RESPONSE TO NEW YORK ENERGY HIGHWAY RFI

Submitted by the New York Battery and Energy Storage Technology Consortium, Inc. (NY-BEST)

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RESPONDENT INFORMATION

The New York Battery and Energy Storage Technology Consortium (NY-BEST) is a nonprofit, industry association with over 100 members focused on growing the battery and energy storage sector in New York State. Our mission is to catalyze and grow the energy storage industry and establish New York State as a global leader.

We do this by: (1) serving as a center for communication, education and interaction amongst stakeholders; (2) leveraging New York's world-class intellectual and manufacturing capabilities and market leadership; (3) supporting and accelerating the commercialization process from research and development to products and widespread deployment; and (4) advocating for policies that promote the energy storage industry.

PROJECT DESCRIPTION

At the RFI conference on April 19, 2012, members of the Energy Highway Task Force clearly stated that comments and suggestions were welcome, and that it was not necessary for respondents to promote specific projects per se. We appreciate this broad view of the mission of the Energy Highway Task Force and hope the members will find this response useful. In response to this guidance, NY-BEST's proposal is not a project in the traditional sense, but a description of the benefits that energy storage technologies are presently providing to electric grids, and the additional benefits that would accrue to New York's grid through widespread adoption of these technologies.

As stated in Energy Highway Task Force documents and elsewhere, there is widespread agreement that New York's aging infrastructure is in need of upgrades and that the constraints preventing energy flows from upstate to downstate create price disparities that adversely impact downstate consumers and upstate generators while contributing to an inefficient grid. In addition, most of the recent discussions surrounding the potential closure of Indian Point focus on the problem of supplying power to the downstate region of the state.

We propose for New York to upgrade its aging infrastructure through deployment of energy storage devices in key locations across the state to support and enhance operation of existing generation, transmission and distribution assets. Energy storage is the key enabling technology that decouples the production and consumption of electricity, e.g. it allows energy produced at one time to be consumed at a different time. Adding energy storage resources to the grid will serve several functions that together, will enhance operation of current assets on the grid, allow for more efficient operation of generation, transmission and distribution assets, and extend useful life of aging assets.

INTRODUCTION

In order to assist the New York Energy Highway[1] Initiative achieve its stated mission, we provide the following comments responsive to the RFI's key inquiries on (a) how to reduce the current costly constraints on the flow of electricity to, and within, the downstate area; (b) expand the diversity of power generation sources supplying downstate load centers, with an emphasis on encouraging the development of utility-scale renewable energy generation; (c) ensure the long-term reliability of the New York State electric system; and (d) economic impact projections of the growth of the energy storage industry in New York State.

BACKGROUND

Electrical energy no longer needs to be used when it is produced. New technologies have been developed to enable the storage of electrical energy, which not only shifts the electric industry's historic paradigm, but opens up new and important opportunities for addressing the needs of the state and national electric system. Among those opportunities is the ability of energy storage to complement the growth in the renewable energy market. As that market grows, the use and diversity of energy storage technologies must also grow. The growth of the energy storage sector must be encouraged and accelerated.

Energy storage provides substantial benefits to the grid. It improves reliability by allowing for more efficient peak demand management, enabling load leveling, and aiding in the forecasting of shifting day-ahead load requirements. Generally, energy storage provides financial benefits over the costs to build new transmission. It is cheaper to develop, it reduces plant capital costs, it reduces developers' and investors' financial risk, and it reduces on-going operation and maintenance costs.

Energy storage also provides direct benefits to all sectors of the electric power industry. For the wholesale market administered by the New York Independent System Operator (NYISO), energy storage provides needed capacity, energy, regulation and/or spinning reserve services and can be used to reduce the effects of price volatility on consumers and market participants. For utility systems, it facilitates utility response to local and system capacity issues. For transmission providers, it fosters VAR support, moderates the need for additional transmission resources and investment, and reduces transmission congestion.

