

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY
U.S. HOUSE OF REPRESENTATIVES
HEARING CHARTER

Water and Geothermal Power: Unearthing the Next Wave of Energy Innovation

Thursday, November 14, 2019

2:00 PM EST

2318 Rayburn House Office Building, Washington, D.C. 20015

PURPOSE

The primary purpose of this hearing is to examine research and development needs in the geothermal energy and water power industries. The hearing will focus on two draft bills: 1) the Geothermal Energy Research and Development Act of 2019, to support research, development, and demonstration activities in geothermal energy production including enhanced geothermal technologies; and 2) the Water Power Research and Development Act of 2019, which authorizes a research, development, and demonstration program for water power technologies including hydropower, pumped storage, and marine energy technologies.

WITNESSES

- **Dr. David Solan**, Deputy Assistant Secretary for Renewable Power, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy
- **Dr. Bryson Robertson**, Co-Director, Pacific Marine Energy Center, Associate Professor, Civil and Construction Engineering, Oregon State University
- **Dr. Joseph Moore**, Manager, Utah Frontier Observatory for Research in Geothermal Energy (FORGE), Research Professor, University of Utah
- **Ms. Maria Richards**, Director, Geothermal Laboratory, Roy M. Huffington Department of Earth Sciences, Southern Methodist University
- **Mr. Sander Cohan**, Director, Innovation, Enel Green Power North America, Inc.

BACKGROUND

Department of Energy, Geothermal Technologies Office (GTO)

The DOE Geothermal Technologies Office (GTO) supports research to develop new technologies and methods to produce energy from the earth's heat. Geothermal energy production yields far lower greenhouse gas emissions when compared to emissions from conventional fossil fuel use without carbon capture, and its development typically has a

relatively small environmental footprint. It is reliable and can be deployed flexibly. Geothermal energy also can be used to meet various heating and cooling demands for buildings. According to the Department of Energy, improvements in geothermal technology could lead to a nearly 26-fold increase in geothermal electric power generation, reaching 60 gigawatts of installed capacity by 2050.¹ Currently, the installed capacity of geothermal energy is around 4 gigawatts.²

Research supported by GTO focuses on developing technology and tools to locate and access geothermal resources in the U.S. Research and development activities focus on enhanced geothermal research, hydrothermal resources, low temperature and coproduced resources, and geothermal systems analysis.³ Enhanced geothermal technologies create permeable pathways enhanced by fluid injected from the surface, which greatly increases the amount of energy generated by allowing the fluid to reach the heat deeper in the Earth's crust. Additionally, developing methods and technologies for locating undiscovered hydrothermal resources could account for up to 30 gigawatts on the grid, according to the U.S. Geological Survey.⁴ Once sources for geothermal energy are located, the potential electricity generated from these sources could be brought online quickly with existing technology. Low-temperature geothermal energy is most useful in direct-use applications, such as heating and cooling buildings, and in some cases to generate electricity. The hot geothermal fluid produced as a by-product from oil and gas drilling can be used in these low-temperature applications. The geothermal systems analysis program within GTO focuses on researching environmental issues, policy, regulation, and other data analyses.⁵

In 2014, DOE GTO announced a funding opportunity for an initiative entitled the Frontier Observatory for Research in Geothermal Energy (FORGE), which is envisioned as a dedicated site to demonstrate enhanced geothermal system technologies and techniques. GTO downselected the site to Milford, UT from an initial pool of five potential sites. The FORGE site will be used to demonstrate operational technologies to produce geothermal energy, and to develop and test instrumentation and serve as a data clearinghouse for the industry.

Department of Energy, Water Power Technologies Office (WPTO)

The DOE Water Power Technologies Office (WPTO) supports research on water power technologies, which includes marine energy and next generation hydropower and pumped storage systems. Water power generation also produces relatively few greenhouse gas emissions.

