Testimony of Deputy Assistant Secretary David Solan

Office of Renewable Power

Office of Energy Efficiency and Renewable Energy

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INTRODUCTION

Chairman Lamb, Ranking Member Weber, and Members of the Energy Subcommittee of the Committee on Science, Space, and Technology, thank you for the opportunity to testify today on the opportunities and challenges of geothermal and water power technologies and the activities that the U.S. Department of Energy is undertaking to secure America's future through energy independence, scientific innovation, and national security.

My name is David Solan, and I am the Deputy Assistant Secretary of the Office of Renewable Power in the Office of Energy Efficiency and Renewable Energy (EERE). As the Deputy Assistant Secretary, I direct renewable energy applied research, development, and demonstration activities for the geothermal, solar energy, wind, and water power technology offices in EERE. Today, I will be discussing the valuable work underway in two of our technology offices, the Geothermal Technologies Office (GTO) and the Water Power Technologies Office (WPTO).

As the U.S. electric grid incorporates an increasing amount of renewable energy, challenges arise to incorporate variable sources of energy while also addressing systems integration needs and grid resiliency. Both geothermal and water power technologies have the capacity to supply valuable baseload power and provide additional grid services such as storage. Hydropower in particular can provide flexibility and scheduled dispatch to address grid integration of variable technologies.

GEOTHERMAL TECHNOLOGIES OFFICE (GTO)

The Geothermal Technologies Office (GTO) conducts research and development (R&D) to reduce costs and risks associated with geothermal development by supporting innovative technologies that address key exploration and deployment barriers.

The United States is the world leader in installed geothermal capacity (3.8 gigawatt-electric (GW) nameplate capacity; 2.5 GW net summer capacity). As an always-on energy source that harnesses the earth's natural heat, geothermal energy provides baseload power with the flexibility to ramp on and off. Geothermal power plants can also provide essential grid services and operate in a load-following mode, helping to support reliability and flexibility in the U.S. grid and ultimately facilitate a diverse, secure energy mix.

Geothermal energy can be used in three technology areas: (1) generating electricity, (2) providing residential and commercial heating and cooling using geothermal heat pumps, and (3) direct-use applications that can provide district scale heating solutions as well as a wide array of commercial and industrial applications where process heating is required.

In May 2019, the Department released its *GeoVision* analysis, a multiyear collaboration among industry, academia, the National Laboratories, and federal agencies to evaluate the potential for different geothermal resources. The effort assessed opportunities to expand nationwide geothermal energy deployment through 2050 by improving technologies, reducing costs, and

addressing project development barriers such as long permitting timelines, ultimately identifying the potential of 60GW of generating capacity, a 26-fold increase from today's geothermal capacity, representing 8.5% of expected national electricity capacity in 2050.

Our flagship initiative, the Frontier Observatory for Research in Geothermal Energy, FORGE, heads the list of activities to address the technology improvement needs called out in the *GeoVision* roadmap. FORGE is a dedicated site where scientists and engineers will be able to develop, test, and accelerate breakthroughs in enhanced geothermal system (EGS) technologies and techniques.

The FORGE initiative is now finishing the second of three phases. GTO selected the final site at Milford, Utah, with the University of Utah-led team, during Phase 2. The University of Utah-led FORGE team is fully instrumenting the site for surface and subsurface investigation, and bringing FORGE to full readiness for R&D technology testing and evaluation in preparation for one final stage gate. During the five-year Phase 3 – Technology Testing and Evaluation, slated to start later this fall, FORGE funding will support tasks necessary for management and oversight of FORGE operations and annual competitive R&D solicitations open to the entire stakeholder community.

GTO is also pursuing innovative technologies in the non-electric sector. Deep Direct Use (DDU) utilizes low temperature ($<150^0$C) geothermal resources, and has the potential to lower the cost of heating and cooling for university campuses, industrial parks, and military installations across the entire U.S., as well as address more global energy storage and resilient grid needs. GTO is funding six DDU studies to determine the economic feasibility of these technologies in various regions around the country.

Two additional challenges to bringing geothermal energy on line are exploration risk and drilling cost. GTO has major sustained investments to address these challenges, including our Play Fairway Analysis program for finding hidden geothermal systems, finishing up validation drilling this fall; Efficient Drilling for Geothermal Energy, with 10 R&D awards to reduce drilling costs; and a recent funding opportunity for R&D in Lost Circulation and State of Stress.

WATER POWER TECHNOLOGIES OFFICE (WPTO)

The Water Power Technologies Office (WPTO) works with national laboratories, industry, universities, and other federal agencies to conduct R&D activities through competitively selected, directly funded, and cost-shared projects. They are pioneering R&D efforts in both marine energy and hydropower technologies to improve performance, lower cost, and ultimately support the United States' ability to sustainably meet its evolving energy demands.

