National Hydropower Association
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RE: National Hydropower Association Comments on the NYISO Grid in Transition Whitepaper

The National Hydropower Association (NHA)[1] appreciates the opportunity to comment on the NYISO Grid in Transition whitepaper. Hydropower is a critical resource to facilitate the transition to a cleaner electric grid. Hydropower provides both the environmental and reliability attributes sought after by public policy, such as zero carbon emissions, flexibility, and resiliency. With the proper policies in place, hydropower can make the grid transition smoother and more affordable, while enabling NYISO to remain in compliance with reliability standards. The policies adopted in New York, the fourth largest producer of hydroelectricity of all U.S. States, will play a critical role in designing renewable energy policy nationwide.[2] We understand the whitepaper is one step in a long process and we look forward to working with the NYISO, policy makers, and other stakeholders as the process unfolds.

I. Introduction

The Grid in Transition paper identifies several attributes that the grid needs to achieve the public policy goals of 70% non-carbon energy production by 2030 and a 100% carbon-neutral grid in 2040. These include "responsive and flexible resources," and "installed reserve capacity available to serve load when wind and/or solar generation output is insufficient for periods that may range from minutes to several days." Hydropower currently provides these products and can supply much more if market rules appropriately value them.

II. NYISO Should Incorporate Hydro Reliability Services in its Analysis

The Grid in Transition whitepaper identifies a need for more responsive and flexible resources that can provide operating reserves to address changes in load as a result of increased penetration of intermittent resources. Hydropower projects across the country, including in New York, provide substantial responsiveness and flexibility with a proven track record of smoothing out the variability of wind and solar resources on a second to second basis and over long periods of time. We encourage the NYISO to recognize hydropower projects as resources capable of providing increased responsiveness and flexibility in a manner that complements wind and solar from both an operational and emissions-free perspective.

In addition, the limitations on the responsiveness and flexibility of hydropower projects are generally unrelated to the technical capabilities of the facilities, but rather, where they exist, are a result of the need to consider and protect other uses of hydropower projects, such as recreation, environmental benefits, and aquatic values. As the NYISO pursues more responsive and flexible resource attributes, there is an

[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, many of whom are in New York, consists of 240 organizations, including public power utilities, investor-owned utilities, independent power producers, project developers, equipment manufacturers, environmental and engineering consultants, and attorneys.

[2] Energy Information Administration "State Profile and Energy Estimates: New York" (2017). Available at: https://www.eia.gov/state/?sid=NY

opportunity to work with stakeholders to achieve a balance between flexible generation and other uses of a hydropower project.

Between now and 2040, when New York aims for a 100% carbon-neutral grid, the licenses of 79 hydropower projects, with a combined capacity of nearly 750 MW, will expire.[3] Since the NYISO needs more flexible and responsive resources to support the transition to a cleaner grid, these requirements should be defined and incorporated into market design in the near term.[4] That will allow the economic value of these products to be factored in by entities considering making substantial relicensing investment decisions. Without proper valuation in the marketplace, many smaller hydroelectric projects will not be able to afford the costs of the relicensing process. NHA encourages the NYISO to monitor these relicensing proceedings closely to assure critical in-state existing clean energy and capacity resources are not adversely reduced as part of relicensing. NYISO articulation and definition of this value may also be a factor in FERC licensing decisions in the future.[5]

Reliability Services Provided by Hydro

In the Grid in Transition whitepaper, the NYISO identifies ten future reliability gaps and proposes recommendations to address them. As the NYISO continues to refine these solutions, NHA encourages the NYISO to consider the reliability services that hydropower provides and devise market rules that optimally deploy all flexible resources including hydropower.

