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Karen Wayland
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Office of Energy Policy and Systems Analysis
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

RE: National Hydropower Association's Pumped Storage Development Council's Comments on the Quadrennial Energy Review

Dear Ms. Wayland:

On January 9, 2014, President Obama, as part of his Climate Action Plan, announced the establishment of a Quadrennial Energy Review ("QER") with the 2014 focus on "our Nation's infrastructure for transporting, transmitting, and delivering energy." Hydropower provides important services related to this initial objective, and the National Hydropower Association ("NHA")[1] applauds this effort and is pleased to submit the following comments on the goals and direction of the QER.

The President's memorandum highlighted the challenges and transformations facing our energy infrastructure, such as "energy supply, markets, and patterns of end use; issues of aging and capacity; impacts of climate change; and cyber and physical threats." With these challenges in mind, the President directed the QER Task Force to "develop an integrated review of energy policy" and offer "recommendations on additional executive or legislative actions to address the energy challenges and opportunities facing the nation."

Hydropower is the largest source of renewable electricity in the United States, regularly avoiding approximately 180 to 220 million tons of carbon emissions per year. In addition, hydropower, specifically pumped storage hydropower ("PSH"), plays an important role in ensuring grid reliability. As a flexible baseload source of power and bulk storage technology, PSH is a critical integrator of intermittent renewable energy generation that also allows asset owners to more efficiently utilize fossil generation resources. These attributes directly address the challenges raised in the President's memorandum and PSH's importance must be included in the Task Force's recommendations.

[1] NHA is a national non-profit association dedicated exclusively to advancing the interests of the U.S. hydropower industry, including conventional, pumped storage, and new marine and hydrokinetic technologies. NHA's membership consists of almost 200 organizations, including consumer-owned utilities, investor-owned utilities, independent power producers, project developers, equipment manufacturers, environmental and engineering consultants, and attorneys.

NHA's comments focus on executive and legislative recommendations to increase the use of PSH and improve the review, permitting, and licensing of PSH projects to meet the challenges and transformations outlined in the QER. Further, by incorporating NHA's recommendations, the QER Task Force will simultaneously advance the Department of Energy's ("DOE") Hydropower Vision initiative[2] and other administration priorities related to improving regulatory review, reducing regulatory burdens, and modernizing infrastructure permitting.[3]

I. Recommendations to Increase the Use and Development of Pumped Storage Hydropower

The benefits of expanding PSH are numerous, but the regulatory framework and current market structures do not provide an effective means of expanding its use toward achieving the President's goals. Therefore, NHA submits the following recommendations for the QER Task Force's consideration.

A. *Executive & Regulatory Actions*

Recommendation 1: One important recommendation that the QER Task Force can make to increase the role and use of PSH is to make clear that hydropower and PSH is an eligible technology in the implementation of all previous and future energy policies and initiatives, and direct federal agencies to recognize and treat PSH equally with other storage technologies.

Over the past few years the Administration has launched initiatives related to expediting and streamlining the permitting of renewable energy development on federal land, and increasing federal renewable energy procurement. However, these initiatives often exclude hydropower and PSH as an eligible renewable technology, or qualify them in a way that effectively eliminates their ability to participate in a meaningful way. Yet, hydropower and PSH has the longest permitting timeline of all renewable energy technologies, averaging between 5-10 years, not including construction. Some recent examples of federal streamlining initiatives include:

- In early 2012, the Department of the Army, through the Army Corps of Engineers, issued a $7 billion RFP for renewable energy contracts, *Large Scale Renewable Energy Production for Federal*

[2] Department of Energy's Hydropower Vision, available at: http://energy.gov/eere/water/new-vision-united-states-hydropower.

[3] See generally, Exec. Order No. 13563, 14 Fed. Reg. 3821 (January 18, 2011*) Improving Regulation and Regulatory Review*; Exec. Order 13610, 93 Fed. Reg. 28469 (May 14, 2012) *Identifying and Reducing Regulatory Burdens*; Exec. Order No. 13604, 60 Fed. Reg. 18887 (March 22, 2012) *Improving Performance of Federal Permitting and Review of Infrastructure Projects*; and *Implementing Executive Order 13604 on Improving Performance of Federal Permitting and Review of Infrastructure Projects* (Jun. 15, 2012).

Installations. Eligible technologies included solar, wind, biomass and geothermal. Hydropower was specifically excluded as an eligible technology.

