ELECTRONIC FILING
September 10, 2018
Secretary Kathleen Burgess
New York State Public Service Commission
Empire State Plaza, Agency Building 3
Albany NY 12223

RE: Case 18-3-0130: In the Matter of Energy Storage Deployment Program

Key Capture Energy (KCE) is an energy storage development company with a focus on utility-scale battery storage projects in the northeastern United States. We select project sites, secure all necessary permits, procure full battery systems and oversee construction to move battery storage projects into operation. KCE is starting construction on its first 20 MW project in New York in fall 2018 and has amassed a development portfolio of stand-alone energy storage projects ranging from 2-200 MWs in the state, ready for deployment starting in 2019.

KCE commends New York State Energy Research and Development Authority (NYSERDA) and the Department of Public Service (DPS) for the development of the Energy Storage Roadmap and for this stakeholder process. Our comments follow the outline of the Energy Storage Roadmap – Albany Technical Conference[1].

With often undefined and changing wholesale market revenues available for energy storage, there is an immediate need for the DPS to take action to encourage the growth of this industry. With unclear revenue streams, it is challenging to deploy development dollars.

Roadmap Analytics and Approach
The Energy Roadmap suggests a target of 1500 MWs for 2025, with a specific focus broken into long, medium long, medium short, and short projects by MW and MWh. KCE appreciates the work that went into this analysis to determine the best results for New York ratepayers, but cautions that while the analysis shows these results now, that a rapidly changing electric grid will shift these numbers (both by NYISO Zone as well as duration).

For instance, while six-hour batteries may be the most appealing from a ISO perspective, at this time the cost of battery cells is likely cost-prohibitive. With declines in battery cell costs, it may be financially viable to construct today a two-hour battery in a specific location, with the expectation of increasing the project duration to a six-hour battery in a later year as battery cell costs decrease and energy storage revenues become more defined.

The energy storage framework needs to have the flexibility for scenarios like this, and while they should nudge developers towards high-value areas for the grid (such as New York Zone J), there should not be mandates per zone or per duration.

[1] NYS Energy Storage Roadmap – Albany Technical Conference. August 21, 2018. NYSERDA / DPS

Recommendations:

1. Define the 1500 MWs by 2025 and 2795 MWs by 2030 as a target floor and not a target ceiling.
2. NYSERDA to commit to re-evaluating the optimal energy storage power and energy by zone every two years to accommodate a rapidly changing electric grid.
3. Incentivize projects that can get in the ground in 2019, regardless of battery duration; projects can always start with a short duration (30 minutes) and scale up to a long duration (6 hours) as battery cell prices continue to decrease and the wholesale market begins to value longer duration storage.
4. There to not be a mandate by zone or resource type, but rather be a mandate for the entire state.

Retail Rate Actions and Load Management Programs

KCE encourages the allowance of stand-alone energy storage as part of the Value of Distributed Energy Resources (VDER) process. KCE sees this as allowing for revenue certainty on sub-5 MW projects in the state in areas in which more generation/load is necessary.

Recommendations for VDER values for stand-alone energy storage projects:

1. **Energy Value**
   It should be clear that storage will receive the nodal and not the zonal price for both charging and discharging as a VDER project.
2. **Capacity Value**
   With a long NYISO Class-Year interconnection process, defining a capacity value for energy storage ensures that these projects can be profitable more quickly. KCE encourages the state to consider 4 hours as the amount for full credit, and for any lower duration project to be partially eligible for this credit (such as a 2-hour battery gets 50% of capacity value)
3. **Environmental Value**
   Projects should clearly be awarded two streams of environmental credits: one for overall GHG emission reduction (based on marginal emissions of off-peak versus peak hours) and localized emissions based on NOx/SOx for those projects in environmental justice areas. Suggested methodology for this credit is in our Market Bridge Incentive Structure below.
4. **Distribution Value (Market-Transition Credit)**
   With battery storage able to enable significantly more distributed energy resources (specifically community or residential solar), this should be locked in for 7 years to ensure the ability to finance the project.
5. **High Value Distribution (LSRV)**
   The initial tranches of high value distribution projects were quickly used by the eligible community solar technologies. Each utility should define a separate tranche of high value locations for energy storage to aid developers in selecting locations.

Investor Owned Utility Roles and Non-Wires Alternatives (NWA)

KCE looks for guaranteed revenues for our projects such that we can get project financing, and services agreements with the utilities for specific Transmission & Distribution deferral is beneficial for both ratepayers and for owners/operators of the battery.

