Written Statement of

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"The Marine and Hydrokinetic Renewable Energy Act of 2013"
and Pending Legislation

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Introduction

Chairman Schatz, Ranking Member Lee, and members of the Subcommittee, thank you for the opportunity to testify on behalf of the U.S. Department of Energy (DOE) on S. 1419, the Marine and Hydrokinetic Renewable Energy Act of 2013.

The Department is still reviewing S. 1419 and therefore does not have a position on the bill at this time. S. 1419 would authorize the Department to perform research and development on marine and hydrokinetic (MHK) technology components, materials, and systems in order to improve performance, increase survivability, and drive down the technology's cost. S. 1419 would authorize the Department to develop appropriate testing infrastructure and support demonstrations of MHK energy technologies to verify their performance and cost. The legislation also would expand the authorized role of National Marine Renewable Energy Research, Development, and Demonstration Centers to include in-water testing and demonstration of MHK technologies.

Background

DOE is pursuing an all-of-the-above approach to developing every source of American energy. The Office of Energy Efficiency and Renewable Energy leads DOE's efforts to help build a strong clean energy economy, a strategy that is aimed at reducing our reliance on oil, saving families and businesses money, creating jobs, and reducing pollution. We support research, development, and demonstration (RD&D) of cutting-edge technologies in sustainable transportation, energy efficiency, and renewable electricity generation, including both hydropower and MHK technologies. The Department supports the goals of ensuring United States leadership in innovating, validating, and manufacturing MHK technologies domestically, as well as deploying these technologies sustainably in order to harness the energy potential of our various water resources while building a clean energy economy.

The Water Power Program has recently completed comprehensive resource assessments that identify the potential of the nation's waves, as well as tidal, ocean, and river currents. These resource assessments estimate that the technically extractable resource potential is almost 900 TWh/yr for wave energy[1] and under 400 TWh/yr for tidal[2] and ocean current,[3] which represents up to 25 percent of projected U.S. generation needs by 2050. With more than 50 percent of the population living within 50 miles of coastlines, there is significant potential to provide clean, renewable electricity to communities and cities in these coastal regions using marine and hydrokinetic technologies. MHK technologies can more readily compete in the near term in coastal regions with higher average electricity prices, and close proximity of coastal populations to water resources reduces transmission distances. There are potentially many different ways that we can sustainably develop our water resources for energy and the Department is committed to helping identify new opportunities for developing renewable energy resources.

Since DOE restarted its Water Power Program in fiscal year 2008, the Program has made significant strides in advancing next-generation water power technologies that can extract energy from moving water, including waves and currents in oceans, rivers, and tidal areas; assessing existing resources; promoting deployment opportunities; and developing this resource in an environmentally responsible manner.

Fostering a domestic MHK industry requires strategic investments in research, development, testing, and demonstration to drive down the cost and improve the performance of the most promising and cost-competitive technologies. The Department plans to invest $41.3 million in fiscal year 2014 to promote MHK technology development and testing in laboratory and open-water settings, while gathering the operational, environmental, and cost data needed to accelerate the responsible deployment and commercialization of MHK technologies.

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[1] Reprocessed at 100 meter depth data from P. Jacobson, G. Hagerman, and G. Scott, "Mapping and Assessment of the United States Ocean Wave Energy Resource," Electric Power Research Institute, Report Number 1024637, 2011.
[2] K. Haas, H. Fritz, S. French, B. Smith, and V. Neary, "Assessment of Energy Production Potential from Tidal Streams in the United States," Georgia Tech Research Corporation, 2011.Upper bound derives from variation on assumptions in numerical models used.
[3] K. Haas, H. Fritz, S. French, and V. Neary, "Assessment of Energy Production Potential from Ocean Currents Along the United States Coastlines," Georgia Tech Research Corporation, 2013. Upper bound derives from variation on assumptions in the numerical models used, and represents Gulfstream from FL to NC.

Furthermore, like all energy development, MHK deployment requires ensuring that our water, ecological, and marine life resources are protected. I will address these broad areas in turn.