NYISO's neighboring RTO, PJM, has identified hydropower as the premier provider of a diverse range of reliability attributes.[6] As shown below, PJM's chart shows hydro exhibiting nearly all reliability attributes.[7]

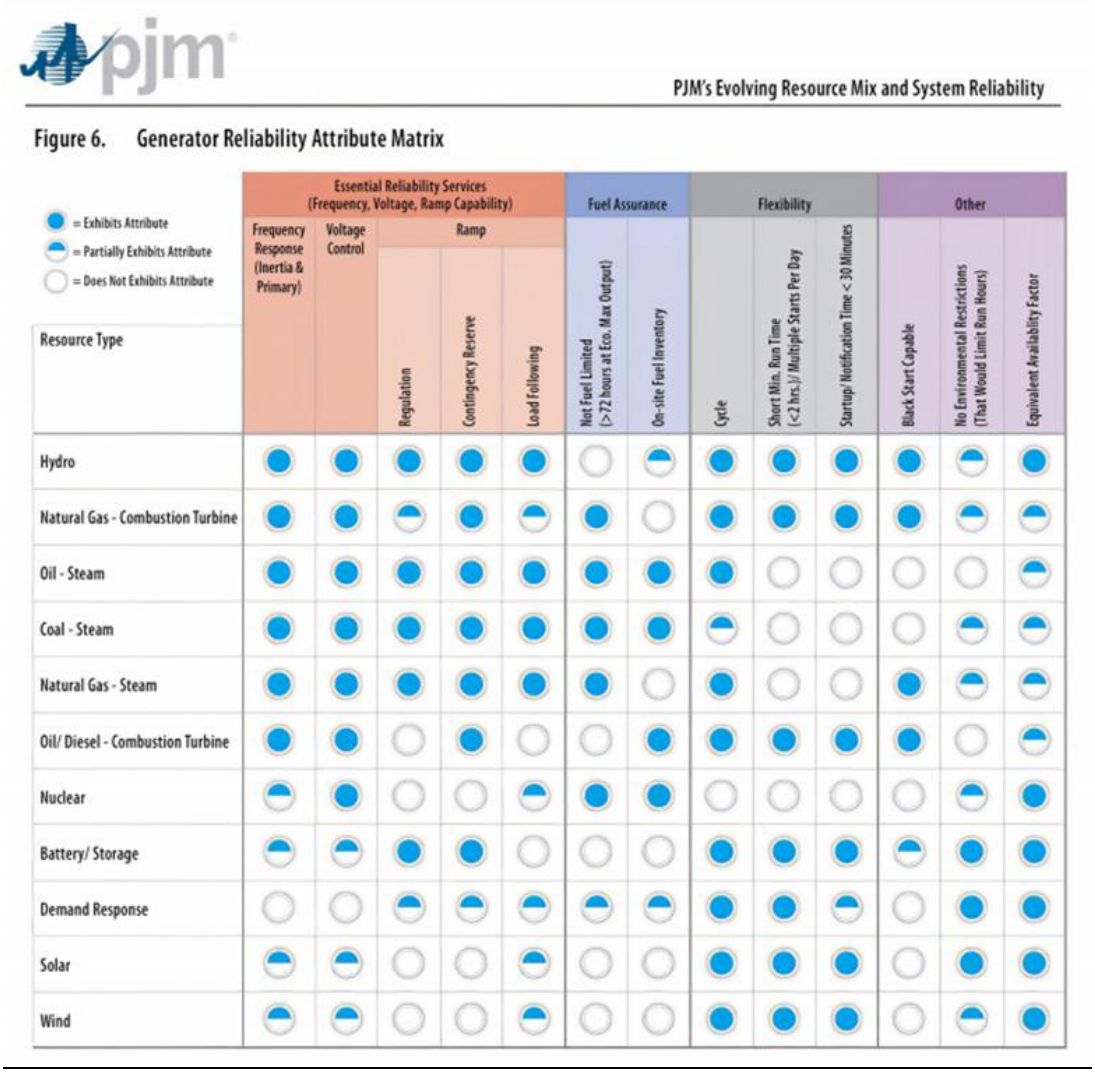
[3] FERC Spreadsheet "Complete list of Active Licenses" available at: https://www.ferc.gov/industries/hydropower.asp

[4] NYISO "Power Trends 2019: Reliability and a Greener Grid" (2019). Available at: https://www.nyiso.com/power-trends

[5] Commissioner Glick testimony before House Energy and Commerce Committee on June 12, 2019: "With regard to hydroelectric facilities, the Commission is responsible for licensing and overseeing non-federally owned hydroelectric facilities in the navigable waters of the United States or on federally owned lands. Before issuing a license, the Commission must determine whether a hydroelectric facility is in the public interest. I believe that the ability of hydroelectric facilities to generate zero-emissions electricity and to integrate other sources of zero-emissions electricity, thereby reducing greenhouse gas emissions from the electricity sector, should be an important aspect of the Commission's public interest determination under the FPA."

