



FY 2020 Appropriations Request

Program: Department of Energy – Energy Efficiency and Renewable Energy – Geothermal Technologies Office

Program Funding History: FY16: \$71 million; FY17: \$69.5 million, FY18: \$80.9 million, FY19: \$84 million

GRC's Requested Amount: \$90 million

Justification for Request:

The Geothermal resources Council is a non-profit educational association for the international geothermal community, headquartered in Davis, California.

For every 100 MW of geothermal capacity, 170 permanent jobs are created. Geothermal produces near-zero emissions of either greenhouse gases or other that harm human health and the environment. Geothermal is also “firm but flexible: a geothermal power plant can be used as a baseload resource (with capacity factors exceeding 95%) but also for load-following or energy imbalance services or as a reserve resource, with ramp times competitive with the fastest peaker plants.

Since its inception, the Department of Energy Geothermal Technologies Office (GTO) has directly supported the innovation and commercialization of new technologies that have helped improve the productivity, efficiency and safety of geothermal. While commercial-scale geothermal has been in operation in the United States for several decades, both the growing global demand for renewable energy and increasing public concern about grid stability and reliability are driving the need for continued innovation and cost reductions. Particularly interesting areas of research inquiry promise to transform the industry in the next several years if federal R&D resources can be put to work:

- **Enhanced geothermal systems.** EGS is an pre-commercial technology concept to enhance the permeability of a subsurface formation in order circulate fluids and extract heat more easily. If commercialized, over 100 GW of cost-competitive EGS could be delivered in the United States in the next 50 years. DOE's primary effort in this space is the Frontier Observatory for Research in Geothermal Energy (FORGE), which was competitively awarded to a coalition of researchers in Utah in mid-2018 as a five-year award to be funded at \$30 million a year.
- **Co-production.** Geothermal coupled with solar power and other types of variable power generation has promise to enable higher levels of alternative power on the grid while shoring up grid stability

and insulating against time-of-day price shifts. Geothermal sites also have the potential to coproduce oil and gas or critical minerals such as lithium, which can be found co-located with thermal brine. When a single drilling operation can yield two or more valuable products, developers can maximize revenue streams and value to their end customer while minimizing surface disturbance.

- **Direct use.** Significant opportunities exist for direct use geothermal – where subsurface heat is used for thermal applications. Currently about 20% of the nation’s annual primary energy supply is consumed at relatively low temperatures (<120°C) to heat buildings and to supply thermal energy for many critical industries, e.g. food and agriculture. Direct-use geothermal in-district heating systems could meet a large proportion of these thermal demands by utilizing lower-grade subsurface heat resources while incurring no greenhouse footprint and no fuel supply chain vulnerabilities.

Further research is needed to explore advanced materials for enhanced performance in high-temperature, corrosive subsurface environments, how lower temperature resources can be utilized for power production, novel drilling techniques (e.g. laser drilling), and strategies for characterizing the subsurface resource from surface expressions and modeling.

Further research is also needed to address market and systematic barriers to geothermal penetration. DOE researchers can advance the industry by examining pathways to reduce the time, cost and risk associated with permitting geothermal on public lands, strategies to reduce drilling costs and risks, and developing and proliferating models for geothermal hybrid facilities to participate in the marketplace.

Requested Report Language:

The Committee recommends \$90,000,000 for Geothermal Technologies to focus on early through late stage research and development and market transformation activities. Within available funds, the agreement provides \$30 million for the continuation of activities for the Frontier Observatory Research in Geothermal Energy project. The Department is directed to continue its efforts to identify and characterize geothermal resources in areas with no obvious surface expressions and to evaluate advanced drilling materials and techniques. As 90% of known commercial geothermal resource is located on public lands, the Department should continue to support research to enable greater efficiencies in project permitting with the goal of reducing project costs while ensuring environmental stewardship. The Committee encourages DOE to work with the Department of Interior on opportunities to improve geothermal permitting.