Many issues have arisen in response to the growing requirements for, and development of, electricity produced by renewable resources. Renewable energy resources have increased the need for frequency regulation, the availability for spinning reserves and load-following and other ancillary services. In addition, the industry increasingly grapples with steeper system ramping requirements, more frequent and serious over-generation events, less efficient dispatch of conventional resources, and other distribution issues.

Energy storage increasingly serves as a solution to these challenges. Proven and developed, and still developing energy storage options include, by way of example: mechanical, including compressed air energy storage; pumped hydro; flywheel; electric; thermal; and chemical, including fuel cells and batteries. As the storage industry matures, there will be more options for energy storage implementation and deployment.

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[1] The NY Energy Highway Initiative, which grew out of the Power NY Act of 2011, envisions a public-private initiative to upgrade and modernize New York State's energy system

THE ROLE OF ENERGY STORAGE IN ADDRESSING KEY RFI ISSUES

A. Reduce constraints on the flow of electricity to, and within, the downstate area; and expand the diversity of power generation sources supplying downstate

Significant and costly constraints in the New York transmission and distribution system persist due to challenges associated with building new or upgrading existing transmission. The most significant challenges are cost and environmental concerns. New transmission lines are costly to develop, with costs running in the billions of dollars, depending on the scale of the project. Such costs, coupled with lengthy and extensive regulatory approval processes relating to local siting and federal and state regulations, can cause delays. In addition, the need to obtain easements or rights-of-way for new transmission projects, as well as local opposition to new construction, has impeded new transmission projects. These delays can reduce reliability and economic efficiencies; create barriers to meeting potential renewable generation policy goals, and impede new development.

There have been positive steps related to the incorporation of energy storage into the regional power systems that may provide opportunities to New York stakeholders. First, in 2010, the Federal Energy Regulatory Commission (FERC) FERC approved the self-certification of an advanced energy storage project in New York as an exempt wholesale generator ("EWG") (*See AES ES Westover, LLC,* 131 FERC ¶ 61,008 (Apr. 5, 2010).)

Second, in 2011, the Federal Energy Regulatory Commission (FERC) issued Order No. 1000[2] reforming the electric transmission planning and cost allocation requirements for public utility transmission providers. The Order builds on the reforms instituted by FERC's Order No. 890[3], and strives to correct deficiencies with respect to transmission planning processes and cost allocation methods. Specifically, Order No. 1000 (a) applies the planning principles of Order No. 890 to regional transmission planning processes,[4] (b) requires transmission planning and cost allocation on an interregional level for cross-border facilities, (c) requires each specific region to implement a form of cost allocation, based on the concept of "beneficiaries pay" and (d) eliminates the federal right of first refusal to transmission facilities that are selected in a regional transmission plan for purposes of cost allocation.

Third, the establishment and efforts of the Eastern Interconnection Planning Collaborative (EIPC)[5] provides New York State with a unique opportunity to influence the development of a comprehensive program to study the impact on the grid of various policy options determined to be of interest to the states in the Eastern Interconnection, particularly to New York and its neighboring Northeastern states. Similarly, the Eastern Interconnection States' Planning Council

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[2] Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 136 FERC ¶ 61,051 (2011).

[3] Preventing Undue Discrimination and Preference in Transmission Service, 118 FERC ¶ 61,119 (2007).

[4] Order No. 890 was issued with the intent of increasing detection of, remedying and reduction of opportunities for undue discrimination with respect to transmission planning. It places a focus on regional transmission planning by independent system operators and transmission owners. It required system operators and transmission owners to describe their proposed transmission planning processes, on which stakeholders were able to provide feedback.

[5] "EIPC was awarded funding from The U.S. Department of Energy (DOE) in 2010 to prepare analyses of transmission requirements under a broad range of alternative futures and develop long-term interconnection-wide transmission expansion plans in response to the alternative resource scenarios." *see* http://www.eipconline.com/Project_Overview.html.

