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**Before the Committee on Energy and Natural Resources
United States Senate**

***Hearing to examine the opportunities and challenges for hydropower capacity*
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Chairman Manchin, Ranking Member Barrasso, and Members of the Committee, thank you for the opportunity to testify today on the opportunities and challenges for maintaining existing hydropower capacity, expanding hydropower at non-powered dams, and increasing pumped storage hydropower. The role of hydropower in our nation's energy mix is more important than ever. We appreciate you holding this hearing and appreciate your work and support of hydroelectric power generation that our members rely on to energize their communities.

While hydropower is one of our oldest forms of generating electricity it is also a resource for the future because of its unique attributes enabling newer forms of generation. These qualities include a high level of flexibility that matches very well with the increasing need to balance intermittent renewable generation sources such as wind and solar. It lends system stability, reliability, ramping capacity, resilience, and effective integration of other resources. It is also efficient in its conversion of energy, uses reliable time-tested technology, and can be relatively low-cost. While extensive use of energy stored in batteries may be in our future, the ability to store the energy of falling water is serving us today and provides the fast response needed on demand. Significant pursuit of development of pumped storage hydropower projects will serve to create even more capacity for meeting peak demand, avoiding reliability events, and balancing other resources.

At this confluence in the history of energy policy, it should be made clear for both existing federal programs and new programs on the horizon that the definition of renewable power should specifically include hydropower. Today, I will describe some of the challenges facing hydropower in the federal regulatory realm and opportunities where the federal government can help adopt policies that allow us to maintain and increase hydropower capacity to address the many competing demands on today's power systems.

Overview and hydropower's role in the West

The Northwest Public Power Association is comprised of over 150 consumer-owned electric utilities in the Western United States and British Columbia. These are rural electric cooperatives, municipalities, and public utility districts governed by the people they serve and located in the states of Alaska, California, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming, including Lower Valley Energy in Jackson, Wyoming, which relies significantly on hydropower.

Our membership uses a wide mix of generation resources including coal, natural gas, hydropower, nuclear, wind, solar, geothermal, biomass, and diesel. Hydropower plays a large role in many of our member's service territories, and it is prominent in many rural communities

in the West that face economic challenges. A foundation of the Northwest region's energy supply, hydropower is a vital component of our nation's clean energy generation portfolio. Still only 7% of energy capacity nationally, hydropower provides 25% of the capacity in Alaska, almost 60% of the capacity in the Northwest generally, and almost 90% of the capacity used by our members who have contracts with the federal power marketing administrations such as the Bonneville Power Administration and Western Area Power Administration.

Hydropower is the original renewable beginning with the waterwheel used to grind corn in ancient times. The dams lend not only a clean, continuing supply of power, but multipurpose dams can be critical to transportation, irrigation, flood control, water supply for municipal and industrial uses, and recreation as well. Losing these assets would be devastating to many communities and would be threatening to the stability of our electric system.

For this discussion today, it is useful to distinguish between federal and non-federal dams. Federal hydropower plays a large and critical role in our region. The projects are owned and operated by the U.S. Army Corps of Engineers and Bureau of Reclamation, but the customers of community-owned utilities with preference rights to purchase that power pay for the costs of operating and maintaining those projects. Federal projects are marketed by the federal power marketing administrations but are not licensed by the Federal Energy Regulatory Commission (FERC). They face a different regulatory regime than non-federal hydropower, and are subject to specific Congressional oversight.

With much of the potential for increasing hydropower generation lying with non-federal developers, this area will be the focus of these comments today. Creating more capacity for meeting peak demand is critical to avoiding reliability concerns as more areas adopt energy policies that call upon intermittent generation. The acknowledgment of the need for hydropower has spanned several years and multiple administrations. For example, the Department of Energy's report from 2016, *Hydropower Vision: A New Chapter for America's 1st Renewable Electricity Source*, estimated that hydropower could grow to nearly 150 GW by 2050. Today it stands at just over 80 GW.

