

**BEFORE THE WASHINGTON STATE  
UTILITIES AND TRANSPORTATION COMMISSION**

In the Matter of the Washington Utilities  
and Transportation Commission's  
Investigation into Energy Storage  
Technologies

DOCKETS UE-151069 AND U-161024

Draft Report and Policy Statement on  
Treatment of Energy Storage  
Technologies and Integrated Resource  
Planning and Resource Acquisition

**Comments of the National Hydropower Association on the Draft Report and Policy  
Statement on Energy Storage Technologies**

The National Hydropower Association (NHA) appreciates this opportunity to provide input to the Utilities and Transportation Commission (UTC or Commission) in response to the issuance of the draft report and policy statement on March 6, 2017 in Dockets UE-151069 and U-161024.

The Commission released the draft policy statement for comment to assist it in developing a final policy statement that provides useful guidance to investor-owned utilities (IOUs), vendors seeking to promote energy storage for use by IOUs, and those interested in the use of energy storage on electric distribution systems.

NHA provides the following general comments and directs the Commission to the submissions by the Northwest Hydroelectric Association (NWhA) and those of NHA member companies in the region.

NHA is the hydropower industry's national association and is dedicated to advancing the interests of conventional hydropower, pumped storage, conduit power and marine energy technologies. NHA's 220-plus members include utilities, independent power producers, project developers, equipment manufacturers and service providers, representing the majority of our nation's non-federal hydropower industry. Our comments include specific input from NHA's Pumped Storage Development Council, which works to address the regulatory, market, and business needs for pumped storage projects.

NHA strongly supports UTC's efforts to properly value all of the benefits that energy storage can provide for grid reliability and renewables integration. We believe pumped storage projects, new and existing, along with the storage capabilities of conventional hydropower projects, have a critical role in meeting these dual objectives - now and into the future.

However, NHA agrees with the concern raised by NWA that policy discussions regarding energy storage, both in Washington State and nationally, have not adequately focused on pumped storage technologies to the same extent as other energy storage resources.

NHA believes that existing pumped storage projects and proposed new developments are: (1) not properly valued (recognized) for the roles they play in providing grid reliability and security services; and (2) not compensated adequately, nor uniformly, in current energy market constructs for these benefits in the various markets across the country. The UTC has an opportunity in the development of the report and policy statement to address this issue for the state.

NHA also supports NWA's statement that energy storage technologies, large and small, are complimentary rather than in competition with each other. As such, any energy storage technology should be recognized and compensated for the services/benefits it provides, which are described in detail below and included in WUTC's draft report.

1. Energy and Capacity Services
  - a. Energy Time-Shift (Arbitrage). An example of this type of service is the ability to deliver renewable energy on peak to better respond to customer needs
  - b. Energy Supply Capacity
    - i. Value storage for each block of capacity it serves, which will vary according to what part of peak demand it addresses
2. Grid Ancillary Services
  - a. Regulation and frequency response
  - b. Load-following and flexibility reserve
  - c. Energy imbalance service
  - d. Spinning reserve
  - e. Non-spinning/Supplemental reserve
  - f. Reactive power and voltage support
  - g. Black start service
3. Transmission Infrastructure Services
  - a. Transmission upgrade deferral
  - b. Transmission congestion relief
  - c. Overall grid portfolio optimization and management for transmission and generation resources

In the final analysis, NHA supports policy development that evaluates energy storage technologies based on their abilities to provide key supporting services to the overall electric grid, particularly when taking into consideration project lifecycle costs, performance and energy storage system degradation.


In addition to these general comments, NHA includes as an attachment our comments to the Federal Energy Regulatory Commission's (FERC) Notice of Proposed Rulemaking

(NOPR) on Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators in Dockets RM16-23-000 and AD16-20-000. The FERC comments provide additional background information and details that may be helpful to the UTC in the consideration of this matter.