- In July 2012, a Memorandum of Understanding ("MOU") was signed between the Department of Interior ("DOI") and the Department of Defense, *Renewable Energy and Renewable Energy Partnership Plan*. Eligible technologies included wind, solar, geothermal and biomass. The MOU contemplated storage technologies, but failed to include hydropower or PSH.
- In 2012, the President set a goal to issue permits for 10 gigawatts of renewables on public lands by the end of the year, and after the DOI achieved this goal ahead of schedule, the President then directed DOI to permit an additional 10 gigawatts by 2020. The DOI has since approved 25 utility-scale solar facilities, 9 wind farms, and 11 geothermal plants. Further, the President committed the Department of Defense to deploying 3 gigawatts of renewable energy on military installations, including solar, wind, biomass, and geothermal.[4] Hydropower and PSH was excluded from these initiatives, even though hydropower and PSH projects have applied for DOI approval.
- In April 2013, the Bureau of Land Management ("BLM") published a final rule, *Segregation of Lands – Renewable Energy*, focused on making it easier to process wind and solar development applications on BLM lands. Hydropower and PSH was not included in the BLM's final rule, even though many pending PSH applications touch BLM land.

As the above examples demonstrate, there is a need for the administration to amend renewable energy initiatives and polices across the federal government to include hydropower and PSH. One avenue to achieve this goal is an executive order or presidential memorandum that treats hydropower and PSH equally to other renewable energy and storage technologies. Specifically, direct all government agencies to include hydropower and PSH in any federal procurement and policy proposals for renewable energy, and to include hydropower project development as an energy priority and compatible with agency missions.

A recent bipartisan example that supports raising the profile of hydropower in the renewable energy debate is the passage of the Water Resources Reform and Redevelopment Act of 2013 (WRRDA). Specifically, in Section 1008 of WRRDA, *Expediting hydropower at Corps of Engineers facilities,* Congress directed the Army Corps of Engineers to give non-federal hydropower development priority, required timely and consistent review of hydropower applications, and established Army Corps reporting requirements related to the transparency and approval of hydropower applications.[5]

[4] The President's Climate Action Plan pg. 7 (June 2013).
[5] See the Water Resources Reform and Redevelopment Act of 2013 at: http://transportation.house.gov/uploadedfiles/wrrda_conference_report.pdf

Recommendation 2: NHA encourages the QER Task Force to work with the Federal Energy Regulatory Commission ("FERC"), Regional Transmission Organizations ("RTO"), and Independent System Operators ("ISO") in developing technology neutral market structures that incentivize and compensate asset owners of technologies that provide energy storage and strategic flexibility. For example, because bulk energy storage can be used to optimize the transmission grid and reduce the amount of new transmission required, NHA believes bulk storage should be included in regional transmission planning processes under FERC's Order 1000.[6]

Recommendation 3: There is inconsistent treatment of PSH in transmission discussions within the DOE. The QER Task Force could recommend that the DOE conduct an internal review across all offices to ensure that PSH is integrated as a storage technology throughout DOE's programs, such as the Office of Electricity, the Loan Guarantee Program, and the Office of Energy Efficiency and Renewable Energy's Water Power Program.

Along these lines, the QER Task Force should also encourage the DOE to reach out to its international counterparts in Europe to learn more about the expansion of PSH to meet their reliability needs as a result of the increase in generation by intermittent renewable energy across the continent. Globally, there are over 21,000 MWs of new pumped storage units actively under construction, which is almost equal to the existing installed capacity in the U.S. Over 5,000 MWs of that capacity is slated to come online in Europe alone. NHA recommends considering any lessons learned and best practices from Austria, Denmark, Norway, Portugal, and Switzerland as a starting point.

B. *Legislative Actions*

Recommendation 1: The QER Task Force should recommend the adoption of an energy storage investment tax credit ("ITC") to support the development of PSH projects. Because of its operational characteristics, energy storage (including PSH) does not fit well under existing programs and incentives like the federal production tax credit ("PTC") or state renewable portfolio standards ("RPS"). Recognizing this, bills have been introduced in the last several Congresses to provide an energy storage ITC. The most recent version of this bill was sponsored by Senator Wyden (D-OR) S. 1030, *the Storage Technology for Renewable and Green Energy Act of 2013*, or Storage Act, is a bipartisan bill that would create a 20 percent energy tax credit for investment in energy storage property that is directly connected to the electrical grid. The bill would also make energy storage technologies eligible under the clean renewable energy bonds ("CREB")

[6] FERC Order 1000: *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities* (July 21, 2011).

program. A similar bill, H.R. 1465, has been introduced in the House of Representatives sponsored by Rep. Gibson (R-NY). This bill also has bipartisan support among its co-sponsors.

