New York Battery and Energy Storage Technology Consortium, Inc.

VIA ELECTRONIC FILING

December 5, 2014

Hon. Kathleen H. Burgess
Secretary to the Commission
New York State Public Service Commission
Empire State Plaza, Agency Building 3
Albany, New York 12223-1350

Re: NY-BEST Comments on Draft Generic Environmental Impact Statement

Case 14-M-0101–Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision

Case 14-M-0094-Proceeding on Motion of the Commission to Consider a Clean Energy Fund

Dear Secretary Burgess:

On behalf of the New York Battery and Energy Storage Technology Consortium ("NY-BEST") please find enclosed for filing with the New York State Public Service Commission, our comments on the Draft Generic Environmental Impact Statement issued by the Commission on October 24, 2014 in relation to the "Reforming the Energy Vision" (REV) program and establishing a Clean Energy Fund. NY-BEST and our 140 member organizations from across New York State and beyond appreciate the opportunity to provide these comments on behalf of the energy storage industry. The opinions stated in this filing represent the views of NY-BEST, not necessarily the views of any individual member of the association.

We stand ready to assist the DPS staff and PSC in ensuring the energy storage is appropriately evaluated for its environmental benefits and positive electric grid system impacts in the context of the REV and Clean Energy Fund programs.

INTRODUCTION

The New York Battery and Energy Storage Technology Consortium ("NY-BEST") is a not-for-profit industry trade association that serves as the voice of the industry for over 140 member organizations on matters related to advanced batteries and energy storage technologies. Our membership covers the full span of activities related to research, development, production and deployment of energy storage devices, and currently includes technology developers ranging in size from small start-up companies to global leaders such as General Electric, leading research institutions and universities, Brookhaven National Lab and numerous companies involved in the electricity and transportation sectors.

Our mission is to catalyze and grow the energy storage industry and establish New York State as a global leader in energy storage. We do this by:

(1) Acting as an authoritative resource on energy storage, proactively communicating energy storage related news and information, and facilitating connections amongst stakeholders;
(2) Advancing and accelerating the commercialization process for energy storage technologies, from research and development, to products and widespread deployment;
(3) Educating policymakers and stakeholders about energy storage and advocating on behalf of the energy storage industry; and
(4) Promoting New York's world-class intellectual and manufacturing capabilities and providing access to markets to grow the energy storage industry in New York.

As we have stated previously in comments to the Commission on the REV proceeding, NY-BEST is supportive of the overall goals of REV and the creation of a Clean Energy Fund. We believe that energy storage can and should play a significant role in achieving the goals of REV.

NY-BEST COMMENTS ON DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT (DGEIS)

NY-BEST has several serious concerns with the Draft Generic Environmental Impact Statement especially as it relates to the assessment of energy storage, its role on the grid and its environmental impacts. These concerns are explained in more detail below. Our comments provide information from reputable sources and studies which attest to the environmental and electricity grid system benefits associated with energy storage technologies and we encourage the Commission to incorporate this additional information in the Final GEIS.

The Role for Energy Storage on the Grid

The DGEIS fails to recognize that energy storage is a unique resource that is able to provide many benefits across a broad spectrum of applications, as well as throughout the grid. Energy storage mediates between variable sources and variable loads. Without storage, energy generation must constantly be equal to energy consumption. Energy storage works by moving energy through time and location. Energy generated at one time can be used at another time through storage.[1] Storing energy creates system-wide benefits for the electricity grid, building greater efficiency, smoothing demand and optimizing grid performance.

As the State seeks new ways to reduce carbon emissions, energy storage will play an important role in increasing efficiency of existing electric generating units, reducing the need for new generation, providing distributed energy and supporting the integration of additional renewable energy sources.

Energy storage technologies provide a variety of solutions with different technologies being utilized to meet quantity, quality, and operational needs. These varied applications also provide different combinations of benefits and value streams.