This expected growth has not happened because public policy and market design are not keeping up with the needs of the current and future grid and have not adequately recognized, enabled, and priced the value of hydropower. This is a threat to the viability of new and even existing hydropower projects as it puts reinvestment in these resources at risk. I will describe some challenges and possible solutions for hydropower relating to:

- **Leveling the playing field for federal incentives for hydropower;**
- **Flexibility, resilience, and proper market valuation;**
- **Permitting challenges and next steps;**
- **Operational flexibility needed under FERC license articles;**
- **Data-driven collaboration for predictive analytics for system management;**
- **Dam safety regulation; and,**
- **Regulatory burdens to removing sediment from projects.**

In addition, listed here for reference are positions within the resolutions of NWPPA relating to hydropower that are intended to ensure an adequate, safe, reliable, affordable supply of

hydropower to meet policy priorities and customer needs in the future. NWPPA has taken positions to:

- Urge Congress and the states to recognize all hydropower, including existing hydropower, as a renewable resource;
- Support market design that values hydropower's baseload availability, flexible capacity, other ancillary services, and carbon-free attributes;
- Support explicit inclusion of hydropower as a zero-carbon electric generation resource that meets the requirements to be included in any clean energy standard considered by Congress and/or the Administration;
- Support federal renewable and other clean energy incentives that are equally available to hydropower and accessible to public power utilities and rural electric cooperatives;
- Support federal investments in advanced hydropower technologies through research, development, and incentives. A major opportunity for increasing hydro-system output is reducing unplanned outages and increasing hydropower's contribution to grid reliability and resiliency;
- Support efforts by Congress to modernize hydropower licensing by designating FERC as the lead agency for purposes of coordinating all federal authorizations;
- Support reducing the time required for the hydropower licensing process by better coordinating federal authorizations, adding schedule discipline, improving trial-type hearings and fact-finding, requiring agencies to equally consider other public purposes of a project when setting conditions, and reducing duplicative study requests and those not tied to project operations;
- Support federal, state, and local efforts to enact policies that expedite the voluntary removal and redeposit of debris and sediment runoff into hydropower reservoirs as a result of frequent and extreme weather events; and,
- Oppose efforts to remove productive dams that provide, or have the potential to provide, economic hydropower generation.

Incentives for hydropower: leveling the playing field

We want to thank Senator Cantwell and Senator Murkowski for introducing S. 2306, the "Maintaining and Enhancing Hydroelectricity and River Restoration Act of 2021" to create a 30% clean energy tax credit to support upgrades at existing hydropower dams for dam safety, environmental improvements, and grid resilience enhancements. We extend thanks to Senator Wyden for his support of this issue in its consideration in tax legislation. Importantly, the bill includes a direct pay option, which would allow municipal and cooperative utilities to take advantage of the tax credit. With nearly one-third of retail customers served by tax-exempt entities, equalizing the treatment of hydropower in this way only makes sense if we are to continue to develop this renewable, zero-carbon resource. We understand that elements of this bill are in the latest Build Back Better proposal, and we support efforts to include other provisions like ensuring that certain projects that have been licensed by FERC, but are not yet built, can qualify.

These investments are sorely needed and in the public interest because they enable us to continue providing baseload, emission-free power that has all of the other qualities mentioned previously. As utilities pursue transition of the generating resources in their portfolios to meet regulatory objectives, especially in states like Oregon, Washington, and California, support of hydropower projects is crucial if we are going to keep the economy strong and the system reliable.

These investments are especially important to rural communities that are particularly vulnerable to impacts of economic downturns. Hydro facilities, once constructed, are some of the lowest cost generation options, especially for rural communities that are not connected to traditional grid systems. A good example is seen in Alaska. Our members there face much higher energy costs than most of our members in the lower 48 states. There is some significant hydropower, including a 120 MW plant owned by the state with the power purchased by several of our member utilities, including Homer Electric Association, which operates the plant. Still Alaska does not have the historic benefit of very large electricity infrastructure projects. So, smaller projects can have a big impact. Policies and incentives should be mindful of considering smaller projects including those under 20 MW, which can have a large impact in rural communities.

Across the west the rate of energy industry change is rapid with increased exploration of battery technology along with additional wind and solar. To be successful operationally, environmentally, and economically, these systems need support from a reliable baseload source like hydropower.

Solutions- In addition to the previously mentioned tax credits and direct pay incentives, increased grant programs putting hydropower as a priority are a step in the right direction. In addition, FERC should enable rapid licensing of pumped storage projects. When built with proper environmental consideration, there is no better clean source of flexible capacity. Developers and investors need permitting clarity to start building more of these as soon as possible. And, a faster FERC license process for smaller, less complex hydropower projects would also create a better path toward success. Other licensing issues are discussed below.