(EISPC), which seeks to create unprecedented collaborative efforts among states in Eastern Interconnection, provides New York with additional opportunities for input and influence.

Additionally, because New York participates in a single-state control area, the state has an exceptional opportunity to develop a comprehensive and cohesive state-focused energy strategy that incorporates energy storage as part of its short-term and long-term strategic plan. New York is one of the leaders in the development and operation of energy storage projects, which include NYPA's 1,160MW Blenheim-Gilboa Pumped Hydro Storage Project, Beacon's 20MW Stephentown Flywheel Project, and AES's 8MW Johnson City battery-based Project. NY-BEST proposes to work with NYISO, State-policy makers and stakeholders to ensure that all energy storage technologies can be incorporated into the New York Energy Market.

The participants in this endeavor must identify the specific forums that can overcome those barriers. The endeavor must take into account the various storage applications that could be deployed when considering economic options or regulatory action. When considering complex issues of transmission, the regulators, together with the energy storage industry and all stakeholders, need to develop an approach that is agreeable to all interested parties and that defines an achievable timeline for identifying barriers, the proceedings that will resolve those barriers, and the actions necessary to effect solutions.

It is clear that grid capacity in New York must be increased, particularly from upstate resources to downstate load centers. Since there are challenges to the development and implementation of new transmission, NY-BEST believes that energy storage options can support a broad range of generation resources, and will mitigate congestion when placed at strategic locations whether near downstate load centers, or near upstate renewable generation facilities (depending on purpose served). Further, long-term storage technologies can harness cheaper or renewable power from upstate during off-peak time periods, and dispatch stored energy during constrained high-peak periods. In addition, storage technologies would reduce the need to use downstate fossil fuel-fired, peaking generation facilities, which are costly to run, both financially (high marginal prices) and environmentally (emitting pollution, and in the most populous areas).

Most storage technologies are clean in nature, particularly when compared to aging fossil fuel-fired peaking facilities. By leveling the interplay between supply and load, the state can improve and manage capacity utilization. In sum, energy storage has numerous benefits over traditional transmission buildouts, will reduce system constraints, and will provide support to the New York system as it expands to include an increasing amount and diversity of renewable and non-renewable resources.

B. Expand diversity of power generation sources supplying downstate, encouraging development of utility-scale renewable energy generation

Successful deployment of utility-scale energy storage, specifically designed to integrate energy generated by renewable resources would not only be a significant step toward alleviating transmission constraints and solving related issues in New York State, but also would support a diverse mix of generation resources supplying power downstate, including utility-scale renewable generation. Energy generated from wind resources upstate, as well energy generated from rooftop solar facilities throughout the state, provide integration challenges that can be overcome with utility-scale storage. Once integration challenges are addressed successfully, additional renewable energy resources can be developed on former brownfield sites or offshore. Energy storage resources could be strategically located near these sites to facilitate delivery when needed to load centers. Development of these resources will foster local job creation—scientists and engineers,

construction and maintenance workers, installers, electricians and personnel in related industries.

Utility-scale energy storage alleviates variability of generation, which, from renewable energy resources, is often unpredictable. Variable generation, often with very fast ramp rates that can go from near zero up to full capacity in a matter of moments, presents significant operational issues (both as to generation levels and timing). For example, a cloudy day wrecks havoc for solar facilities and a significantly variable windy day wreaks havoc on wind facilities. At times of very rapid production increase or decline, storage resources can quickly be dispatched to moderate the impact on the grid

Additionally, energy storage technologies would enable utilities to provide improved ancillary services, such as frequency regulation, better integration of spinning reserves, and load-following services. Typical load and wind demand/production profiles are almost inverse, which can create oversupply and ramping challenges. Energy storage can even out these profiles. While generation from wind and solar resources seem complementary, in fact, when they are combined, they actually may make ramping more complicated. Energy storage capacity would provide the utility much needed flexibility to effectively balance intermittent nature of renewables. The flexible capacity nature of storage allows for load following. In fact, energy storage gives the utility the ability to automatically respond during intra-dispatch intervals to an ISO's control signal, and thus adjust output to maintain system frequency and tie line load with neighboring balancing area authorities.