In addition, energy storage technologies produce no new emissions and are able to provide services to the grid when and where they are needed. Energy storage deployments cross over asset classes in that benefits can be realized across the transmission, generation, distribution, and/or behind-the-meter (demand/end-use) portions of the electricity system. In fact, it is precisely all of these attributes that give energy storage its strengths and ability to provide flexibility to grid operations across a wide range of applications. Key characteristics of energy storage resources include not only their total capacity but also

[1] Abbas A. Akhil, et.al., *DOE/EPRI Energy Storage Handbook 2013*, July 2013

include their response times, ramp rates and flexible operating range. The applications and benefits of storage are numerous and broad, including:

- Bulk energy services
    - Peak capacity, off-to-on-peak energy time shifting and firming, on-peak intermittent energy smoothing and shaping and load following
- Management of ramping requirements
    - Resulting from variable output generation from wind and solar
- Ancillary services
    - Frequency regulation, reactive power and voltage support, reserves (spinning, non-spinning, supplemental), black start
- Transmission and distribution infrastructure
    - Congestion relief, upgrade deferral, minimization of line losses, voltage support, resiliency, transportable distribution-level overload mitigation, peak load shifting downstream of distribution system, variable distributed generation integration, microgrid formation
- Customer energy management
    - Power quality, reliability, resiliency, demand-charge management and retail time and price shifting, variable generation integration/back-up power/UPS[2]

The DGEIS does not currently recognize the attributes and applications of energy storage technologies and the important role energy storage plays in increasing grid efficiency. NY-BEST urges PSC to incorporate these various energy storage applications, attributes and benefits in the Final GEIS.

Environmental Impact of Energy Storage

Importantly, environmental issues related to energy storage are both *site-specific* and *technology-specific.* [3] However, in several places, the DGEIS groups all types of energy storage together, asserts that energy storage has negative environmental impacts and fails

[2] Ibid.

[3] Ibid.

to recognize energy storage's strong role in reducing greenhouse gas and criteria air pollutants. (DGEIS pp. ES-5, ES-6, 4-5, 5-14).

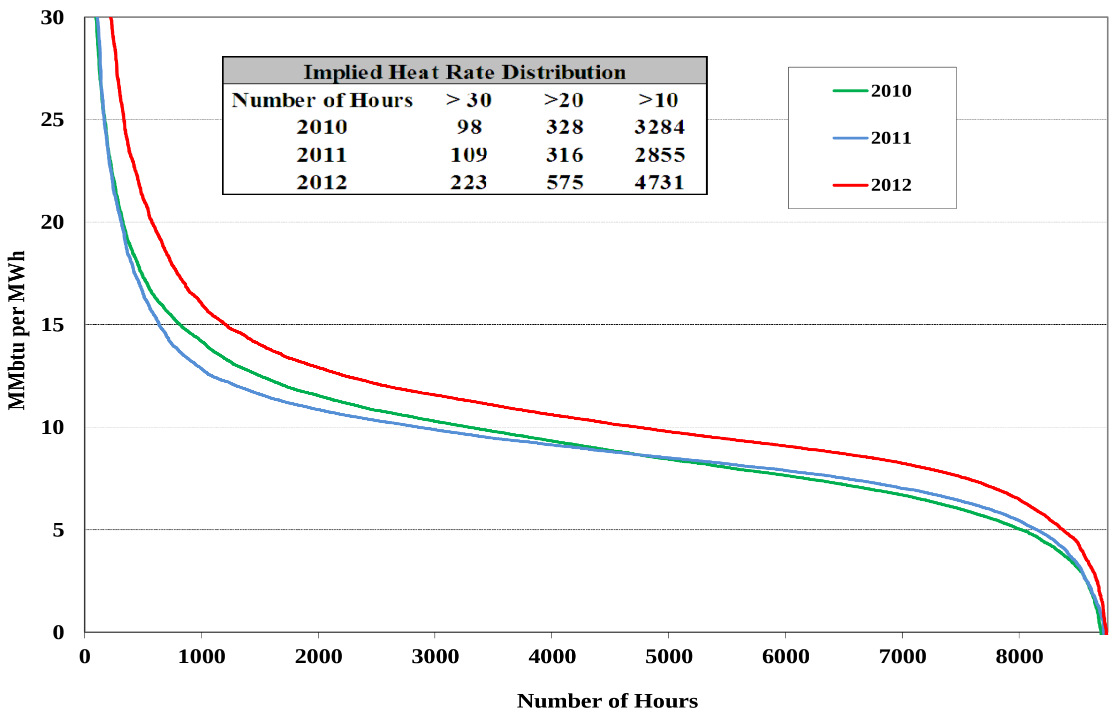
Notably, the DGEIS states that an energy storage system will add to greenhouse gas emissions because it is a net consumer of electricity. As a general assertion, this is incorrect.