Research and Development

The levelized cost of energy (LCOE) of today's wave energy devices is between 61 and 77 cents per kilowatt-hour (¢/kWh), and is between 47 and 53 ¢/kWh for tidal stream energy devices.[4] The MHK subprogram goal is to achieve cost-competitiveness at local coastal hurdle rates, which is approximately 12 to 15 ¢/kWh by 2030. The Program has developed detailed cost models for six different MHK device designs using performance simulations and small-scale laboratory tests for validation. To build on these cost models and clearly identify cost reduction pathways, the Program is identifying research and development opportunities to reduce the LCOE for MHK devices, supporting a detailed, internal techno-economic assessment of MHK technologies and helping stakeholders identify research and development gaps to achieve cost-competitive energy rates by 2030. Using data from internal techno-economic MHK assessment, the Department has established baseline costs for the technology to better inform MHK RD&D activities.

Research activities enable the development of innovative technologies and improve the reliability and technology readiness of MHK systems. DOE currently supports systems and performance advancement projects to develop new drivetrain, generator and structural components as well as develop software that predicts ocean conditions and adjusts device settings accordingly to optimize power production. One example includes innovative components with cross-platform applicability, such as simplified drivetrain designs that will eliminate costly and unreliable gearboxes and hydraulics by utilizing permanent magnet and linear direct-drive generators. DOE also researches ways to improve the technology's survivability, like innovative corrosion resistant materials, such as composites, which can lower repairs and reduce operations and maintenance costs.

[4] "The Carbon Trust, Accelerating Marine Energy," July 2011: http://www.carbontrust.com/resources/reports/technology/accelerating-marine-energy

Testing and Demonstration

DOE has invested in three National Marine Renewable Energy Centers. These Centers are geographically diverse, offering testing sites for a wide range of MHK technology types in different water conditions and climates, to help validate technology performance and identify and address technology deficiencies early in the development cycle. Recently, the Northwest National Marine Renewable Energy Center, led jointly by Oregon State University and the University of Washington, launched the Ocean Sentinel, a mobile instrumentation buoy to support ocean testing that obtains critical technical and cost performance data for a variety of wave energy technologies.

Additionally, the Water Power Program is focused on making strategic investments in transformative technologies, including systems demonstration for advanced MHK industry projects like wave energy converter technologies. By supporting in-water demonstrations, the Program will have the opportunity to evaluate the entire process from demonstration inception to completion, validating construction, generation, and operating expenses and informing the investor community on the status and progress of MHK systems. Between fiscal year 2011 and fiscal year 2013, the Program cost-shared the testing of 10 MHK devices in open-water environments, and the testing of 8 MHK devices in test tanks in controlled conditions. These demonstrations have greatly increased our knowledge and understanding of device performance and their interaction with the environment. This important demonstration work helps to advance the commercial readiness of full-scale MHK technologies, like the first-ever grid-connected tidal power device in the United States in Cobscook Bay, Maine, now delivering enough electricity to the utility grid to alone power 25 to 30 homes annually.

Developing MHK Resources Sustainably

EERE's MHK subprogram pursues market acceleration and deployment activities that address key environmental and ecological uncertainties, which DOE believes currently represent the most significant barrier to rapid and efficient permitting and licensing of new demonstrations or commercial projects. In fiscal year 2014, DOE plans to invest $5 million in activities that support a range of environmental studies and tool development to ensure that energy generated from MHK is not only renewable, but environmentally sustainable. This includes the development of instrumentation, associated processing tools, and integration of instrumentation packages for quickly and cost-effectively conducting environmental monitoring of MHK technologies. Additionally, DOE is an active member of the International Energy Agency's Ocean Energy Systems group and recently collaborated with international partners to create the Tethys database, which catalogues and shares environmental research and monitoring information from around the world to enable sustainable development and expansion of clean, renewable ocean and offshore wind power. For the past four years, DOE has also served as the convener of the Federal Renewable Ocean Energy Working Group to discuss issues of importance, including environmental considerations, amongst relevant federal agencies.

Conclusion

In conclusion, I would like to thank you for the opportunity to testify on S. 1419 and on DOE’s work to advance MHK technologies. The Department’s goals are to help build a viable domestic MHK industry and secure a supply of efficient clean energy from our water resources by supporting innovations enabling cutting-edge MHK technology, testing and demonstration of these technologies, and tools and analysis to ensure we develop our marine and hydrokinetic resources sustainably. I look forward to working with this Subcommittee and with Congress to ensure United States leadership in this industry and to enable the deployment of this source of clean energy.