[6] PJM "PJM's Evolving Resource Mix and System Reliability" (March 30, 2017), Available at: https://www.pjm.com/~/media/library/reports-notices/special-reports/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx

[7] Except for >3 day fuel supply, which, notably in NYISO's case, hydro imports from Quebec provide.



PJM's Evolving Resource Mix and System Reliability

Figure 6. Generator Reliability Attribute Matrix

● = Exhibits Attribute
◒ = Partially Exhibits Attribute
○ = Does Not Exhibits Attribute

Resource Type	Essential Reliability Services (Frequency, Voltage, Ramp Capability)					Fuel Assurance		Flexibility			Other		
	Frequency Response (Inertia & Primary)	Voltage Control	Ramp			Not Fuel Limited (>72 hours at Eco. Max Output)	On-site Fuel Inventory	Cycle	Short Min. Run Time (<2 hrs.)/ Multiple Starts Per Day	Startup/ Notification Time < 30 Minutes	Black Start Capable	No Environmental Restrictions (That Would Limit Run Hours)	Equivalent Availability Factor
			Regulation	Contingency Reserve	Load Following								
Hydro	●	●	●	●	●	○	◒	●	●	●	●	◒	●
Natural Gas - Combustion Turbine	●	●	◒	●	◒	●	○	●	●	●	●	◒	◒
Oil - Steam	●	●	●	●	●	●	●	●	○	○	○	○	◒
Coal - Steam	●	●	●	●	●	●	●	◒	○	○	○	◒	◒
Natural Gas - Steam	●	●	●	●	●	●	○	●	○	○	●	◒	◒
Oil/ Diesel - Combustion Turbine	●	●	○	●	○	○	●	●	●	●	●	○	◒
Nuclear	◒	●	○	○	◒	●	●	○	○	○	○	◒	●
Battery/ Storage	◒	◒	●	●	○	○	○	●	●	●	◒	●	●
Demand Response	○	○	◒	◒	◒	◒	◒	●	●	◒	○	●	●
Solar	◒	◒	○	○	◒	○	○	●	●	●	○	●	●
Wind	◒	◒	○	○	◒	○	○	●	●	●	○	◒	●

Hydropower is unique among generating resources because it can provide nearly all the attributes necessary for a reliable and resilient electric grid from dependable capacity to black start capability. Hydropower's ability to ramp up or down quickly in response to consumer demand or to offset variable energy resource production is valuable in a rapidly evolving electric system. As the grid integrates more and more variable energy resources such as wind and solar, hydropower's ability to provide firm capacity, frequency response, voltage support, load following and long-term storage is increasingly critical. While each plant is different and some have greater capabilities than others, hydropower projects have the characteristics defined as necessary to affordably help meet NYISO reliability needs.

Firm/Installed Capacity: Hydropower systems are built to take advantage of high stream flows and hence have available capacity that can be called upon to meet system peaks.

Annual Energy: Even though stream flows can vary, hydropower is a reliable resource that produces energy throughout the year. Hydropower generation can be forecasted with a high degree of accuracy. Reservoir storage at individual dams, and systemwide, can facilitate the best coordinated use of water.

Regulation and Frequency Response: Hydropower projects can provide frequency regulation by responding within 4 seconds to meet reliability merely by allowing more water to pass through turbines using automatic generation control — or simply by relying on large machine inertia. Fast load ramping rates provide rapid frequency response without generating carbon emissions. The control systems used on hydropower units (governor controls) provide the arresting frequency response, as well as the initial recovery response to major system events, to protect consumer equipment and provide electric grid reliability.

Spinning Reserves: Because hydropower projects generally have some turbines that are not being fully utilized, hydropower is a natural fit for supplying reserves that can respond to load changes in as fast as 10 seconds.