Grid resilience, flexibility, and proper valuation of hydropower in markets

The threat of electric system outages, especially during severe weather is always a top concern to our members. Grid resiliency is getting more focus at a national level as well, and it is helpful to see program funding going toward a variety of technology and grid management solutions. Hydropower is particularly well suited to lend a hand with resilience as outlined in a useful Department of Energy report from October 2021 called Hydropower's Contributions to Grid Resilience (PNNL-30554). It noted the critical role hydropower can play in the Western Interconnection during extreme events causing unplanned large loss of generation. This also underscores why the investments in hydropower systems described above are so important.

Even small-scale, run of the river hydropower has potential for adding resiliency in black start situations. In a demonstration project with public power utility Idaho Falls Power, the Idaho National Laboratory completed a series of tests designed to assess how small hydropower plants can provide startup power during outages. The City of Idaho Falls owns several small run-of-river hydro plants that, combined, can provide enough power to meet about one-third of the city's power needs. These were not built to be run off the grid, but tests with varying operations

enabled them to implement operational controls where they could restart generators individually and then gradually add load to operate the system in islanded mode – in effect, creating their own new microgrid during emergencies.

Rapid restoration service is an important hydropower value. And the qualities of hydropower that make it so useful for resilience also make it uniquely valuable for many aspects of system operations, especially in balancing systems with significant amounts of other variable resources like wind and solar. Other electric system values offered by hydropower include:

- Load-following and flexibility reserve
- Energy imbalance
- Frequency response, reactive power, and voltage support
- Spinning reserve, and,
- Supplemental (non-spinning) reserve.

Even though it is only 10% of total generation for the California Independent System Operator, hydropower provides up to 60% of CAISO’s spinning reserves. For the Midcontinent Independent System Operator it can provide up to 35% of spinning reserve requirements according to DOE’s *Hydropower Value Study: Current Status and Future Opportunities* (January 2021 PNNL-29226).

Market valuation—This flexibility is very valuable and needed to address the resource adequacy concerns arising from situations where renewable portfolio standards and carbon policies create large amounts of variable resources such as wind and solar that may not be available in a system when needed most (for example an evening peak during hot weather). Traditional markets value some attributes of power, such as energy, and were not designed to provide proper price signals for capacity, ancillary services and other attributes. If a renewable portfolio standard excludes hydropower, or its storage and capacity is not valued, it is at a disadvantage even though it could help meet the policy and operational priorities driving that system. This issue is described in several recent reports including DOE’s *Value Study* cited above, IEA’s *Valuing Flexibility in Evolving Markets: Current Status and Future Outlook for Hydropower* (IEA, Annex IX, June 2021), and *Reinvigorating Hydropower* (April 2019, NHA & Chelan County Public Utility District).

Solutions—there need to be more comprehensive market mechanisms that can create accurate price formation to compensate hydropower for what it does naturally to support the system and to incentivize dispatch of hydropower in the areas and times of day it is needed most. Focus on this in recent years, along with technological advances increasing data and system visibility, has led to steps toward monetizing services such as frequency response in some areas. But, there is much work ahead to achieve more explicit compensation for the value offered by hydropower.

Challenges in permitting and next steps

The valuable aspects of hydropower place it in high demand. A crucial question then is can existing or new hydropower projects navigate the arduous federal permitting process in time to help meet the system needs that are increasing every day. The laws around licensing are well-intentioned. Many projects have some impact to the surrounding environment, and owners and operators take their stewardship responsibilities and mitigation needs very seriously. But often resources that could be invested in mitigation measures are tied up instead to pay for lengthy

processes and duplicative studies that may or may not have a clear nexus to impacts of the project.

An example of this arduous permitting process for hydropower is seen in a comparison of processes experienced by Energy Northwest, a public power joint operating agency in Richland, Washington. It took less time with a more straightforward and predictable process for them to renew the license for their 1200 MW nuclear plant than it did for their 27 MW hydro project. In describing how this could be the case, they highlight the contrast between having a clear lead agency in the Nuclear Regulatory Commission with authority to drive and manage the other agency reviews versus an array of agencies without firm timelines for their hydro project. This is one more argument for FERC to be the clearly designated lead agency for hydro license renewals with firm schedules and accountability.