Hydroelectric power is the leading renewable energy source in the United States, accounting for seven percent of total U.S. utility-scale electricity generation in 2018[1]. Conventional and pumped-storage hydropower are stable power sources that are also flexible enough to smooth out

[1] https://www.eia.gov/tools/faqs/faq.php?id=427&t=3

fluctuations presented by variable renewable energy sources, such as wind and solar, as they have large reservoirs of "fuel" (i.e. water) to fill any gaps in generation at a moment's notice. This stability and flexibility supports the deployment and integration of more variable renewable resources.

In addition to critical research and development efforts in hydroelectric power, WPTO leads the way in evaluating new sources of marine and hydrokinetic energy, such as highly predictable waves, currents, tides, and ocean thermal resources. With more than 50 percent of the American population living within 50 miles of the coast, a cost-effective marine and hydrokinetic industry could provide a substantial amount of electricity for the nation. WPTO is investing heavily in this new and innovative industry, a nascent technology sector that is an example of American ingenuity at its best, producing cutting-edge technologies that can contribute to our nation's energy independence. In addition to supporting the early-stage R&D that will enable long-term cost reductions and performance improvements, WPTO has also recently undertaken new efforts to explore nearer-term opportunities for marine energy to reduce power constraints for other ocean industries.

In FY 2019, WPTO launched its Powering the Blue Economy Initiative (PBE), which supports marine energy R&D targeting maritime markets that could benefit from the early adoption of wave or current technologies. Successfully leveraging marine energy technologies to solve existing power problems for other ocean industries also offers the potential to meaningfully accelerate cost reductions for marine energy systems, by both providing greater opportunities for in-water experience and attracting additional private capital.

In FY 2020, WPTO will expand the PBE portfolio, creating new funding initiatives and lab-focused work that builds on the analysis from FY 2019 and launch new partnerships with federal partners. An example of those partnerships is WPTO’s recently announced joint Ocean Observing Prize with the National Oceanic and Atmospheric Administration (NOAA) to generate innovation in marine energy-powered ocean observing platforms.

On the hydropower side, WPTO launched a new grid research initiative in FY19—Hydropower and Water Innovation for a Resilient Electricity System (HydroWIRES)—to understand, enable, and improve hydropower and pumped storage hydropower contributions to reliability, resilience, and integration in a rapidly evolving electricity system. The initiative leverages expertise from industry and DOE National Laboratories to understand the value drivers for hydropower, to quantify its unique capabilities and constraints, to improve operations and planning for hydropower alongside other resources, and to invest in technology innovation to improve hydropower capabilities. Key efforts in FY19 included industry support for quantifying hydropower flexibility, and National Lab work to improve hydropower modeling capabilities.

In FY20, the HydroWIRES initiative will apply modeling tools developed in FY19 to investigate the highest-value technology innovations needed to improve hydropower flexibility. This will include the launch of a cross-cutting technical assistance program for external decision-makers so that National Lab research results can be implemented for the benefit of the broader hydropower and power system communities.

CONCLUSION

Thank you again for the opportunity to testify before the Subcommittee today. The Department appreciates the ongoing bipartisan efforts to address our Nation's energy challenges, and looks forward to working with the Committee on future legislation and activities. I would be happy to answer your questions.

David Solan

Deputy Assistant Secretary for Renewable Power

David Solan directs renewable energy applied research, development, and demonstration activities for the geothermal, solar energy, wind, and water power technology offices in the Office of Energy Efficiency and Renewable Energy (EERE). In addition, he oversees EERE's energy system integration efforts.

Previously at the U.S. Department of Energy (DOE), he was the Acting Executive Director and Principal Deputy Director of the Office of Policy, as well as a Senior Advisor in the Office of Science.

Before that, Solan was an executive at a multi-institutional research consortium and directed a research institute at Boise State University. He was the Principal Investigator or Co-PI for energy research awards from the National Science Foundation, the International Atomic Energy Agency, DOE, state governments, non-profits, and industry.

He has also been a member of the board for the manager and operator of the Idaho National Laboratory, the energy and advisory council to the Idaho state government, Idaho Power's Integrated Resource Plan advisory council, and the advisory board for The Electricity Journal. He has published across the energy technology spectrum on solar, wind, renewables integration, bioenergy, electric transmission planning, energy efficiency, nuclear power, energy security, and natural gas and natural gas liquids.

He has long-time experience in Federal government service outside of DOE. At the House of Representatives, he was a staffer for the Government Reform Subcommittee on Energy and Resources, and a Legislative Director for a Member of Congress. He also served at the Environmental Protection Agency as a Senior Policy Advisor to the Deputy Administrator and to the Office of Research and Development on energy issues.

Solan received his Ph.D. and M.A. from the University of Delaware and his bachelor's degree from Drew University.