To properly evaluate the impact of energy storage on greenhouse gas and criteria air pollutants emissions, it is critical to take into account the emissions associated with the energy used to charge the storage system and the emissions associated with the energy that the system's output displaces. The efficiency of electricity generation, and the emissions associated with the generation, can vary significantly both with the generating source and with the overall load on the electricity grid.

Figure A-6 below shows the implied heat rate duration curves for New York State for 2010 to 2012. The heat rate is a measure of the amount of energy that is consumed to produce a unit of electricity and is measured in MMbtu/MWh. Higher heat rate means more fuel is consumed and the system is less efficient. The implied marginal heat rate equals the day-ahead electricity price divided by the natural gas price and shows which generation assets will be on the margin. As can be seen in Figure A-6, for more than half of the hours in a given year the implied marginal heat rate is less than 10 MMbtu/MWh. For a few hundred hours per year the implied marginal heat rate is greater than 20 MMbtu/MWh.

The disparity in marginal heat rate is even greater for regions with greater peak capacity requirements relying to a greater extent on inefficient peaker plants. The New York City region has an implied marginal heat rate of over 20 MMbtu/MWh for 608 hours. Long Island has an implied marginal heat rate of over 20 MMbtu/MWh for 904 hours.

Figure A-6: Implied Heat Rate Duration Curves for New York State
2010-2012



An energy storage system that is charging from a low heat rate generation source and is discharging and displacing electricity from a high heat rate source will reduce fuel consumption and overall emissions, even if it has a relatively low round trip efficiency. For the majority of energy storage applications, the difference in heat rate is significant and positive for the storage device. In considering the emissions impact, it is also important to recognize that, beyond simply consuming more fuel, the very high heat rate plants running at peak consumption times when the energy storage is discharging are higher emitting facilities.

Grid storage displaces less efficient, dirtier peaker generation by time-shifting more efficient, cleaner base-load generation to peak periods. Studies completed in California and elsewhere have shown that this results in substantial system-wide air quality and greenhouse gas emissions benefits.[4]

According to industry analyses completed by AES Energy Storage, energy storage is gaining broad use as a capacity resource and is cost competitive with new simple-cycle combustion turbines (peakers).[5] Unlike peakers, energy storage can provide low- or zero-emissions generation during peak demand by discharging energy stored from efficient natural gas combined cycle (NGCC) plants, nuclear or renewable generators.

Energy storage uses electricity as a fuel source and has proven efficiencies greater than 90%. If NGCC units that currently turn down or cycle-off overnight are used to charge energy storage, the emissions reduction impact would be 33%, including losses associated with charging and discharging. [6] The first table below illustrates the difference in emissions rates for an efficient NGCC plant and a simple-cycle combustion turbine. The second table shows the reduction in emissions from replacing one MWh of electricity from a peaking plant with the equivalent amount of electricity from energy storage, charged using a NGCC plant.

---

[4] Janice Lin and Giovanni Damato, Strategen Consulting on behalf of California Energy Storage Association, *Energy Storage: A Cheaper Cleaner Alternative to Natural Gas-fired Peaker Plants*, February 2011. http://www.storagealliance.org/sites/default/files/White%20Papers/CESA_Peaker_White_Paper_2011-02-08.pdf

[5] AES Energy Comments to US EPA Clean Power Plan Proposed Rule, EPA Docket ID: OAR-2013-0602

[6] Ibid.

Emissions Rate (lbs/MWh)

	NO_x	CO_2
NGCC	1.0	825
Simple-Cycle	1.6	1365

An energy storage system with a 90% round-trip efficiency would require 1.11 MWh of energy provided from a NGCC to replace 1.0 MWh of energy from a simple-cycle combustion turbine, but still creates a 33% emissions reduction compared to using the peaker. This emissions reduction would be even greater if compared to the older fleet of combustion turbines that exist in New York City and Long Island today.