KCE encourages the state to continue to define the value attributes that are needed by the utilities and for them to contract for just those value attributes, allowing for the owner of the project to optimize the rest of the revenues in the wholesale markets. For instance, a recent NWA solicitation was for load-reduction on a substation during summer peak hours; this is a very clear solicitation to which we can propose the best solutions.

Recommendations for NWA processes:

1. Always define the expected costs of the wired alternative so the developer knows if we are in the same ball-park on price.
2. Have each utility publish transparent calculation of the benefits and the costs (for instance, the ConEd BCA Handbook[2]).
3. Require each utility to create a Benefit Cost Analysis spreadsheet that developers can use to see how their project's Services Agreement compares.
4. Include a mandatory extension option for year the end of life of the contract.
5. Clearly define that a project's interconnection will exist after the Services Agreement ends.
6. Have very clear credit and liquidated damages requirements in the original RFP such that the developer knows in advance if the project can be financed.
7. Inform developers of projects that are not selected of the final rationale, including any specific reasons why those projects were not selected
8. Clearly delineate that the developer retains all future revenue streams in the wholesale and environmental markets

"Clean Peak" Actions

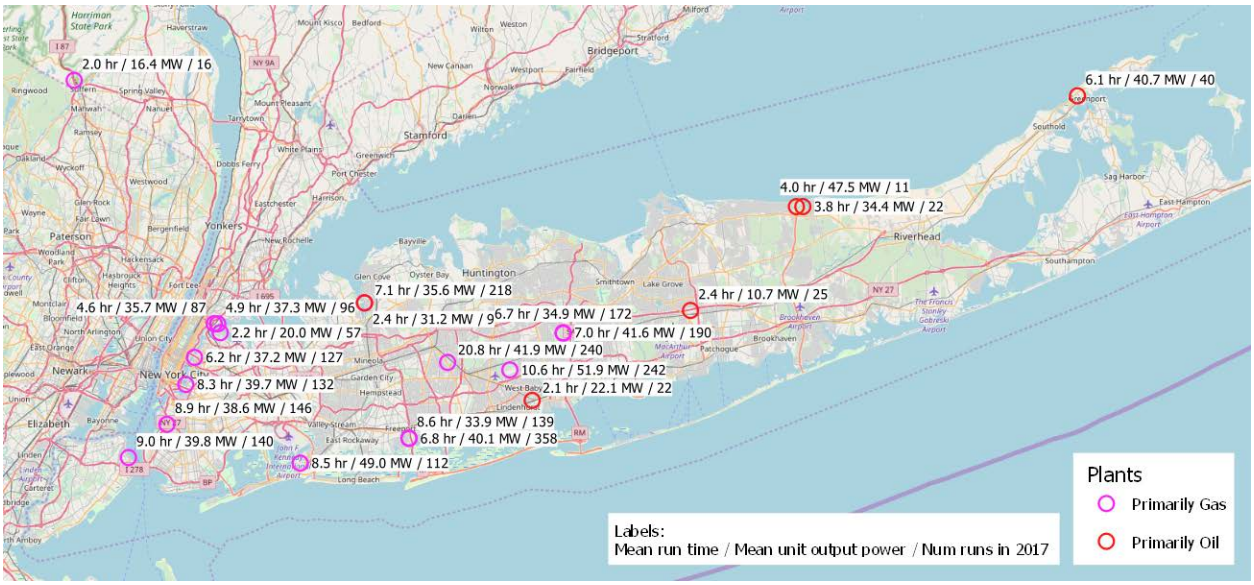
Local environmental impacts of legacy fossil fuel plants, especially in environmental justice areas, continue to have an ongoing impact. While DEC has "peaking unit contingency plan" with initial results due by July 2019, the challenge will be for NYISO to become comfortable with energy storage systems to provide alternatives to the existing high emission plants.

KCE evaluated appendix H of the Energy Storage Roadmap, and has identified peaking plants with the highest CO2/NOx/SOx/sulfur emissions. Some of these have many short peaks – which typically lead to higher GHG emissions as:

1. Plant efficiencies decrease when they are operated below design load.
2. Emission controls fail when plants are fired up and turned off.

Using publicly available data, the below indicates the gas and oil peakers down-state where nearby energy storage systems could provide alternatives.

[2] https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/coned-bcah.pdf?la=en



There is no value to the market to subsidize owners of fossil fuel plants, which would occur if NYSERDA, DPS, DEC, ConEd, LIPA, NYISO and plant owners identify how to "hybridize, repower, or replace" with storage existing fossil fuel plants, and instead a process should be created to open up competition for solutions with battery storage and other technologies.