We believe that energy storage technologies, in particular modern pumped storage projects, have the capability to support the integration of additional sources of renewable energy into the electric grid in a reliable and efficient manner consistent with Washington State energy policies, including resource diversification and decarbonization. It is critical that the benefits these advanced projects be fully understood, as they bring multiple benefits to bulk power system, including managing regional energy resources as the western power grid becomes more integrated.

Once again, NHA thanks the Commission for advancing the dialogue on energy storage needs in the region and looks forward to engaging further in the process to fairly compensate all energy storage technologies for the various services they provide and to promote the economic viability of all sizes and types of energy storage projects.

Respectfully submitted,

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Jeffrey Leahey  
NHA Deputy Executive Director

Attachment

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

**Electric Storage Participation in Markets )**

**Operated by Regional Transmission )**

**Organizations and Independent System )**

**Operators )**

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**Docket Nos. RM16-23-000  
and AD16-20-000**

**COMMENTS OF NATIONAL HYDROPOWER ASSOCIATION ON THE  
NOVEMBER 17, 2016 NOTICE OF PROPOSED RULE MAKING**

**I. Introduction**

The National Hydropower Association (NHA) appreciates this opportunity to provide input to the Federal Energy Regulatory Commission (FERC or Commission) in response to the November 17, 2017 Notice of Proposed Rulemaking (NOPR), Dockets RM16-23-000 and AD16-20-000.

The NOPR aims to allow energy storage resources and all categories of aggregated distributed energy resources to more fully participate in organized electricity markets. FERC proposes to amend its regulations under the Federal Power Act (FPA) to remove barriers to the participation of electric storage resources and distributed energy resource aggregations in the capacity, energy, and ancillary service markets operated by regional transmission organizations (RTOs) and independent system operators (ISOs).

Specifically with regard to storage resources, the NOPR proposes to require each RTO and ISO to revise its tariff to establish a participation model consisting of market rules that, recognizing the physical and operational characteristics and importance to grid reliability of electric storage resources, accommodates their participation in the organized wholesale electric markets. While leaving significant aspects of integrating these resources into organized markets to the ISOs and RTOs, the NOPR would move toward a standard – and more expansive – role for these resources in markets. The NOPR is consistent with the Commission’s recent Policy Statement affirming that storage resources can potentially serve as transmission assets and receive multiple revenue streams in an organized market.<sup>1</sup> NHA strongly supports both of these initiatives.

NHA is the hydropower industry’s national association and is dedicated to advancing the interests of conventional hydropower, pumped storage, conduit power and marine energy technologies. NHA’s 220-plus members include utilities, independent power producers, project developers, equipment manufacturers and service providers, representing the majority of our nation’s non-federal hydropower industry. Our comments include specific input from NHA’s Pumped Storage Development Council, which works to address the regulatory, market, and business needs for pumped storage projects.<sup>2</sup>

NHA believes that existing pumped storage projects and proposed new developments are: (1) not properly valued (recognized) for the roles they play in providing grid reliability and security services; and (2) not compensated adequately, nor uniformly, in current energy market constructs for these benefits in the various markets across the country.

While some key services these projects provide have market recognition, there are other services that both existing and new, advanced-technology pumped storage projects are capable of providing that are either undervalued or not valued at all. These include: improved grid

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<sup>1</sup> *Utilization of Electric Storage Resources for Multiple Services When Receiving Cost-Based Rate Recovery*, 158 FERC ¶ 61,0151 (2017).

<sup>2</sup> While these comments are primarily focused on energy storage technologies, including pumped storage, NHA notes that conventional hydropower projects with storage reservoirs are able to participate in most energy storage markets, and encourages FERC to maintain such opportunities through implementation of this and future rulemaking actions.

reliability and security (i.e. providing extremely fast response to major system disturbances, thereby helping to improve system dynamic performance including blackout prevention); enabling significant growth in non-dispatchable, intermittent renewables without adverse grid stability challenges (thereby avoiding the need for new transmission); and the ability to reduce greenhouse gases on a macro-scale by enabling thermal generation projects to operate at peak efficiencies.

