U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

GEOTHERMAL TECHNOLOGIES OFFICE FY 2017 BUDGET AT-A-GLANCE

The Geothermal Technologies Office (GTO) accelerates deployment of clean, domestic geothermal energy by supporting innovative technologies that reduce the cost and risks of development. This abundant resource generates energy around the clock and has the potential to supply more than 100 GWe of electricity—roughly one-tenth of America's energy demand. By optimizing the value stream for electricity production and cascaded uses, the office aims to make geothermal energy a fully cost-competitive, widely available, and geographically diverse component of the national energy mix.

What We Do

GTO funds activities across a full scale of technology readiness to drive the growth of cost-competitive energy applications.

- ✓ **Invest in Research and Development (R&D)** for innovative technologies and methods that improve the process of identifying, accessing, and developing geothermal resources.
- ✓ **Facilitate Demonstrations** that support field site validation to overcome technical obstacles and mitigate risk.
- ✓ **Address Market Barriers** by solving non-technical challenges, including environmental permitting, demand for subsurface data, and analysis of our investments.

Program Goals/Metrics

- Demonstrate the capability to create and sustain a 5 megawatt Enhanced Geothermal Systems (EGS) reservoir by 2020.
- Lower the levelized cost of electricity from newly developed geothermal systems to $0.06/kWh by 2030.

FY 2017 Priorities

- GTO's flagship initiative, the revolutionary **Frontier Observatory for Research in Geothermal Energy (FORGE),** will continue full implementation of FORGE field operations. Activities include commencement of drilling, continuation of site characterization, and advancement of a competitive solicitation for R&D projects focusing on reservoir creation technologies.
- The **Hydrothermal** subprogram initiated 11 play fairway analysis awards in 2014. This technique, adapted from the oil and gas sector, maps exploration risks and probabilities from existing data. The effort is aimed at assessing exploration risk to identify new resources on a regional scale. Phase III will consist of expanding data collection and drilling in high-potential "blind" geothermal resource areas identified in previous phases of this program to validate findings to date of each play fairway.
- The **Low Temperature and Coproduced Resources** subprogram will conduct feasibility studies of low-temperature deep-well geothermal systems coupled with advanced direct use applications and cascaded surface technologies. These efforts will support identification of potential sites and assess new geothermal resource opportunities. Additionally, R&D of thermal desalination technologies will continue in collaboration with the Advanced Manufacturing Office (AMO) Desalination Hub.
- A **Subsurface Engineering Crosscut** activity is advancing a better understanding of how energy technologies interact in the subsurface. The initiative draws program offices across DOE to engage with national laboratories, industry, and other stakeholders.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Requested
Enhanced Geothermal Systems	$32,100	$45,000	$45,000
Hydrothermal	$12,500	$13,800	$40,500
Low Temperature and Coproduced	$6,000	$8,000	$10,000
Systems Analysis	$3,900	$3,700	$4,000
NREL Site-Wide Facility Support	$500	$500	$0
Total, Geothermal Technologies	**$55,000**	**$71,000**	**$99,500**

Key Accomplishments

- In FY 2015, the Energy Department's Geothermal Data Repository (GDR) received its 500th data submission since its launch in March 2012. The GTO deployed the GDR to store all of the data collected from office-funded projects. This project helps accelerate the research and development of geothermal energy resources by providing researchers, academia, and industry with access to this project information.

- In FY 2015, the GTO wrapped up Phase I of its Play Fairway Analysis (PFA) effort, with promising results. The concept of the PFA has been used to identify potential locations of blind hydrothermal systems and areas warranting future exploration. The tool also describes geothermal opportunities in rift-zone settings. It also incorporates the regional or basin-wide distribution of known geologic factors besides heat flow that control the occurrence of a particular example of a geothermal system. Conducting PFA in unexplored or underexplored basins or regions or using new concepts in basins with known geothermal potential is central to this effort.

- In FY 2015, the AltaRock Newberry EGS demonstration project was completed, achieving numerous technical firsts. The AltaRock team demonstrated the first multi-zone EGS stimulation utilizing a novel chemical diversion technology, increasing the volume of rock that is available for fluid circulation and ultimately heat extraction. The team confirmed the creation of a new EGS reservoir in the low permeability rock surrounding the injection well. Additionally, AltaRock developed and employed a first-of-its-kind pumping system using custom-made Baker Hughes pumps to allow a wide range of injection rates and pressures during stimulation. Finally, in order to monitor the evolution of their reservoir and monitor for seismic impacts, AltaRock deployed the most sensitive telemetered seismic array of any project in the GTO portfolio.

- GTO launched a massive effort to produce an analytical report outlining a vision for the future of the geothermal industry in the coming decades. The GeoVision report will highlight the potential economic, environmental, and social benefits of geothermal energy.

- In FY 2015, a first-in-the-world hybrid geothermal-solar facility in Fallon, Nevada successfully combined 33 MW geothermal and 26 MW photo voltaic with an additional 2 MW Concentrated Solar Power at the Stillwater Hybrid Geothermal-Solar site. With Idaho National Lab and the National Renewable Energy Laboratory, GTO entered into agreement with Enel Green Power to explore potential and quantify the benefits of integrating geothermal energy with solar as a replicable strategy.

DOE EGS demonstration at Newberry Volcano, Oregon. *Source: Elisabet Metcalfe*

Enel Stillwater hybrid geothermal-solar facility in Fallon, Nevada. *Source: Enel Green Power North America*