Recommendations:

1. NYSERDA should Identify the highest local GHG emitting facilities in high population areas.
2. Incentivize via the Market Bridge Incentives how to get batteries in the areas identified.
3. Put specific environmental values for CO2, NOx, SOx, and sulfur emissions for any battery that is within 2 miles of these systems, and tie the specific environmental values to the current output of those facilities.

For instance, connecting a 50 MW/300 MWh battery to the same node as Plant A on Long Island would have offset about 15,000 tons of CO2 in 2017 by discharging when Plant A would have otherwise run, and charging during the cleaner hours between 2 and 8 AM (assuming marginal emissions = average emissions at that time). Using a full cost of carbon of $58/ton[3], such a battery would be compensated $870,000. Actual carbon offsets could be determined by simulating how much of the previous 3 years' generation by Plant A could have been technically replaced by a battery, and calculating the difference between the plant's CO2 emissions rate per MWh and the NYISO's marginal emissions rate when the battery would have been charging. This would produce a tons CO2 per MWh figure specific to that battery at that location, which would be applied to future throughput.

For NOx, SOx, and other more localized pollutants, KCE recommends a robust assessment of the environmental impacts of these, and for the state to provide an adder provided the energy storage project is within 2 miles of the fossil fuel plant.

[3] *Pricing Carbon into NYISO's Wholesale Energy Market to Support New York's Decarbonization Goals*. The Brattle Group, 10 Aug 2017.

Market Acceleration Bridge Incentive Design and Implementation

KCE encourages NYSERDA to focus Market Acceleration Bridge Incentives on getting projects on the grid in 2019. The early projects are the ones that have the highest soft costs (as going through tax / interconnection / land / permitting processes with new technologies have additional costs and timelines) and will be the ones that help bring down soft costs. Much like a Renewable Energy Credit is the delta between the expected wholesale market prices and what it takes to get a project financed, a Storage Credit (SC) should be created to bridge this gap. As energy storage has flexible use cases and can participate in a variety of ways in the wholesale market, the SC should not be aligned to a specific use case, but rather should be the $/kw-year necessary to bridge the gap between a profitable project and a marginal one – allowing the former to get built.

Much like the original NYSERDA solicitations allowed for 10-year REC contracts that were able to get wind farms built in the state, the SC should be for 7-10 year contracts to allow for guaranteed revenues that allow for project debt providers to contract, lowering the costs of battery storage.

Recommendation: Any Energy Storage Project that achieves COD after January 1, 2019 should be eligible for Market Bridge Incentives

As a developer with late-stage energy storage development projects, KCE should not be penalized if we bring online a commercial project before the Energy Storage Roadmap proceeding has finished. Any project that achieves COD after January 1, 2019, should be eligible for these market bridge incentives.

Recommendation: Market Bridge Incentives should be front-loaded

The market bridge incentives seek to promote short-term deployments in order to build a self-sustaining market for the future and accelerate the decreasing cost curves of the technology. The incentives should be distributed primarily within the first years of the program, with the value decreasing yearly. The rate of the awarded incentives should follow the decreasing cost trends of technology and deployment of the energy storage systems as they grow increasingly more competitive. With expected cost reductions (both through CapEx economies of scale as well as the learning-by-doing soft cost reductions), the value to the grid over time continues to increase.

To get the first tranche of projects online, KCE recommends that NYSERDA incentivizes the market bridge on a $/kW basis in 2019. In 2020 it should switch to a $/kWh basis to encourage longer duration batteries.

Recommendation for NYSERDA Market Bridge Incentives:

KCE proposes that NYSERDA uses the following schedule for the SC:

1. 2019 projects: 100% $/kw-year per **kW** of new installed capacity for ten years
2. 2020 projects: 100% of $/kw-year per **kWh** of new installed capacity for ten years
3. 2021-2022 projects: 50% of $/kw-year per **kWh** of new installed capacity for ten years

Some sample amounts could be:

Project Size		New Project Installed In:				Market Bridge Incentive / Year ($MM)		
MW	MWh	2019	2020	2021		2019	2020	2021
		($/KW)	($/kWh)	($/kWh)				
20	**10**	$ 50.0	$ 50.0	$ 25.0		$ 1,000,000	$ 500,000	$ 250,000
20	**20**	$ 50.0	$ 50.0	$ 25.0		$ 1,000,000	$ 1,000,000	$ 500,000
20	**40**	$ 50.0	$ 50.0	$ 25.0		$ 1,000,000	$ 2,000,000	$ 1,000,000
20	**80**	$ 50.0	$ 50.0	$ 25.0		$ 1,000,000	$ 4,000,000	$ 2,000,000
20	**120**	$ 50.0	$ 50.0	$ 25.0		$ 1,000,000	$ 6,000,000	$ 3,000,000

By front-loading the payments now, NYSERDA will allow for the soft cost reductions and for all parties, from the ISO to the utilities to local jurisdictions to regulators, to understand storage and how it will play a part in the future.