Non-Spinning Reserves: Hydropower units are able to quickly turn on and provide power in less than 10 minutes, and can maintain output for an extended period using less than fully utilized turbines. Since hydropower is capable of responding in less than 10 minutes, some markets have begun to differentiate a fast ramp product, which can realize hydropower's value.

Flexible Capacity: Many hydropower projects are flexible enough to adjust generation during the day to assure loads and resources stay in balance. This flexibility is critical in integrating wind and solar, especially during steep ramping events, such as those experienced in California and other regions.

Long-Term Storage: Many conventional hydropower projects with large reservoirs can provide storage capability, providing opportunities to better balance loads and generating resources. Some storage projects have reservoirs that can store water for months at a time to release when needed. In addition, run-of-river projects can often be coordinated with storage projects to optimize generation from stored water. In addition, pumped storage hydropower provides significant energy storage capacity, representing 95 percent of the energy storage in the U.S. today. It is the proven, cost-effective, durable, and reliable utility-scale energy storage innovation available.

Inertia: Hydropower units are a source of inertia that help avoid widespread blackouts by providing large rotating mass. Inertia can stabilize the grid by slowing frequency declines or increases and damping the oscillations that can occur when there is a sudden change of large generation or load. Some hydropower units can provide inertia to the grid without having to generate.

Black Start: During outages, hydropower can help restart the power system without support from the transmission grid, enabling other generators to come online. Units can be operational very quickly (within minutes); their output can be continuously adjusted without impact; and they can provide stable system restoration. Grid operators turn to hydropower for black start because it is a proven resource – one that has been undervalued and yet played this critical role time and again, most recently during the East Coast blackout of 2003. The U.S.-Canada Power System Outage Taskforce that examined the East Coast blackout

noted specifically that hydropower plants in western New York formed the basis for restoration of power throughout New York and Ontario.[8]

III. NYISO Market Design Should Attract and Retain Flexible Units Including Hydro

The Grid in Transition whitepaper makes multiple references to the need for price signals that attract flexible resource over the short- and long-term.[9] NYISO should evaluate options to ensure needed and valuable resources are compensated for their value. Relying on generator bidding behavior is likely not sufficient to achieve this valuation. Hydropower projects provide many ancillary services in NYISO, are frequently one of the only providers, and often are not permitted to charge beyond their costs of service, which does not always take into account unique operating characteristics of the project.

Specifically, hydropower projects provide services that require the projects to start and stop operations more frequently. However, the operational and maintenance costs of increased starts and stops is often not reflected in the cost of service calculation. As more intermittent resources come online, accurately calculating the cost of increased starts and stops will become even more important to ensure proper price signals. As the Grid in Transition process unfolds, NHA looks forward to working with the NYISO to develop market policies that accurately value flexible resources and send the proper price signals.

Conclusion:

Hydropower is one of the largest sources of carbon free energy in New York and is capable of providing the means for NYISO to achieve public policies goals while maintaining reliability. Hydropower provides the environmental and reliability attributes required to support additional intermittent resources. For more information, we encourage the NYISO to review NHA's whitepaper from April 2019: "Reinvigorating Hydropower: A cornerstone of our clean, affordable, reliable electric future," authored by NHA and Chelan County PUD.

We appreciate the opportunity to comment. If you have any questions or need additional information, please contact Dennis Cakert, NHA's Manager of Regulatory Affairs and Market Policy, at 202-697-2404, or at dennis@hydro.org. We look forward to continuing this important work with NYISO, policy makers, and other stakeholders.

Respectfully submitted,

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NHA President and CEO

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[8] U.S.-Canada Power System Outage Task Force: "Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations" (April 2004). Available at: https://www.energy.gov/sites/prod/files/oeprod/DocumentsandMedia/BlackoutFinal-Web.pdf

[9] "Enhance energy and shortage pricing such that prices are consistent with customers' value of lost load and probability of outage as supply conditions tighten and with smoother demand curves."
Page 8 of NYISO "Reliability and Market Considerations For A Grid In Transition" (May 2019).