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

GEOTHERMAL TECHNOLOGIES OFFICE
FY 2016 BUDGET AT-A-GLANCE

The Geothermal Technologies Office (GTO) accelerates the 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, GTO 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** 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 GTO investments.

Program Goals/Metrics

- Demonstrate the capability to create and sustain a 5-MW enhanced geothermal systems reservoir by 2020.
- Lower the levelized cost of electricity from newly developed geothermal systems to $0.06/kWh by 2030.

FY 2016 Priorities

- GTO's flagship initiative, the revolutionary **Frontier Observatory for Research in Geothermal Energy (FORGE)** announced selections for candidate sites and collaborative operations teams in fiscal year (FY) 2015. The initiative constitutes a first-of-its-kind dedicated field laboratory designed to establish a commercial pathway to large-scale, economically sustainable enhanced geothermal systems (EGS).
- The **Hydrothermal** program 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. In FY 2016, these awards will undergo a downselect process for validation drilling at the most prospective areas for new geothermal exploration and development.
- The **Low-Temperature and Coproduced Resources** program introduces a new geothermal funding priority in *Deep Direct Use*, an emerging technology to maximize geothermal system efficiencies and value streams. *Deep Direct Use* integrates electricity conversion with a full range of cascading industrial and commercial applications for large-scale production. In addition, the program awarded nine Mineral Recovery projects in FY 2014 to find a replicable model for extracting lithium and other critical materials from the subsurface.
- A **Subsurface Engineering Crosscut** activity is advancing a better understanding of how energy technologies interact in the subsurface. The initiative draws program offices across the Energy Department (DOE) to engage with national laboratories, industry, and other stakeholders.

(Dollars in Thousands)	FY 2014 Enacted	FY 2015 Enacted	FY 2016 Request
Enhanced Geothermal Systems (EGS)	27,084	32,100	45,000
Hydrothermal	10,285	12,500	36,500
Low Temperature and Coproduced	4,708	6,000	9,000
Systems Analysis	3,698	3,900	5,000
NREL Sitewide	0	500	500
Total, Geothermal Technologies	**45,775**	**55,000**	**96,000**

Key Accomplishments

- In FY 2014, Secretary Moniz announced the deployment of the National Geothermal Data System, a "best-in-class" data collection and dissemination effort. This initiative aggregates data from all 50 states and DOE-funded projects, and it meets a critical need in advancing geothermal research and resource development.
- In FY 2014, DOE announced the commercialization of a rechargeable energy storage device capable of operating in the extreme temperatures necessary for geothermal energy production. FastCAP Systems successfully demonstrated an ultracapacitor that is fully operational in 200°C conditions—extending the upper limit of high-temperature energy storage and electronics, as well as engineering a flexible system that could reduce cost and risks of geothermal drilling and EGS settings.
- In FY 2014, Baker Hughes completed the preliminary design for a measurement-while-drilling system for geothermal applications capable of operation at 300°C for 50 hours and at depths of up 30,000 feet and complete with mud pulse telemetry system.
- In FY 2014, a clean energy bond bill signed by the Governor of Colorado leveraged DOE investments at Pagosa Springs, a known geothermal resource area located at a natural hot springs resort. The collaborative framework of public-private investment and support for this project provides a model going forward for other geothermal projects in Colorado.
- In FY 2014, the Oregon Institute of Technology (OIT) commissioned the installation of 1.75 MW of geothermal power. Combined with a 2-MW solar array, this clean energy makes OIT the first university in North America to generate most, if not all, of its electric power from renewable sources. Industry Partner Johnson Controls developed a novel technology to maximize efficiencies from low-temperature geothermal fluids, a replicable strategy that could enable geothermal energy extraction in a much wider swath of the country.
- In FY 2014, a first-in-the-world hybrid geothermal-solar facility in Fallon, Nevada, successfully combined 33 MW of geothermal and 26 MW of photovoltaic, with an additional 2 MW of concentrated solar power now under construction at the Stillwater Hybrid Geothermal-Solar site in FY 2014. With Idaho National Laboratory 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.

Images: top, DOE EGS demonstration at Newberry Volcano, Oregon. *Source: Elisabet Metcalfe*; center, commercial production of the new downhole energy story device, which extends the upper limits of high-temperature storage devices, *Source: FastCAP Systems*; lower, Enel Stillwater hybrid geothermal-solar facility in Fallon, Nevada, *Source: Enel Green Power North*