Because of these benefits, the hydropower industry is embarking on a re-investment in the existing pumped storage fleet and developers are investigating dozens of new project opportunities. However, the market products that will support upgrades to existing projects, or investment in new, advanced technologies, need to be developed to justify such major capital expenditures. We believe the future for pumped storage is one of sustained and potentially significant growth, if the proper market products are put in place.

In its recently released Hydropower Vision Report (Report), the Department of Energy (DOE) documents that pumped storage hydropower is not properly valued, which is ultimately stifling project deployment.<sup>3</sup> This affirmation is important and noteworthy as the DOE Report also investigates a range of growth scenarios, finding that the existing 21.6 GW of domestic pumped storage capacity can increase in both the near term (2030), by 16.2 GW, and in the longer term (2050), by an additional 19.3 GW, for a total of 35.5 GW deployed by 2050.<sup>4</sup> Put simply, the potential is there and the valuation question is critical to unlocking it.

## **II. NHA's Overall Comments**

NHA's review of the NOPR considers FERC's direction a very positive start toward recognizing the need for a level playing field for all energy storage technologies. In various states, and in some federal policies, there have been carve outs, or set asides, for certain specific energy storage technologies. Instead, NHA supports policy development that evaluates energy storage technologies based on their abilities to provide key supporting services to the overall

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<sup>3</sup> Department of Energy Hydro Vision Report, 2016 (<http://energy.gov/eere/water/articles/hydropower-vision-new-chapter-america-s-1st-renewable-electricity-source>), Chapter 2: Unvalued and Undervalued Services, at page 119.

<sup>4</sup> Hydropower Vision Report: Executive Summary P.4

electric grid, particularly when taking into consideration project lifecycle costs, performance and energy storage system degradation.

It is important that FERC appreciates the regional needs of the various balancing authorities (RTOs/ISOs) and that this proposed rulemaking allow for the regions to implement solutions that best fit their market and grid needs. NHA believes that all of the various energy storage technologies have a role to play, including existing storage projects, but their abilities to provide services are not equal, nor are they intended to serve the same roles within the electricity grid. Furthermore, NHA appreciates FERC's acknowledgement that "effective integration of electric storage resources into the organized wholesale electric markets would enhance competition and, in turn, help to ensure that these markets produce just and reasonable rates." (Paragraph 12, Page 15)

NHA urges FERC to consider how the various RTOs/ISOs can better align revenue streams with reliability needs and whether and how those additional incremental revenue streams can justify new investment. This is particularly important in regions experiencing widespread installation of utility-scale and customer-sited intermittent renewable energy. Energy market (economic) spreads between off-peak and on-peak hours have diminished, and reliance on resources such as pumped storage hydropower (or conventional hydropower storage reservoirs) capable of long-duration load balancing, fast-starts and fast-ramping, has increased. In addition, in some regions, it may be appropriate to include the grid services provided by energy storage projects in long-term transmission and planning studies to better understand the potential grid benefits and risks, along with helping utilities and future asset owners value their investment. NHA requests FERC encourage ISO/RTOs to update their long term planning process to more accurately reflect the grid reliability and security services provided by pumped storage facilities.

### **III. Topic: Elimination of Barriers to Electric Storage Resource Participation in Organized Wholesale Electric Markets**

#### **1. Creation of a Participation Model for Electric Storage Resources**

For electric energy storage of all forms, today's wholesale electricity market revenues alone are not always sufficient to justify new development<sup>5</sup>. Existing resources are often relied upon for capabilities that do not have defined market revenue streams such as inertia and primary frequency and voltage control response. As a result, the establishment of new participation models for electric energy storage, as contemplated in the NOPR, will be critical to encourage development of new energy storage capability.

