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Senate Appropriations Energy and Water Subcommittee
Department of Energy (Water Power Program) FY 2014 Appropriations

The National Hydropower Association¹ submits this statement in support of \$59 million for the U.S. Department of Energy's (DOE) FY 2014 Water Power Program and its research and development (R&D) initiatives. The program provides critical R&D support to ensure that innovative new technologies and operational advancements arrive at market, increasing America's clean energy portfolio and providing economic and jobs benefits the country needs.

As we work to improve and facilitate new project development on the nation's existing waterway infrastructure, we also strongly advocate directing resources to the U.S. Army Corps of Engineers (USACE) and Bureau of Reclamation.²

Requesting \$59 million in FY 2014 funding for the DOE Water Power Program

In recognition of scarce federal resources, we propose a FY 2014 funding request for the DOE Water Power program that represents **no increase** over the current congressionally adopted funding level of \$59 million. Funds should be directed across all hydropower technology sectors including – conventional hydropower, pumped storage, marine and hydrokinetic (MHK), and conduit technologies.

Advocating for federal R&D Support

Hydropower offers tremendous promise as a way to address some of our most pressing energy challenges while creating a multitude of economic and jobs opportunities in localities across the country. By maintaining stable funding for the Water Power program's R&D initiatives, we bring the country closer to expanding a home-grown and clean resource. Continued research into how to increase the cost effectiveness of this resource will quicken the pace to commercialize and make use of new water power generation advancements.

Furthermore, continued funding of basic and applied research and development for clean energy technologies balanced with work on commercialization, market transformation and other efforts ensures that products, services, and data assessments are transferred to the private sector.

In addition, NHA's request for continued federal support for hydropower R&D is in line with the Administration's pledge to spur investment in renewable energy projects that also create well-paying domestic jobs. This aligns with the president's own goal to explore "targeted and smart investments to help catalyze renewable energy technologies" that can lead to more U.S. manufacturing.

¹ NHA, with over 180 members, is the national trade association dedicated to promoting the nation's largest renewable electricity resource and advancing the interests of the hydropower, pumped storage, and new ocean, tidal, conduit and in-stream hydrokinetics industries.

² For example, DOE has identified 12 GW of new capacity at existing non-powered dams. Of the top 100 sites, for which there is 8 GW of potential, 81 are on USACE dams.

The Department of Energy Water Power Program

The DOE Water Power Program is growing the nation's global position by funding cutting-edge research to produce the next generation of hydropower, pumped storage and marine and hydrokinetic (MHK) technologies, and by accelerating the development of markets for those technologies. Over the years, the program has been the smallest of the DOE R&D programs, yet as described below, will play a central role in the future as the country looks to bring more new renewable energy online and integrate increasing amounts of intermittent energy resources.

Increasing hydropower generation provides more clean energy megawatts to the grid, and also increases the amount of grid reliability, stability and integration services needed to support the penetration of resources like wind and solar. Hydropower and pumped storage projects can provide utility and grid-scale energy storage, and other ancillary services, but doing so will require projects to operate in new ways and modes, and in some cases, utilize new technologies.

This makes continued federal research investments vitally important.

Further, the hydropower industry employs more than 300,000 workers in the U.S., making it the largest renewable electricity production workforce in the nation. With the DOE's goal for waterpower technologies to provide 15% of the nation's energy by 2030, hydropower can provide hundreds of thousands of new jobs and economic development benefits.³

Priority Hydropower R&D Needs

In support of the country's energy independence and clean energy goals, NHA has identified industry R&D priority topics that will enhance the industry's ability to grow and develop new projects, technologies, and operational modes, to maintain and enhance generation at existing projects as well as support new project deployment.

Market analysis on the value of ancillary services

In addition to being our nation's largest renewable energy generator, hydropower provides ancillary services to the power grid such as frequency regulation, spinning reserves, voltage control, and load following, among others.

However, current market structures undervalue – and largely take for granted – the ancillary services provided by hydropower, which serves as a disincentive for further development. Improving methods to estimate the benefits of the ancillary services provided by conventional and pumped storage generation would not only refine the valuation of hydropower-generated energy, potentially leading to additional project development, it would also increase grid stability.

