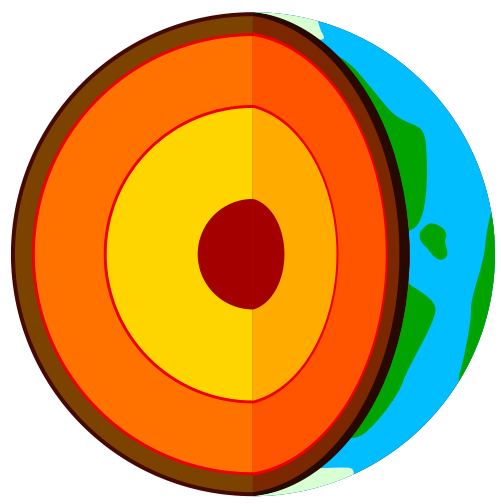


Geothermal

What Is It?

The interior of the Earth gives off heat primarily from radioactive decay. Geothermal energy harnesses this heat to generate electricity.



How Clean Is It?

Steam geothermal plants release just 26 pounds of carbon dioxide per million Btu, and binary-cycle geothermal plants release no carbon dioxide at all, making it cleaner than any carbon-based resource and even certain solar energy when accounting for manufacturing and disposal.



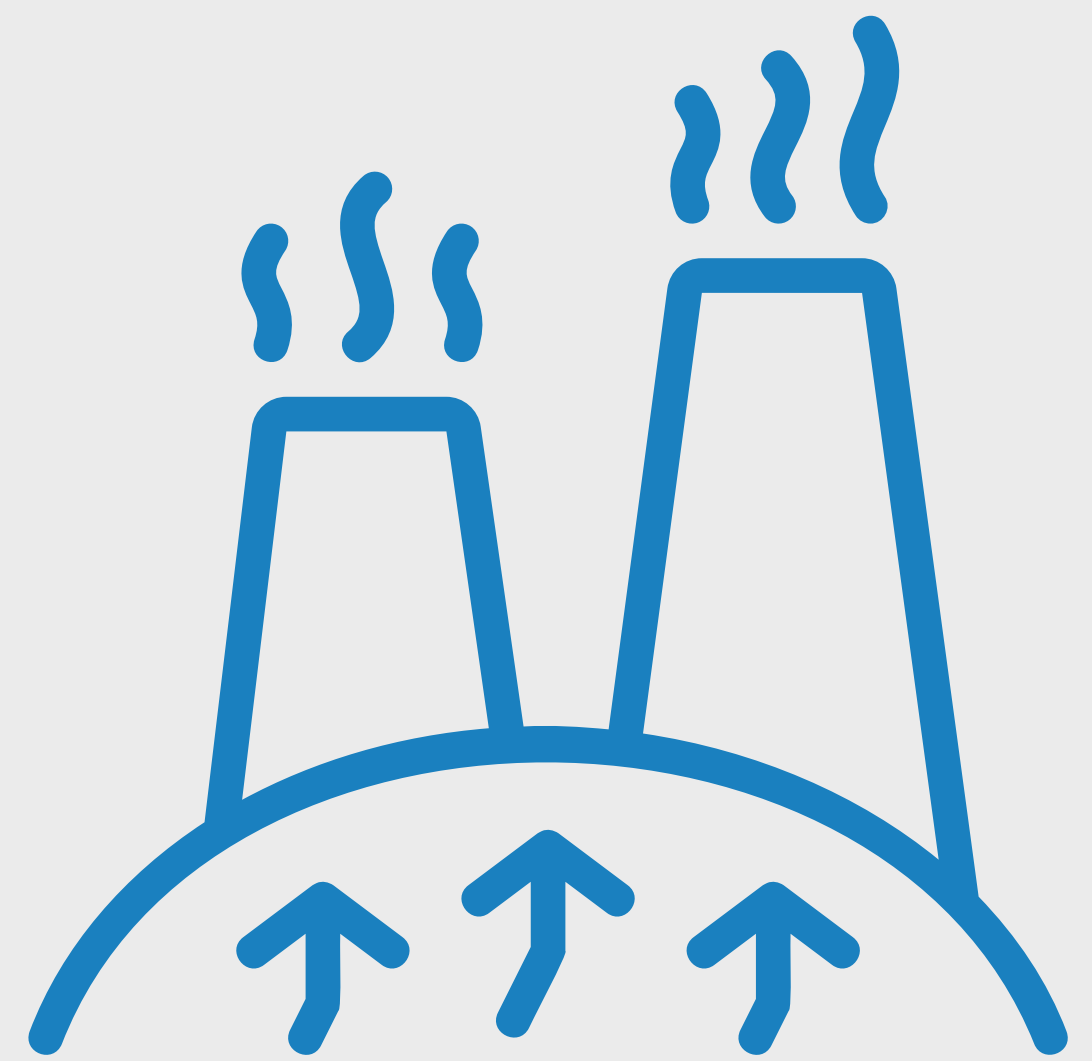
What Does It Cost?

Geothermal energy plants have high startup costs and require extensive geologic surveying, but operating costs are low, requiring no fuel costs. Geothermal energy costs only around 3 cents per kWh.



How Does It Work?

1. Heat is generated under the surface of the earth by tectonic plate friction and radioactive decay of potassium, thorium, and uranium.
2. Heat from under the earth manifests itself in volcanoes, hot springs, and more.
3. Extensive surveying reveals a location where the heat from the earth can be harnessed by drilling deep wells.
4. A geothermal plant is constructed, and a geothermal fluid (usually water) is pumped down an injection well, where it will be heated in the geothermal zone.
5. Heated geothermal fluid (usually steam) is pumped back up into the plant through the production well, where it will be used to push a turbine or put through a heat exchanger.
6. Electricity is generated from the turbine, and the geothermal fluid is cooled to be pumped back into the injection well.



Space



Geothermal energy plants are fairly land efficient, and require no resource transportation or storage. However, geothermal power plants require extensive geologic surveying and are only feasible in some locations. Much of the eastern United States is unfavorable for geothermal energy production, and geothermal power plants require some water resources to function.

Point

- Geothermal energy has very low carbon dioxide emissions.
- Geothermal energy does not rely on commodities or fuel.
- Geothermal energy has a small land footprint.
- Geothermal has low maintenance costs once operation begins.
- Geothermal can provide base load power and in some cases can be dispatchable to dial up or down with demand.
- Geothermal energy requires no resource extraction, transportation, or storage. It is not reliant on supply chains or foreign resources.

Counterpoint

- ↔ ○ Geothermal energy requires a large capital investment, including emission-causing actions like concrete and deep drilling.
- ↔ ○ Geothermal energy can run out in 30-40 years in some locations.
- ↔ ○ Geothermal energy is location dependent and requires extensive surveying.
- ↔ ○ Initial investment in geothermal can carry significant costs, which can be prohibitive in some cases.
- ↔ ○ Geothermal energy production in the United States has essentially remained unchanged since 2001, providing only half of one percent of the electricity to the grid.
- ↔ ○ Deep drilling can possibly lead to surface instability, including earthquakes. And while no material transport is needed, transmission lines to the grid are required.

Did You Know?

Natural hot springs have been used for thousands of years by cultures across the world, helping ancient humans in heating, bathing, and cooking.

What's Next?

Geothermal can provide constant base load power and production unaffected by weather. Production may also increase as technology becomes cheaper, and some old gas and oil wells could be repurposed into geothermal plants. There are transferrable skills from oil and gas exploration and production (namely drilling), which may enable a future transition.