New participation models should not only contemplate new wholesale markets for energy, but also properly value and provide certainty for the additional capacity and grid value services that energy storage can provide. As defined in the Energy Policy Act of 2005 (Act) energy storage technology, and specifically pumped storage technology, that increases the capacity, efficiency, or reliability of an existing or new transmission facility is defined as an "Advanced Transmission" Technology<sup>6</sup>. Without consideration of both energy and capacity in new participation models, energy storage will likely be fragmented with different incentives provided to specific technologies to encourage development rather than a uniform policy that provides clear incentives for all energy storage technologies. Including energy storage projects in long term transmission and capacity planning studies will send clear signals to market participants on how to develop new energy storage products that benefit customers, RTOs/ISOs, utilities and asset owners.

NHA hopes that the recent issuance of the Commission's Policy Statement on cost recovery for energy storage, clarifying energy storage resources can be compensated at the same time for market and transmission or grid support services, will further encourage the inclusion of energy storage technologies in long term transmission and capacity planning. Through the guidance, the Commission has potentially removed a significant barrier by making clear that energy storage can be fully utilized and optimized by grid operators, providing project developers a broader

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<sup>5</sup> This is particularly so for new pumped storage hydropower as market-driven procurement has favored less capital-intensive projects with shorter development lead times.

<sup>6</sup> Energy Policy Act of 2005 Section 1223.



range of revenue streams based on project capabilities. NHA encourages FERC to work with RTOs/ISOs on implementing the guidance and to direct RTOs/ISOs to more closely consider procurement of certain forms of energy storage resources through procurement and cost-allocation mechanisms, traditionally utilized for new transmission build-out.

New Participation Markets should also consider a new project's ability to secure project funding. Many new hydropower projects since 2005 have taken more than twelve (12) years from inception to commercial operation<sup>7</sup>. Longer timeframes for centralized capacity procurement may improve the ability for high capital and exceptionally long-lived energy storage resources, such as pumped storage, to participate in financial markets for project financing.

NHA wishes to point out that inclusion in the transmission planning process does not imply that a project will then be included in a transmission rate base. Inclusion of energy storage technology in long term planning and identification of Advanced Transmission Technology is anticipated to improve the likelihood of a project's ability to secure long term financing, while also recognizing the overall grid benefits various energy storage projects may provide. Identification of Advanced Transmission Technologies will likely be based on regional balancing authorities' (i.e. RTO/ISO) needs rather than an overall policy. To the extent that pumped storage is included as an Advanced Transmission Technology, NHA would support all pumped storage be included, regardless of type or project age.

The equitable treatment of existing electric energy storage resources must also be accounted for in any new participation model. Accordingly, NHA requests FERC to require specific enhancements to existing RTO/ISO wholesale market products to further reduce barriers for new electric storage as well as preserve existing storage resources, which are heavily depended on for grid reliability. Creating incremental value streams, open to all market participants, will enable equitable treatment of

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<sup>7</sup> DOE Hydropower Vision Report, 2016, page 219

existing and new electric storage resources and help ensure appropriate compensation for the suite of services electric energy storage resources are capable of providing. In addition, open markets will spur efficient resource expansion by incentivizing the right amount of resources with the characteristics most desired for grid reliability. Markets will likely evolve to include new ways to retain existing energy storage resources and justify new storage development of all sizes, technologies and characteristics by providing compensation commensurate with the value offered.

## 2. Requirements for the Participation Model for Electric Storage Resources

### i. Eligibility to Participate in Organized Wholesale Electric Markets.

NHA encourages FERC to require eligibility for participation in new energy storage markets be based on project capabilities and system needs, rather than on any specific technology. New pumped storage projects with adjustable speed technology currently utilized in Europe and Japan have the capability to respond faster and with more precision than technology currently in use throughout the United States<sup>8</sup>. NHA supports inclusion of capacity services that may not currently be procured through existing market mechanisms and further encourages FERC to direct RTOs/ISOs to establish “premium reserve” products.