Many of the concerns regarding the complexity and timelines of the permitting process for hydropower were outlined in the recent report from the Department of Energy, *An Examination of the Hydropower Licensing and Federal Authorization Process* (Technical Report NREL//TP-6A20-7942, October 2021). It notes that 90% of projects seeking original licenses are abandoned prior to receiving the license. This is for various reasons including the length of time, the cost, the complexity, and the environmental measures considered. Some factors in delay and cost include:

- The CWA 401 process is lengthy, costly, often duplicative of other authorization processes;
- Staff turnover mid-project and lack of technical expertise;
- Disagreement over scientific data, lack of trust among stakeholders;
- Waiting time on studies from resource agencies; and,
- Requests for additional studies or information from stakeholders;

An example of the licensing and environmental processes faced even when attempting to reenergize an existing dam can be seen in Washington where Okanogan County Public Utility District filed a preliminary FERC License application in 2005 and received the license in 2013 but abandoned efforts to reenergize the project in 2018. In total, the District spent more than \$18 million on this effort from 2005 through November 2018. In 2007, the initial cost estimate to reenergize Enloe Dam was \$31 million. Through the next decade, it saw the addition of project risk, complexity, litigation, primarily around the Clean Water Act (CWA) 401 certification process, and general cost inflation due to the time lag. By November 2018, the 30% design cost to construct the project had increased to over \$87 million, which was approximately \$150/MW. Even after the decision to stop, the litigation continued through the beginning of 2020.

In summary, time plus cost equals abandonment because developers and investors have other places to focus their resources and project sponsors can not afford to continue to pursue these projects at exorbitant cost on an unpredictable timeline.

We appreciate that there has been some progress in this area, and that members of this committee have led strong efforts in Congress to address the process delays and costs. NWPPA supports several pieces of legislation on those issues. In addition, we recognize that there is some progress from FERC under its existing authority to do what it can on process elements such as

the default length of license, and the ability to migrate from an exemption application to a license application without completely starting over.

Solutions- Proposals to improve the license and relicense process include:

- Clearly establish FERC as the strong lead agency with authority to demand strict accountability;
- Allow FERC to develop an enforceable schedule for the issuance of all federal authorizations for a given project;
- Require FERC and other agencies to use relevant existing studies and avoid duplicating studies relevant to an existing project;
- Resolve interagency disputes over licensing by referral to OMB in consultation with CEQ; and
- Allow for trial-type hearings on certain mandatory conditions.

FERC should allow operating flexibility to meet critical needs

Beyond the process of the original license or relicense, FERC licensed hydropower (public and private) often has constraints stipulated in the license articles that unnecessarily limit its operations. This can relate to operations such as the ability of the project to adapt to changes related to climate or energy market operations, including articles pertaining to flood control (typically under the direction of another entity such as the U. S. Army Corps of Engineers), supporting recreational opportunities, environmental mitigation, and protection of water quality.

These constraints are arguably necessary to ensure safe, environmentally responsible, equitable operation of dams, but because they are set into the terms of long-term licenses these constraints hinder the ability of dams to adapt their operations in response to changes in public policy, climate-impacted conditions, and the energy market. Hydropower fleet operators, such as Seattle City Light, have seen changes to the hydrograph from wildfire, landslides, flooding, and extreme weather that affect hydropower capacity through impacts on equipment longevity and function, access to facilities, employee health and safety, and supply chain integrity.

Solutions-- Given these impacts and increases in uncertainty, variability, and demand, it would be helpful if FERC could offer additional operating flexibility to support maintaining and increasing hydropower capacity. Some solutions are:

- Grant operators greater flexibility to reorder the priority of constraints included in their license articles to meet urgent near-term needs. For example, flood control is mandated as the first consideration in the order of operation. Naturally, safety is high priority. But, in years with low flood risk, production of flexible capacity to support reliability and renewable resource generation could be prioritized. The operator is in the best position to determine the priority of its license constraints in any given year.
- Establish a process for operators to quickly update their license articles to allow them to adapt hydro operations to changing conditions without having to go through a full-blown relicensing process. Currently, there is not a way to do this without an unwieldy license amendment process. FERC should consider an abbreviated license update process to allow utilities to better keep up with a rapidly changing world of technology, market constructs, and public policy considerations.
- Shed light on the trade-offs between competing environmental interests (e.g., higher flows/spill for fish migration can result in less clean hydropower to support integration of

renewable resources). Make this part of the relicensing process; FERC could help utilities make the case that hydro flexibility has unrealized potential that can be part of a long-term, comprehensive environmental solution.