¹ GeoVision, U.S. Department of Energy, <https://www.energy.gov/eere/geothermal/geovision>

² State of the Geothermal Industry, 2019, Will Pettitt, Geothermal Resources Council, https://geothermal.org/PDFs/Pettitt_GRC_State_of_Geothermal_Industry_2019.pdf

³ About the Geothermal Technologies Office, U.S. Department of Energy, <https://www.energy.gov/eere/geothermal/about>

⁴ A Roadmap for Strategic Development of Geothermal Exploration Technologies, Benjamin R. Phillips, John Ziagos, Hildigunnur Thorsteinsson, and Eric Hass, https://www1.eere.energy.gov/geothermal/pdfs/exploration_technical_roadmap2013.pdf

⁵ Systems Analysis, U.S. Department of Energy, <https://www.energy.gov/eere/geothermal/systems-analysis>

According to a report produced by DOE, through innovative research and development in hydropower technologies, the U.S. hydropower capacity could increase to 150 gigawatts by 2050. U.S. hydropower capacity is currently a little over 100 GW.⁶ Hydropower can also pair with other variable clean energy sources to flexibly deploy electricity by using pumped storage technologies. The Hydropower and Water Innovation for a Resilient Electricity System (HydroWIRES) initiative at the WPTO focuses hydropower and pumped storage research and development on how these resources can best be used as a tool for the U.S.'s future electric grid.⁷

The use of marine energy technologies is growing the electricity market, especially in the Southeast and Northwest. Marine energy is inclusive of power generated from waves, tides, and currents not only in the ocean but in rivers, lakes, and streams, among other sources. The Powering the Blue Economy initiative at the WPTO explores how investment in marine energy technology development can improve other areas of coastal and maritime markets, or the “blue economy”: ocean observation, underwater vehicle charging, marine aquaculture, marine algae, seawater mining, seawater desalination, coastal resiliency and disaster recovery, and isolated communities.⁸ Much of the research and development in marine energy technologies occurs at the National Marine Energy Centers, which are hosted at institutions of higher education or consortia thereof and funded by both government and private industry. The National Marine Energy Centers are not only used to demonstrate the energy generating technology themselves, but also to develop and test instrumentation and technologies capable of monitoring and mitigating environmental impacts of marine energy technology.

LEGISLATION

Draft Geothermal Energy Research and Development Act of 2019

The Geothermal Energy Research and Development Act of 2019 would reauthorize activities of the DOE's Geothermal Technologies Office. It includes research initiatives on oil and gas technology transfer to geothermal research, secondary use research areas such as minerals recovery, desalination, industrial applications of geothermal energy, grid management and storage, and new areas of enhanced geothermal research.

It would also authorize two FORGE sites, including the existing project in Utah, in addition to authorizing an enhanced geothermal demonstration initiative.

⁶ Hydropower Vision Report, National Hydropower Association, <https://www.hydropowervision.org/>

⁷ HydroWIRES Initiative, U.S. Department of Energy, <https://www.energy.gov/eere/water/hydrowires-initiative>

⁸ Powering the Blue Economy: Exploring Opportunities for Marine Renewable Energy in Maritime Markets, U.S. Department of Energy, <https://www.energy.gov/eere/water/powering-blue-economy-exploring-opportunities-marine-renewable-energy-maritime-markets>

Draft Water Power Research and Development Act of 2019

The Water Power Research and Development Act of 2019 directs the Secretary of Energy to carry out a research, development, demonstration and commercialization program for water power technologies, which is inclusive of hydropower, pumped storage, and marine energy technologies. The bill outlines activities for a hydropower and pumped storage program and, separately, a marine energy program. The bill also provides for authorization of existing or new National Marine Energy Centers.

The bill requires the Secretary to collaborate with industry, National Laboratories, other relevant Federal agencies, institutions of higher education, and international bodies with relevant scientific expertise. It requires the results of projects supported by the Act to be publicly published to the extent practicable. It also supports education and outreach activities to promote understanding of water power technologies and the water power workforce. The bill encourages the Secretary to conduct technical assistance and workforce development activities.

Finally, the bill instructs the Secretary to create a strategic plan that addresses near and long-term planning for these programs, and also to provide a report to Congress at least every two years on the findings of research conducted and activities carried out under these programs and pursuant to the Strategic Plan.