These products can offer performance-based payments for specified operational characteristics deemed most necessary for grid operations. Among the services are: primary frequency control, speed governor response and use of kinetic energy stored in unit rotors. In addition to these, pumped storage can also provide primary voltage response using automatic voltage regulators (AVR’s) and stored energy of the rotor to respond immediately to deviations in grid voltage. Fast ramping and load curtailment are features

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<sup>8</sup> The application of Adjustable Speed Pumped Storage hydro plants has been documented in a report to the Electric Power Research Institute (EPRI) of Palo Alto, CA. The report is titled “Application of Adjustable-Speed Machines in Conventional and Pumped-Storage Hydro Projects”, and is identified by the number EPRI TR-105542, Project 3577-01. The report was issued November 1995.

that advanced adjustable speed pumped storage projects can also provide, and are doing so in various European countries.

In RTOs and ISOs experiencing growth in intermittent renewables and increased grid volatility (system inertia consequences) with potential reliability implications, energy storage products such as pumped storage hydropower can provide fast-start capabilities and the ability to ramp to full capacity within a matter of a few minutes, which should prove highly valuable given that models recognize and value these services. NHA further encourages FERC to direct RTO/ISOs to offer credit for fuel diversity to incentivize a mix of resource and possibly of electric energy storage technologies capable of offering distinct and complementary services. In addition, FERC should require RTO/ISOs to review whether market services like frequency regulation and transmission functions such as deferral of new transmission (congestion management) , voltage support and relief of thermal constraints (transmission line overloading), among others, are being valued appropriately, and whether all resources providing these services are compensated for doing so. These types of products and actions can assure that electricity markets function efficiently and equitably, while at the same time help to close the growing revenue gap that must be addressed to sustain existing energy storage resources and fully value new grid scale storage project developments.

NHA also supports updating the NERC Glossary of Terms and Associated Reliability Standards to include the capabilities on non-synchronous technologies. For example, new adjustable speed pumped storage technologies are often connected to the transmission grids through large converters and inverters allowing the pump/generator to operate at non-synchronous speeds and providing for rapid response as well as operation at power levels over a broad range.

### 3. Bidding Parameters for Electric Storage Resources

- i. NHA supports the inclusion of optional bidding parameters that include state of charge. Allowing the owner/operator to manage the cost and operational constraints of transitioning between generating and charging as close as possible to real time would allow operators to control the amount of variability for each resource. Newer adjustable speed pumped storage technology provides even more operational flexibility.

### 4. Eligibility to Participate as a Wholesale Seller and Wholesale Buyer

- i. NHA supports the proposed reforms identified in the NOPR to allow operators to participate in wholesale transactions as both a buyer and seller. NHA also supports provisions that hold operators harmless if the ISO/RTO selects a more valuable service for the grid, but prevents the operator from selecting a more valuable market based service. An example of this would be if an operator could have made more revenue by participating in the market as a seller of energy (discharge mode), but the grid operator finds it more valuable to operate the energy storage project as a buyer (charge mode) instead.

### 5. Minimum Size Requirement<sup>9</sup>

- i. Bulk energy storage projects like pumped storage provide multiple, unique grid-scale benefits that many smaller projects cannot provide (i.e. grid security, new transmission deferment, energy time shifting, etc.). The largest pumped storage project in the U.S. is the six-unit Bath County plant with a total installed capacity in generation mode of 3,030 MW and the smallest is Reclamation's 8.5 MW Flatiron Plant. NHA believes FERC's proposed rule change will be compatible with existing and future pumped storage

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<sup>9</sup> NHA has concerns, generally, with market participation limitations based on project size. In the past, too many of these size limitations or criteria have adversely impacted the hydropower and pumped storage industries. One of the most recent examples of this is California's 1.3 GW energy storage procurement target, which specifically excluded large-scale pumped storage from the program (defined as 50 MW or greater).