Energy storage opportunities for integrating renewable resources in New York are presented by pumped hydro, compressed air, batteries, flywheels and other proven and emerging technologies. Compressed air energy and pumped hydro storage opportunities are dictated more by local geology and geography than technology. However, existing pumped hydro facilities can be expanded, and empty natural gas wells upstate can be developed, since they provide excellent sites for compressed air storage. Further, traditional and new battery technologies are being deployed and developed, and providing energy storage options that range from small uses to utility-scale.

Utility-scale storage can be developed if all the benefits can be recognized and delivered through a long-term contract , In order for a utility-scale project to be financially viable, the technology has to be proven; there has to be adequate and predictable cash flows from a creditworthy counterparty; and there have to be assurances of constructability and operability. In many cases, these criteria have been met—making for successful projects that are in service today. Clearly, for many applications the underlying agreements must be capacity-type usage contracts, specifically for power storage that is connected to a particular project. However, in order to have a utility-backed storage contract, there needs to be mechanisms in place that allow the utility to recover its investment in the power storage projects or contract, thus, the benefits of power storage could be captured in a Power Purchase Agreement, which are approved by the relevant regulators.

C. Assure long-term reliability of electric system is maintained in face of major system uncertainties

Over half of all of the electricity demand in New York State is concentrated in the Southeast region of the state, which includes Westchester County, New York City and Long Island. Much of the electricity generation in this region comes from aging fossil fuel-based plants, which face an uncertain economic and environmental future. Air pollution regulations may force closures of or costly upgrades to many of these plants. While renewable generation may provide a solution, the integration issues detailed above make it clear that the replacement of fossil fuel-fired

generation with renewable generation resources without adverse reliability impacts would be facilitated by implementation of storage technologies.

One significant solution is community energy storage opportunities in the form of microgrids. Microgrids, which provide an integrated energy system, or network consisting of distributed generation resources and multiple electrical loads operating as a single, autonomous grid, may be, in the near-term, the most economic way to solve many of the issues outlined above. Working either in parallel with, or independent of, the existing power grid, microgrids operate very much like a small vertically integrated electric utility. They can be used by municipalities, state or federal government buildings, hospitals, housing communities, multiple dwelling units, shopping centers, or any clusters of energy users. For example, microgrids are ideal for New York City co-ops or apartment complexes. Using technologies like fuel cells, microgrids also can be used to discharge power. They can provide regulation and dispatchable stored energy.

In addition to microgrids, energy storage can be used in a number of ways to enhance the efficiencies and reliability of existing downstate generation facilities, while reducing related pollution and environmental concerns. Since conventional fossil fuel-fired plants remain the majority of generation resources downstate, energy storage can work directly with these generation assets, enabling them to operate existing facilities in a more cost-effective manner. Optimizing existing baseload generation assets by supplementing them with energy storage can avoid the need for capital expenditures for assets that may require updating or capacity increases, and provides a higher level of service to consumers.

Large-scale energy storage facilities can supplement baseload generation, by providing power via long-duration discharges and low-cost ancillary services, such as load following and spinning reserves. Such energy storage facilities also can offset expensive, pollutant-emitting peak capacity generation located downstate, which generally are used during the hottest summer months when the air quality is likely to be bad. In this way, large-scale storage facilities would be used as system optimizers, rather than for generation replacement.

Energy storage would enable fossil fuel-fired generating facilities to generate power during off-peak hours and store the power for use during peak. Energy storage thus would be used to increase the economic efficiencies of fossil-fueled facilities. By reducing dispatch cycling costs and providing a capability to provide flexible products to sell in the wholesale power market, energy storage would allow facilities to produce more off-peak power, lower the fixed cost per unit output, and, in turn, improve the economic and environmental competitiveness of fossil fuel generation facilities.