Emissions (lbs)	NO_x	CO_2
Charge (NGCC)	1.1	916
Discharge (Simple Cycle, avoided)	(1.6)	(1365)
Reduction	(0.5)	(449)
% Reduction	-33 %	-33%

Additionally, the aging electric grid relies on large thermal plants with low ramp rates and a limited amount of energy storage via pumped-hydro. Significant environmental benefits and consumer savings can be achieved by using energy storage to create system-wide efficiency through re-dispatch of units.

A Sandia National Laboratory report, which studied the addition of energy storage on Maui, noted that it created significant customer savings and emission reductions by improving island-wide fuel efficiency.[7] The study found that the utility would be able to turn off the least efficient plants, improve heat rates on the most efficient plants, and reduce the number of generators running at sub-optimal levels. The same optimization opportunity exists on a larger scale in New York and can help the State achieve its emissions reduction goals.

[7] James Ellison, Dhruv Bhatnagar, and Benjamin Karlson for Sandia National Lab, *Maui Energy Storage Study, December 2012*

DGEIS Summary Chart of Environmental Impacts

NY-BEST is also very concerned with the portrayal of the environmental impact of energy storage in Exhibit ES-3 and Exhibit 5-6 “Summary of Environmental Impact by Technology and Resource Area” of the DGEIS. By grouping all energy storage technologies, including pumped hydro into the same category, energy storage is erroneously portrayed as having negative environmental impacts in several categories. We strongly encourage the Commission to separate pumped hydro from other energy storage technologies and reflect their potential impacts separately.

Further, we would note that impacts associated with non-pumped hydro energy storage technologies should be reflected on the chart as negligible, especially in relation to water use and greenhouse gas emissions. Notably, the DGEIS related to the Indian Point Contingency Plan developed by the PSC in July of 2013, asserted that, for battery energy storage, “cumulative impacts would be negligible” based on geographic location and avoided impact on urban and residential communities.[8]

Also, an Environmental Impact Assessment was performed on a battery-based energy storage project in Johnson City, New York, as part of the New York State Environmental Quality Review (SEQR) process. The 20 MW energy storage system utilizing advanced battery technology was reviewed and found to “not have a significant impact on the environment” and was given a negative declaration pursuant to SEQRA.[9]

---

[8] Indian Point Contingency Plan Draft Generic Environmental Impact Statement”, New York State Public Service Commission, July 2013

[9] Please see: http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={B733662B-9B0E-4E8A-8074-CFAA496DA332}
http://www.townofunion.com/documents/PlanningBoardMinutes02-09-10.pdf

Benefits of Combining Energy Storage and Renewable Energy

Although the DGEIS briefly mentions the benefits of combining energy storage and renewables, it does not fully acknowledge the myriad of benefits arising from this pairing. We encourage the Commission to incorporate the following information in the Final DGEIS.

Energy storage is a fundamental component in addressing climate change due to its capacity to displace fossil-fueled peaking power plants and enable integration of renewables into the grid. Storage provides the flexibility to integrate renewables into the electric grid without consuming additional fossil fuels needed to meet the ramping requirements of renewable energy generation resources.

While generating resources can only inject power into the grid, energy storage provides the ability to either inject or absorb power, allowing variable resources to be used more efficiently and effectively. The fast response nature of some energy storage technologies can make them ideally suited to meet grid stability and reliability challenges as providers of grid support, or ancillary services.[10]

As the State implements aggressive renewable energy goals and increases the share of intermittent resources like solar and wind, one challenge will be maintaining grid reliability. Various studies indicate that grid system performance may degrade at certain levels of renewable penetration. [11]This increase in variability may require a substantial increase in ancillary services, specifically frequency regulation.

Energy storage is particularly suited to performing frequency regulation. Many energy storage technologies, such as flywheels and batteries, have extremely fast response rates. Maintaining grid stability and reliability requires balancing the output of generating units with demand. Frequency regulation maintains this balance through a rapid increase or decrease in output, matching generating power to load. These fast response rates also lead to higher regulation efficiency, meaning that a MW of energy storage is not equivalent to a

[10] Janice Lin, et.al. Strategen Consulting prepared for California Energy Storage Association, *Energy Storage—a Cheaper, Faster, & Cleaner Alternative to Conventional Frequency Regulation*, February 2011.

