Written Testimony before the US House of Representatives

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Field Hearing: Letting Off Steam: Unleashing Geothermal Energy Development on Federal Land

Good afternoon Chairman Stauber and distinguished Members of the Subcommittee. My name is Joseph Moore. I am a Research Professor at the University of Utah and the Principal Investigator of the Utah Frontier Observatory for Research in Geothermal Energy (FORGE). I am honored to appear before you today to discuss the Utah FORGE project, an innovative geothermal energy research project funded by the Department of Energy in the State of Utah. I am providing testimony today as an individual and not on behalf of the University of Utah.

The thermal energy beneath our feet is enormous. Some of this energy reaches the surface naturally through hot springs, but this is only a small fraction of the available energy. In fact, in 2006 Jeff Tester and his colleagues concluded that if we could capture even 2% of the thermal energy between depths of 2 to 6 miles, we would have more than 2000 times the amount of energy used in the United States annually.

In 2022 the DOE set an ambitious objective of 60,000 MW of electric power generation by 2050. We currently produce 3,900 MW electric from conventional hot spring systems. Reaching the 60,000 MW electric goal from hot springs systems is an impossible challenge. These systems are characterized by a heat source, permeability, mainly as fractures in the rocks, and water to transfer the heat. Although we can drill deep enough to find the temperatures needed to generate electricity, most rocks do not have sufficient natural permeability to circulate water to the depths required.

In the 1970s, attempts to create geothermal reservoirs where none exist naturally were initiated by the Los Alamos National Laboratory. Numerous experiments followed worldwide, but none were capable of producing more than a few MW electric. These projects used pressurized water to create an interconnected fracture network that would allow water to circulate between the injection and production wells.

In 2014, the DOE issued a Funding Opportunity Announcement (FOA) to build and operate a field scale underground laboratory where tools and techniques for the creation of Enhanced Geothermal System (EGS) reservoirs could be tested. The Utah site was one of five locations considered for the laboratory. The number of sites was narrowed down to two: one at Fallon, Nevada and the second near Milford, Utah. Deep test wells were drilled at each site. In 2018, the DOE determined the Utah location best met the requirements of an ideal EGS test site. Temperature, low permeability reservoir rocks and a low potential for induced seismicity were important factors in the decision.

Since the award was made, six additional wells ranging from 3,000 to 11,000 feet in length and four 1,000-foot wells have been drilled. The deepest well reached a depth of 9,500 feet and a temperature of approximately 450ºF.

In addition to operating the field laboratory and maintaining a strong outreach program, Utah FORGE has managed 28 external R&D contracts with private companies, National Laboratories and Universities. Approximately $100 M of the nearly $293 M received from the DOE has been used to fund these R&D projects. Several have led to the development of new tools for geothermal applications.

Utah FORGE is the only field scale laboratory in the world dedicated to EGS research. The ultimate goal of the project is to provide a roadmap for EGS development. I would like to highlight some of the results that have been achieved since the project was initiated and illustrate the importance of this research. Significantly, no private geothermal company can afford to maintain a dedicated laboratory like Utah FORGE on its own.

The project team identified a number of critical needs required to bring EGS to commercialization. Reducing drilling costs, mitigating induced seismicity, minimizing water losses, optimizing the stimulation techniques required for creating the fracture network that forms the reservoir, and controlling fluid movement between wells are among the most important issues.

Drilling costs can account for 50% of a geothermal project. Reducing well costs ultimately comes down to minimizing the number of times worn drill bits and bottom hole assemblies must be replaced. Utah FORGE pioneered the development of Polycrystalline Diamond Compact (PDC) bits for the geothermal industry. Working with private industry, bit designs were progressively improved over a period of three years. The result was a 50% increase in the rate of penetration in the hard, hot, abrasive granite that hosts the Utah FORGE reservoir and a significant reduction in drilling costs. Using the newly designed bits, Utah FORGE drilled over 2,000 feet on a single bit run in granite, a world record at the time.

Induced seismicity is a natural consequence of reservoir creation. Even small magnitude events can lead to public concern, property damage, and project shutdowns. Our efforts to minimizing potential damage are focusing on new monitoring tools and technologies. We are testing fiber optic cables suitable for high temperatures, seismometers for measurements at reservoir depths, and improved Traffic Light Systems. These systems define the measures that must be taken when seismicity exceeds predetermined levels. We update the local communities quarterly on our activities to keep them informed. Information on seismic activity can be monitored by anyone in real time through our seismic data webpage. Computers placed in the local libraries allow easy access to this webpage.

The successful stimulation of cased wells proved to be an important step in reservoir creation. After the initial tests in vertical wells, highly slanted production and injection wells were drilled and successfully hydraulically stimulated. Ninety percent of the water injected was recovered during a 30-day circulation test and the produced water reached a temperature of 380ºF. The results of the test demonstrate low water loss and high temperatures are achievable. Longer

circulation tests, ranging from four months to a year will be conducted to monitor temperature and permeability changes in the reservoir.

Prior to Utah FORGE, the growth of the geothermal industry in the United States over the last two decades was slow. The positive results and technological advances demonstrated at Utah FORGE have had a major effect on the industry. Many new companies are now investing in EGS, and even some of the major oil and gas companies have shown significant interest in geothermal development. Fervo located its project immediately adjacent to Utah FORGE and several other companies have leased land in the vicinity. All of the data generated at Utah FORGE can be downloaded from the Geothermal Data Repository, a database available to the public free of charge.

Utah FORGE is a unique publicly owned and operated laboratory. It is an essential test site for EGS technology advancement and a stepping-stone to hotter environments, including superhot resources. No comparable facilities exist in the world. Our current four-year contract, which began in October 2024, will end in 2028. There is still significant work left to do, particularly at higher temperatures. Unless DOE provides additional funding, we may have a to plug and abandon the wells and bring the surface back to grade. We urge the Committee members to continue their support of the Utah FORGE project and EGS development in the United States.

Thank you for the opportunity to testify on the Utah FORGE project. I am happy to answer any questions you may have.