Data-driven collaboration to maintain hydropower capacity

As the nation transitions to a cleaner electric grid, it is more important than ever to ensure existing carbon-free hydropower capacity remains cost-effective, available, and flexible to integrate other renewables. However, our existing hydropower fleet is aging, and many asset owners are facing significant reinvestment and maintenance costs. An important research area to consider is predictive analytics, collecting the data to support its use, and collaboration among hydropower owners to perfect it.

Solutions – The Hydropower Research Institute, a data-driven collaborative of federal, public, and private hydropower owners, is focused on identifying preemptive maintenance opportunities that can reduce the impacts of extended forced outages, decrease maintenance costs, and ensure that hydropower is available when most needed for grid reliability. We encourage federal support, through DOE’s Water Power Technologies Office and others, to ensure our existing hydropower fleet is able to meet energy needs as the nation transitions to our energy future.

Dam safety regulation

Hydropower is not only affordable, renewable, and reliable, but it is also a generally very safe form of power generation. Keeping dam safety as a top priority is critically important to hydropower operators and their communities. We appreciate the recent support and funding on this issue in infrastructure legislation. There is, however, a regulatory aspect where requirements mandated in the name of safety can be inconsistently or arbitrarily applied. This seems to vary among regional offices of FERC. Hydro facility operators are very accustomed to ensuring safety and providing documentation to FERC regarding structures and foundational elements of the dams. But, there appears to be a trend in some areas where project owners are receiving requests from safety regulators for plans and studies that relate more to operational or environmental matters than to safety. One example was FERC asking the operator for a comprehensive evacuation plan in case of grass fires despite the fact that the project is a concrete structure sitting in the middle of a large river a quarter mile from the shore or any grass.

Solutions—Operators already have state agencies overseeing facility and occupational safety issues, and there are already other FERC staff ensuring environmental compliance with license provisions. FERC safety staff should not be requiring unnecessary or redundant reports, studies, and action plans not directly related to safety. This only creates more staffing and higher costs passed onto consumers, and it detracts from resources that might otherwise be invested in actual safety mitigation measures.

Hurdles to hydropower maintenance- permits to remove sediment

Some of the challenges to hydropower involve the regulatory process to simply maintain a facility in good working order. A notable example of this is sediment removal when it involves federal lands. In areas prone to wildfire, the run-off from the cycle of fires and floods on U.S. Forest Service lands adjacent to reservoirs creates rapid buildup, dramatically reducing

generating capacity, restricting water supply, and potentially causing safety concerns at the dam. For context, when the McKays Point Reservoir in California was completed in 1989, original sedimentation buildup over 30 years was estimated to be 43,560 cubic yards. However, the frequency of extreme weather events, including floods, droughts, and wildfires, lead to greater rates of erosion that flows into the reservoir. As a result, debris flowing from USFS land amounted to 519,040 cubic yards—nearly 12 times greater than anticipated. This sediment buildup limited storage capability, degraded water quality, and reduced overall generation of a clean and renewable resource. This is happening in reservoirs across the West.

Solutions – The least expensive option is to return the sediment back onto USFS lands where it can be used for fire breaks, road augmentation, and soil replacement. Regrettably, the process for securing a "Special Use Permit" needed to relocate this noncontaminated sediment back on USFS lands is broken. In the McKays Point example, the Northern California Power Agency has worked with the local USFS office, as well as headquarters in D.C., for more than two years to no avail. The process should be reformed to promote a collaborative relationship, with the USFS accepting relocated sediment for beneficial use in a timely, transparent, and efficient manner. Federal permitting processes and laws must be reformed to recognize and reflect the time-sensitive climate adaptation challenges this presents.

Conclusion

At a critical time in our nation's history with respect to energy policy, hydropower is positioned to lead us boldly into the future if our state and federal policies allow it to do so. As a safe, reliable, and low-cost resource that has the means to enable other renewable generation and keep our system reliable, the potential for this proven technology is too valuable to ignore. With the policy and operational challenges facing us in the days and years to come hydropower can be one of the best tools in our industry to help achieve our goals. Now is the time to act on streamlining regulation and creating more equitable incentives and appropriate market signals to bring hydropower to its full potential in our nation.

Thank you for your leadership in holding this hearing today. We greatly appreciate the committee's focus on this critical set of hydropower issues. I would be glad to answer any questions today and to provide any additional information for the record at your request.