ECONOMIC IMPACT AND JOB CREATION

The energy storage industry is widely recognized to create tens-of-thousands of new jobs over the next decade and New York State is well positioned to be a leader in this sector. NY-BEST engaged ECG Consulting Group Inc. to determine the potential economic impact of developing a vibrant, world-class, advanced battery & energy storage industry in New York State. To determine the impact, ECG 1) reviewed a broad range of market, regulatory and technology research to identify key trends, opportunities and market segment forecasts 2) interviewed more than 25 New York State companies and institutions in the battery & energy storage markets and 3) considered factors ranging from private company, government and university R&D capabilities to the potential impact of public policy decisions & incentives designed to help New York companies become more successful competitors in the global battery & energy storage markets.

The summary and key conclusions from this work include:

- New York State has an established base of industry and academia to grow this industry and our private, government and university R&D organizations perform world-leading research in battery & energy storage technologies.
- Electricity storage, with applications in residential, commercial (ranging from ice-based building energy storage to time-of-use and demand-side-management systems) and industrial markets and on the electricity grid, is an emerging energy storage market with major upside potential. It is potentially a $32 billion global market by 2020 and could exceed $93 billion by 2030.
- Transportation Energy Storage, with applications for batteries and chargers Light, Medium & Heavy Duty electric vehicles and hydraulic drive systems for large industrial vehicles, is also an emerging energy storage market with major upside potential. It is potentially a $34 billion global market by 2020 and could exceed $86 billion by 2030.
- In the Base Case, with incentives at their current levels, New York State companies and organizations could generate over $3.6 billion in global sales and over 14,000 jobs by 2020, and over $10.8 billion in global sales and 35,000 jobs by 2030.
- New York companies' level of success in these two key emerging "mega-markets" can be influenced by measures taken by New York State to help develop the industry, including:

    - Buy-down incentives—including adding energy storage targets to the New York State Renewable Portfolio Standard—to encourage broader deployment
    - Tax & economic development incentives to encourage R&D focused on lower cost & improved performance and siting of manufacturing in the State.
    - Establishment of 3rd party test & validation facilities
    - Enhancement of programs to encourage demonstration of energy storage technologies for residential, commercial and grid-connected applications on New York Utility & ISO grids
    - Changes in New York State Article X, to streamline siting non-emission producing new energy storage facilities
    - Changes in New York State Public Utility Regulations to allow and encourage the procurement of energy storage backed PPA's or the direct purchase of energy storage by all affected parties, including regulated T&D utilities and IPPs

- In the Optimistic Case, with New York implementing the key measures identified above to develop the State into a Center of Excellence for Energy Storage, a stronger and more vibrant industry could generate over $5.9 billion in sales and 22,000 jobs by 2020, and over $17 billion in sales and 56,000 jobs by 2030.

CONCLUSION

Robust and ample energy storage will be critical to a smooth ride on the Energy Highway. Energy storage will help to cost effectively and reliably alleviate capacity constraints on the New York system, will complement and facilitate the development of alternative and renewable resources, and will modernize and make stronger the New York system. To get there, New York State should encourage energy storage and consider energy storage solutions when addressing transmission and generation needs. In addition, New York State should implement the recommendations outlined above, and create a cohesive regulatory framework that fosters a cost-

recovery strategy. Such a strategy would take into account evaluation methods, operational needs, the evolving energy market, price signals (in both the wholesale and retail markets), and commercial needs of developers and other market participants.

Because energy storage produces no emissions, is easy to site, and systems are commercially available, these new alternatives can be implemented faster than conventional approaches. Broad scale adoption of energy storage in New York State will not only deliver energy and environmental benefits, but establishing the State as a leader in this industry will create vast economic benefits for all New Yorkers.