Recommendation 2: The QER Task Force could recommend amending the Energy Policy Act of 2005 ("EPAct") to recognize all hydropower, including PSH, as a renewable energy resource eligible for federal procurement. Currently, EPAct of 2005 defines renewable electrical energy technologies as "solar, wind, biomass, landfill gas, ocean (including tidal, wave, current and thermal), geothermal, municipal solid waste, and *new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project*." (emphasis added). The current definition unnecessarily restricts hydropower's eligibility.

II. Advantages of Pumped Storage Hydropower

PSH has a long history of successful development in the United States and around the world. It is a proven technology, cost effective, highly efficient, and operationally flexible – all attributes necessary for meeting the challenges and transformations facing our Nation's energy infrastructure. In the U.S. there are 40 existing pumped storage projects providing over 22,000 MWs of storage and grid services. Additionally, there are over 50,000 MWs in preliminary permits, pending licenses, and relicenses in the FERC queue.

PSH is a modified use of conventional hydropower technology to store and manage electricity. Pumping water uphill for temporary storage "recharges the battery" and, during periods of high electricity demand, the stored water is released back through the turbines and converted to electricity like a conventional hydropower facility.

Because of their ability to respond rapidly, many existing PSH projects are already being used to meet increased transmission system demands for reliability and system reserves. This effectively shifts, stores, and reuses energy generated until there is the corresponding demand for system reserves and variable energy integration. This shifting mitigates potential transmission congestion, assists in efficiently managing the grid, and avoids potential interruptions to energy supply. New adjustable-speed technology also allows PSH projects to provide fast ramping, both up and down, and frequency regulation services in both the generation and pump modes. This is important because many of the renewable energy resources being developed (e.g., wind and solar) are generated at times of low demand and off-peak grid reliability services are still being met with fossil fuel resources, often at inefficient performance levels that increase the release of greenhouse gas emissions. The result is that when PSH is paired with other renewable energy projects, there is a significant reduction in greenhouse gases.

Important facts about PSH:

- Over 98% of the world's energy storage capacity is provided by PSH.
- Over 142,000 MWs is the combined generating capacity of the world's PSH projects.
- Modern PSH round-trip or cycle energy efficiencies can exceed 80%, often outperforming other energy storage and thermal technologies and nearly twice as efficient at hydrogen storage.
- On a levelized cost of energy perspective, PSH is one of the most economic means of energy storage.
- PSH projects have tremendous capacity, with the ability of individual facilities to exceed 1,000 MWs, magnitudes higher than other energy storage technologies.
- PSH is extremely durable, exceeding 50,000 cycles and decades of proven operation, compared to other energy storage technologies.
- Many new pumped storage projects are closed loop, meaning there are no on-stream reservoirs – significantly reducing the impact on potentially sensitive habitat and aquatic species.
- PSH is the only energy storage technology that can supply "grid-scale" services in the case of major energy disruptions; resulting in a more resilient, secure electric grid.

III. The Need for Pumped Storage Hydropower

An essential attribute of our nation's electric power system is grid-reliability – the real-time matching of electric generation to electric demand. The primary challenge in achieving this match is that once generated, electricity has no shelf life - it is generated when needed - and electricity demand continually changes throughout the day, week, month and seasons.

Electric transmission grid operators have long met this challenge on a real-time basis using a limited number of specific generation technologies that have the ability to quickly start up and/or vary their electric output as the demand changes. PSH, in addition to conventional hydropower storage, stands alone as the only proven technology available now and in the foreseeable future for grid-scale energy storage.

The last decade has seen tremendous growth of wind and solar power generation in response to favorable tax incentives and state RPS' intended to spur development of renewable energy and reduce greenhouse gases from fossil fueled generation. The most significant outcome of these incentives is the transformation of the energy generation mix. The variable nature of wind and solar generation and the frequent mismatch of timing between periods of variable generation and energy demand can create challenges for grid reliability and increases the need for system reserves and energy storage.

In some areas of the country, the impact of having large swings in generation due to the variability of wind and solar, combined with excess amounts of this generation during off-peak periods is becoming a significant challenge for electric grid operations. Developing additional bulk energy storage, such as PSH, could significantly improve grid reliability while reducing the need for construction of additional fossil-fueled generation capacity or new transmission to support the integration of wind and solar to the grid.

For more information about PSH and the need for energy storage, NHA directs you to the Pumped Storage Development Council's White Paper, *Challenges and Opportunities for New Pumped Storage Development*.[7]

IV. Conclusion

NHA's Pumped Storage Development Council appreciates the opportunity to submit comments on the QER. We look forward to additional opportunities to work with DOE and the QER Task Force on future QER objectives.

Respectfully submitted,

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[7] Available at: http://www.hydro.org/wp-content/uploads/2014/01/NHA_PumpedStorage_071212b12.pdf.