hydropower plants connected to the high voltage bulk power grid. Previous FERC Orders 827/828 [Small Generator Interconnection Agreement (SGIA)] have been codified for interconnecting of units with ratings of 50 MW or less. It should be noted that there are potential pumped storage concepts under consideration that would have capacity ratings less than 100 kW, and at this level of rating would likely be connected to primary distribution feeders and not the bulk power grid. In such a case, units with a capacity rating less than or equal to 100kW would be addressed under the rules discussed under Part B of the NOPR “Distributed Energy Resource Aggregators in the Organized Wholesale Electric Markets.”

6. Energy Used to Charge Electric Storage Resources

- i. NHA concurs with FERC’s characterization of charging and discharging energy transactions in the Norton Energy Storage, LLC case (Paragraph 100, Page 79) as wholesale energy transactions. NHA also concurs with the New England Power Generator’s Association, Inc. and endorses the concept that robust existing generation and demand-side resources have for decades provided the voltage support, thermal overload protection, and other transmission reliability services the Commission contemplates new energy storage resources may provide. Existing resources, including existing pumped storage resources, compete to provide reliability services through ISO New England’s wholesale markets rather than through out-of-market transmission rates. New energy storage resources permitted to participate in the wholesale markets while recovering their costs through transmission rates will cause out-of-market price suppression.

Furthermore, if new energy storage resources do not directly compete in the wholesale markets, granting a subset of supply-side resources with preferential cost recovery for services currently provided within the market is generally inefficient and unnecessary. Though new energy storage resources

may provide some modularity and mobility not found in every existing resource, these distinctions do not justify discriminatory rate treatment.

NHA feels it is critical to note that not one grid scale merchant pumped storage project has been financed or constructed and commissioned under the current wholesale market rules as compared to the 42 existing pumped storage projects in operation and providing system reliability and ancillary services. The most recent, large-scale pumped storage project was completed more than 25 years ago; however, there are multiple new projects operating or under construction in Europe or Japan.

In previous comments, NHA proposed to FERC that a reverse demand response tariff be considered that more accurately compensates energy storage resource operators for charging services during periods of excess energy supply and grid instability. NHA understands that a reverse demand response concept for compensating the grid benefits of creating load in excess energy conditions may conflict with the Norton decision. NHA suggests that FERC investigate the viability and effectiveness of the wholesale market energy tariff mechanism to assess the practical application of that market mechanism if it is in fact fairly and accurately compensating technologies that provide that capability.

Further, NHA proposes that FERC investigate long term capacity and flexibility tariffs to incentivize the investment in long lived assets that provide increased grid flexibility, all within the context of the existing wholesale markets so that all energy storage resources can participate and be assessed on their respective technical capabilities.

#### **IV. Topic: Participation of Distributed Energy Resource Aggregators in the Organized Wholesale Electric Markets**

NHA would like to emphasize that all technologies be treated equitably including aggregated distributed resources. From a market perspective, NHA requests that FERC instruct the ISOs/RTOs to treat energy storage participation in markets impartially and not allow mixing of wholesale and retail operations. For example, an aggregated distributed resource that buys into the wholesale market for charging energy should then also sell back into the wholesale market.

## **V. Conclusion**

NHA thanks the Commission for the opportunity to present these comments in response to the November 17, 2017 Notice of Proposal Rulemaking (NOPR), Dockets RM16-23-000 and AD16-20-000.

Properly addressing the barriers to appropriate valuation and compensation of new and existing pumped storage hydropower projects is a high priority for NHA, its members, the hydropower industry and the interconnected transmission system at large. We believe that as the true technical capabilities of existing and advanced technology pumped storage are fully understood, the case for market changes and more equitable valuation and compensation is clearly evident.

Respectfully submitted,

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Jeffrey Leahey, Esq.  
NHA Deputy Executive Director