³ DOE, Office of Energy Efficiency and Renewable Energy, "Water Power for a Clean Energy Future," at P.2. http://www1.eere.energy.gov/water/pdfs/wp_accomplishments_brochure.pdf

Initiatives could include: research market structures that would provide appropriate incentives to build new assets providing ancillary services; and improve methods to estimate and value benefits of ancillary services.

Conventional Hydropower and Pumped Storage Generator R&D

Due to the significant addition of intermittent generation resources such as wind and solar to the grid, hydropower and pumped storage assets are operated with more starts and stops that increase operation and maintenance costs. Generators with faster cycling times, variable speeds, and improved efficiencies would benefit the grid, increase generation, allow for increased penetration of intermittent sources, and lower the costs for operation and maintenance.

This is particularly needed for the pumped storage sector, which is our nation's largest form of grid energy storage accounting for 99% of storage capacity in the U.S. and worldwide. Due to its importance in maintaining a stable power grid, further investigation of industry needs would help to facilitate expansion of existing hydropower pumped storage and the deployment of new facilities.

Technological advancements in generators, the diversification of plant configuration options, improvement of pump-back efficiencies, and investigation of multi-phase systems all provide the potential for increased generation and grid stabilization, while reducing the price of power.

Advanced Turbines

Advanced turbines have potential to add significant generation capacity by addressing environmental mitigation issues that are often barriers to adding new capacity to existing projects as well as developing new projects. Deployment, testing and monitoring of these advanced turbines is required to prove the environmental effectiveness, operational performance, and document operational and maintenance costs.

One of the major challenges facing the hydropower industry is in providing effective downstream fish passage, particularly at sites with threatened or endangered species. Advanced turbines are intended to reduce the fish mortality associated with turbine entrainment. In addition, market analysis of new potential installation locations, and comprehensive evaluations of potential uses and locations for advanced turbines will facilitate long-term deployment. Multiple site installations will be required to verify advanced turbines as its effectiveness is site dependent.

In addition, small hydropower resources in the U.S. are underutilized due the capital expense in development, environmental mitigation, and licensing. Advances in small turbine designs to reduce the cost of installation and/or environmental mitigation would lead to an increase in hydropower generation.

Further research into the recent experiences of small hydropower developers as well as reviewing the new low-head turbine applications would create efficiencies for potential project developers. Similar to large hydropower sites (which have been the primary focus of current

turbine research), a primary challenge for smaller installations is fish passage and entrainment mitigation. As such, research into the available turbine and other mitigation technologies that minimize injury, mortality, as well as address water quality issues, while maximizing power generation, would facilitate small project deployment.

Additional R&D Initiatives

Beyond the specifics mentioned above, the hydropower industry has identified other R&D topics including:

- hydropower generation system integration (operational forecasting of renewable energy; benefits of aggregating small distributed hydro assets);
- computational fluid dynamic (CFD) modeling (improvements in flow modeling; turbine analysis; water quality modeling and mixed phase modeling);
- flow measurement (research improved flow measurement methods and lower costs and maintenance of continuous flow measurement techniques);
- hydro resources and assets database development (clearinghouse of all available information, studies, results and compilations including growth potential, mitigation effectiveness, best practices, etc.)

Support for increased hydropower development at federal facilities

In this request, NHA also urges the Committee to direct support to the Army Corps of Engineers Civil Works and the Bureau of Reclamation efforts to operate, maintain, and upgrade their existing hydropower projects as well as to build on their existing non-powered infrastructure.

Recent federal studies show that thousands of megawatts of new hydropower capacity exist at non-powered dams owned or operated by the Army Corps of Engineers as well as significant growth potential at existing Bureau canals and conduits.

NHA, along with members of the NGO community, have formed a coalition to address issues with non-federal hydropower development at these federal sites. Without action to redress current challenges as experienced by developers wrought with costly and unnecessary delays, the country will not realize the significant energy potential these untapped sites offer.

Conclusion

Unlocking the vast hydropower potential of our rivers, oceans, tides and conduits requires funding the R&D and other initiatives that make innovative ideas a reality. The DOE Water Power Program is an important source of support for the researchers, scientists, and project developers and owners working to grow to our country's clean energy resources.

We urge Congress to maintain current \$59 million funding level for the DOE program and to provide funding support to the Corps of Engineers and the Bureau of Reclamation. This investment will increase not only the amount of clean, renewable hydropower generation, but also the grid services needed to expand the use of intermittent, variable energy resources as well.