Recommendation: The majority of bridge incentives should be used for stand-alone energy storage.

While the awards from the program should be given to both standalone storage systems and those paired with renewables, the majority of the incentives should be reserved for standalone projects, as there are other incentives designed for combined renewables+storage. For instance, paired solar and storage allows for the storage portion to receive the 30% federal Investment Tax Credit[4], and storage paired with onshore wind, offshore wind, and solar are all eligible for the NYSERDA Large-Scale Renewables Requests for Proposals[5].

Stand-alone storage allows for use-cases such as T&D deferral, peaker replacements in urban areas, and electricity congestion reduction – which renewables+storage are unable to provide, especially closer to NYC as there is a lack of space suitable for large-scale clean energy projects.

Recommendation: Market Bridge Incentives should be fixed, decreasing, and correspond to specific values that energy storage is not getting credited for in the wholesale market.

To ensure that the market bridge incentives are distributed fairly, they should be awarded based on the values the systems provide to the grid. Many of these benefits can be quantified:

Environmental Benefits:
Analyzing the projects based on emissions reductions will also capture additional benefits from the storage systems, including raising the efficiencies of other generators and alleviating the need for expensive and inefficient fossil fuel peaker plants. Therefore, awarding adders for the energy storage projects that are proportional to the emissions reductions will give a non-biased method for distributing the market bridge incentives. Stakeholders have previously raised concerns around the viability of mechanisms for monetizing energy storage benefits, citing issues including reduced emissions beyond carbon and reduced renewable curtailment (pg. 49). However, allocating an adder based on the

[4] https://www.nrel.gov/docs/fy18osti/70384.pdf
[5] https://www.nyserda.ny.gov/All%20Programs/Programs/Clean%20Energy%20Standard/Renewable%20Generators%20and%20Developers/RES%20Tier%20One%20Eligibility/Solicitations%20for%20Long%20term%20Contracts

project's carbon dioxide emissions-equivalent reduction will encompass a broader range of emissions outside of solely carbon. It will also address the issue of capturing reduced renewable curtailment, as storage will shift the time renewable generation is used in order to lessen the need for fossil fuel peaker plants, therefore reducing emissions.

For example, Beacon Power in a 2015 report found CO_2 reductions of 214,129 tons/year for their 20 MW frequency regulation project in PJM, as the energy storage project displaced natural gas in the ancillary services market[6]. Through a study performed internally in KCE for the NYISO market, it was revealed that performing energy arbitrage, charging during off-peak and discharging on-peak, a 20MW/40MWh battery is able to relieve 249.6 lbs-NO_x/yr, 720.2 lbs-SO_2/yr, and 890.2 tons-CO_2/yr. This is due to moving energy from when the majority of wind coming online in the evenings and low demand, where low capacity-factor fossil-fueled peaker plants don't perform, to when those peaker plants do perform and when wind production is more limited.

The ability of storage to "arbitrage" pollutants will only increase with increasing levels of renewable generation. An LBNL study[7] simulated the hourly marginal carbon emissions in 2030 for a variety of renewables penetration scenarios. An analysis done by KCE on this data suggests that in a high-solar future (about 30%), an average difference of almost 800 lb CO2/MWh could be found between the most- polluting and least-polluting hours of the day. A 10 MW/10 MWh battery arbitraging this difference could reduce New York's carbon footprint by 1400-1500 tons annually.

Recommendation: Include Ratepayer Avoided Costs Benefits:

There are additional benefits of storage that accrue to the entire system as avoided costs:

(1) reduced operating reserve requirements;
(2) reduced start-up and shut-down costs of all generation facilities;
(3) improved heat-rate of thermal plants and consequently reduced emissions;
(4) reduced uneconomic dispatch decisions, in the form of uplift or revenue sufficiency guarantee payments;
(5) reduced curtailment of renewable resources;
(6) reduced risk of exposure to fuel price volatility; and
(7) reduced local emissions for areas with emissions restrictions.