[11] Ibid.

MW of conventional generation. Some studies have indicated that a 100 MW energy storage system can be as effective as 200-300 MW of combustion turbine capacity dedicated to providing regulation services. [12]

Importantly, use of conventional resources not only requires more MWs to provide the same service, but will also result in more greenhouse gas emissions, as generation resources are forced to remain on-line to meet regulation requirements. As renewables are added to the grid, energy storage can maximize the value of those resources without compromising emissions reduction goals.

Within PJM, the largest grid operator in the U.S., energy storage has grown significantly to serve critical reliability needs. In a year of service, advanced battery storage displaced almost 50% of regulation services away from coal fired generation and allowed them to run at a more efficient set-point. Coal-fired electric generating units can run more efficiently and produce fewer CO_2 emissions when they are not ramping up and down on regulation. Energy storage installed in PJM by AES is estimated to reduce air emissions by 62,000 tons of CO_2.[13]

Energy storage can be used instead of natural gas generators to smooth out the variable output of renewable resources, such as wind or solar power, over long periods, and allow these resources to be scheduled according to daily fluctuations of electricity demand. For example, the use of Compressed Air Energy Storage (CAES) to smooth wind power generation would result in a 56 percent reduction in CO_2 emissions per kilowatt-hour of electricity, compared to smoothing variable wind power with generation from a gas turbine, and would enable a greater penetration of wind power. [14] Another recent study

[12] KEMA (2010). *Research Evaluation of Wind Generation, Solar Generation, and Storage Impact on the California Grid.* Prepared for the California Energy Commission, Public Interest Energy Research Program.

[13] Janice Lin, et.al. Strategen Consulting prepared for California Energy Storage Association, *Energy Storage—a Cheaper, Faster, & Cleaner Alternative to Conventional Frequency Regulation*, February 2011.

[14] Greenblatt, J. B., Succar, A., Denkenberger, D. C., Williams, R. H., and Socolow, R. H. 2007. "Baseload wind energy: modeling the competition between gas turbines and compressed air energy storage for supplemental generation." *Energy Policy.* 35: 1474–1492.

estimated that over the span of 20 years, a 20 MW flywheel facility could reduce CO_2 emissions from coal power plants by 67-89 percent[15], depending on the regional regulations and intended use of the coal power plant (whether it is for peak or base power generation). The flywheel plant would remove the need to have a coal power plant that could produce 20 MW of power to the grid, resulting in CO_2 emissions reduction.[16]

Energy Storage charged with electricity from low-carbon sources can also be used to displace fossil fuel generation to provide regulation services by smoothing out the fluctuations between supply and demand over short periods of time. This use of energy storage could reduce the amount of fossil fuels burned by generators, leading to GHG and conventional emission reductions.[17]

CONCLUSION

NY-BEST appreciates the opportunity to provide these comments and share additional information on the positive role of energy storage in REV and the Clean Energy Fund proceedings. We encourage the Commission to also consider the comments of the Energy Storage Association and particularly ESA's comments to the U.S. Environmental Protection Agency (EPA). US EPA on its draft 111(d) rule, Clean Power Plan, submitted to the Commission under separate cover. Those comments provide additional case studies and operational data in support of energy storage's positive impact on reducing greenhouse gas emissions, no matter the charging generation source and application on the grid.

[15] Emissions Comparison for a 20 MW Flywheel-based Frequency Regulation Power Plant. Beacon Power Corporation. January 8, 2007.

[16] Ibid.

[17] Pew Center on Global Climate Change Climate Tech Book, Electric Energy Storage, August 2011.

NY-BEST stands ready to assist DPS staff and the Commission as needed in providing additional information as the REV and Clean Energy Fund proceedings continue. Thank you for your consideration of these comments.

Respectfully submitted,

William P. Acker
Executive Director
NY-BEST
1450 Western Ave, Suite 101
Albany NY 12203