For many of these benefits, the first deployments of storage will have the most benefits to the grid. Much like the first 100 MWs of solar at peak times had the largest impact on wholesale energy prices (compared to the 10th 100 MW of solar tranche), the first 100 MWs of storage will have the greatest impact on the overall grid pricing, and should be incentivized properly in the market bridge incentives.

New York can learn from many of the other efforts from across the country and globe to incentivize energy storage getting online:

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[6] Beacon Power. 2015 Final Technology Performance Report. Contract ID DE-OE-0000200

[7] J. Seel et. al. *Impacts of High Variable Renewable Energy Futures on Wholesale Electricity Prices, and on Electric-Sector Decision Making*. Energy Analysis and Environmental Impacts Division, Lawrence Berkeley National Laboratory, May 2018.

California[8]: The Self-Generation Incentive Program (SGIP) is a financial incentive program with goals of greenhouse gas reduction, demand reductions and reduced consumer electricity purchases, improved electric system reliability through improved transmission and distribution system utilization, and market transformation for distributed energy resource technologies. 75% of the program's budget is reserved for energy storage technologies, with incentives on a $/MWh scale that decline in series of steps into which total energy storage funds are divided.

Maryland[9]: The Energy Storage Tax Credit Program, applying to residential and commercial taxpayers, is designed to encourage deployment of energy storage systems in Maryland. For Tax Year 2018, the Maryland Energy Administration awards energy storage tax credits which are defined as 30% of total installation costs up to a maximum of $5000 for a storage system installed at a residential property and $75000 for a storage system installed at a commercial property

Austria[10]: Beginning in March 2018, the Ministry of Economic Affairs set aside 6 million euros for the promotion of the inclusion of storage on new solar generation projects. The program provides a subsidy at a set €/kWh amount, and storage projects must meet a range of ratios of kWh of storage per kW of generation capacity installed to be eligible. The Ministry has also earmarked 6 million euros to continue the program in 2019.

South Korea[11]: The Ministry of Trade, Industry, and Energy provides an energy storage incentive for solar power plant operators in the form of additional points on the assessment of plants' renewable energy certificates (RECs). The program is aimed at encouraging local power operators to use large-scale batteries to efficiently distribute power, and the Ministry claims the program will create nearly $400 million in new demand for energy storage systems by 2020.

While other jurisdictions have focused on tax incentives, New York should continue to focus on very quantifiable numbers that align with the goals of the state. Key for the market-bridge incentives, NYSERDA should ensure that all 2019 projects are eligible for the market-bridge incentives. KCE has a near-term 20 MW project, and does not want to have to delay the start of the project until the rules are clear – creating an adverse incentive to moving a project from development into construction.

Recommendation: Create a "Storage Credit (SC)" for the missing money necessary to finance energy storage projects

KCE recommends for bulk storage that the Storage Credit (SC) created that does not impede participation in the wholesale market. To ensure that storage projects are located in the places in the market that create the most value, the SC should be uniform across NYISO – with the developers to site their projects in the areas with the highest wholesale values (corresponding to highest wholesale market needs). The clearest way to do this is to have a $/kW/year which effectively acts as a storage REC: this

[8] https://www.selfgenca.com/documents/handbook/2017
[9] http://energy.maryland.gov/business/Pages/EnergyStorage.aspx
[10] https://www.pv-magazine.com/2017/12/18/austria-announces-new-solar-and-storage-incentives-for-2018/
[11] http://english.yonhapnews.co.kr/business/2016/09/19/0501000000AEN20160919003600320.html

would allow for developers/operators to use the battery in the use cases with the highest wholesale values.

Recommendation: NYSERDA to include stand-alone energy storage as part of annual Large-Scale Renewable solicitations
Once there is a standard Storage Credit across NYISO, NYSERDA can then contract for this product in the same way as Large-Scale Renewables. Annual solicitations for predictable revenue streams provide developmental certainty.

Conclusion:
Energy storage will play a crucial role in helping New York meet its goals and continue to lead the energy transition by improving the efficiency of existing generators, increasing the amount of renewable energy sources into the electric grid (especially at the distribution level) and enabling the flexibility of these resources, as well as enhancing the overall reliability and resilience of the electric grid. As we continue to develop energy storage projects in New York, we look for strong state support in overcoming barriers to realizing value through these deployments, and consequently, for the grid itself.

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