Questions & Answers

Webinar: "An Introduction to Energy Storage for Virginia Localities"
December 10, 2020

Please see below for responses to Questions submitted via WebEx Q&A that were not answered during the webinar.

Topic: Land Development Considerations

1. *How much acreage on average is a 100 MW battery storage site? Or acre per MW consideration?*

Sam Lines' presentation (page 40 of the entire slide deck) notes that a 100MW/400MWh energy storage battery project (note: not a solar and battery storage project) takes up roughly 7 acres. A 100 MW solar project by comparison takes up at least 500 acres, likely more. Remember that energy storage must specify both power AND duration to gauge footprint, but assume 4hr systems in VA.

2. *I have heard of challenges in NYC around the heat generated by the actual storage equipment. Is that true? And if so, is the problem specific to NYC and the types of spaces that are available to storage? Or more importantly, will we have similar problems in VA?*

The primary safety consideration for battery storage plants is heat generation and subsequent fire risk. The technology used in NYC is identical to what would be used in VA. The consideration in NYC is around the density of the city and the opportunity that fire may have to spread to surrounding structures, so NYC has its own standards that surpass NFPA 855. Similar to datacenters/servers, the heat generated by the batteries is controlled by integrated HVAC systems and/or liquid cooling, and then large projects will also have fire suppression systems (using water and chemicals/clean agent) in case of emergencies. These issues are less of a concern in less dense areas where any potential thermal emergency can simply be contained within the site and not incur a risk of spreading to nearby buildings. The national fire code NFPA 855 specifies siting considerations (i.e., setbacks, fire suppression measures) to mitigate this risk.

Topic: Battery Technology/Safety/End of Life Issues

3. *Technology often seems to give rise to fear. Are there concerns, real or imagined, about health and safety effects of battery storage?*

Sam Lines' presentation has a couple of slides related to safety issues (page 42 of the slide deck) that includes National Fire Protection Agency (NFPA) standard 855 that governs the design and installation of battery storage systems. Other resources include the Fire Safety Protocol in battery energy storage fires available here. Degraded batteries are taken offsite during operations and at end of life to reuse/recycling and there are no leakage concerns given that the batteries are designed as a completely sealed cell much like a household battery with even more safety redundancies certified under the UL code.

In addition, Cliona Robb's presentation includes slides on fire safety (page 69 on the slide deck) that explains the research and technology advancement since a fire incident that took place in Arizona a year ago. Other comments from her remarks include useful safety procedures found from energy storage developer Fluence found on their website here. Local governments and communities want to consider fire suppression, ground fault detection, deflagration when considering buying a battery energy storage system.

4. *What are the disposal/ end of life issues/ challenges with the spent batteries?*

The Energy Storage Association has developed a Corporate Responsibility Initiative around end of life and recycling of lithium ion battery energy storage systems. This document includes decommissioning issues and how to recycle a used battery. Once a battery has been used it is designated as "universal waste", a hazardous waste category regulated by EPA. Rules require recordkeeping, labeling, and storage methods that keep material out of the environment, and they outline approved recycling or disposal pathways. After dismantling and removal from the site, the old batteries are transported to facilities for refurbishment, recycling, or disposal. Transport of batteries, whether new or used, is governed by U.S. Department of Transportation (DOT) regulations that treat batteries as "Class 9" miscellaneous hazardous material and specify packaging and materials containment to mitigate the risk of accidental activation or reaction of the batteries during transport.

5. *What does the recycling industry look like for spent batteries, in other words as the batteries get replaced where do they go and how developed is that end of life part of the industry?*

See answer above.

6. *I know this energy storage (battery storage) is a fairly new use especially in VA but are there any longer-term studies of environmental impacts with battery storage facilities. Battery degradation, soil contamination, fire risks, etc.?*

The industry is still quite young and so the data required to answer this question is still to be determined. However, the recyclability of battery energy storage facilities depends mostly on the type of chemistry used. Batteries manufactured by LG Chem and Samsung (NMC) have at least somewhat of a residual value for recycling purposes. So-called Lithium Iron Phosphate chemistries (LFP) do not have any residual value and need to be disposed of. These chemistries

are typically manufactured by Chinese firms. In general, however, these risks are somewhat in line with any other type of power equipment. (Think oil used in transformers, etc.…)

The key thing, however, is to have up to date building codes and regulations that address these issues. The NFPA 855 standard for fire safety is very important to address and be aware of prior to issuing permits for these facilities. I would strongly recommend reading the DNV GL report on the McMicken Battery Energy storage facility in Arizona, to fully understand the risks involved and required education for local fire departments.

The report can be found at this link: https://coaching.typepad.com/files/mcmicken.pdf

Topic: Financial Issues

7. *Are there any financial vehicles to support storage projects other than cap ex?*

Yes. There are a lot of ownership structures available for battery energy storage systems. Utilities typically spend capital on these types of assets and then recover the costs from customers. Developers finance these projects using tax credits (when paired with solar) or other market (merchant) and non-market (PPA) revenue streams.

8. *Until we get the issue of local taxation settled, I don't see why localities should be expected to be accommodating to this. I understand the benefits, but it is much easier to just say no to all of this until we get fair tax treatment.*

Taxation for solar projects was an iterative process, and taxation for storage will likely be one, too.

Topic: Administrative Issues/Commissions

9. *Are storage facilities are covered by the Uniform Statewide Building Code? Are permits or can permits even be issued? Small localities don't have staff/fire marshals on staff. The version of the NEC used in VA is set by the Uniform Statewide Building Code, currently it is the 2014, we will be going to the 2017 in the next few months.*

There is nothing that would prohibit a locality from issuing a building permit for storage so long as it goes through the appropriate AHJ for review - building/inspection. If not a city of town then at the county level.

10. *Why aren't fire departments/fire marshals included in the task force for energy storage?*

The General Assembly did not purposely neglect to include fire marshals or the fire departments in the task force but the point is received. This task force will be housed within the State Corporation Commission, which in the past has been welcoming to participation by all interested parties in its working groups.

Topic: Role of Investor-Owned Utility/Independent Power Producer

11. *Are Dominion's safety requirements for their RFP's for plant's they are owning? Or are they for 3rd parties that would own/operate the plants and sell the power to Dominion?*

Dominion's safety requirements may apply to projects that they own and operate as well as projects that are owned by third parties that have a contract with Dominion awarded through their most recent RFP. Projects may be proposed that do not intend to sell to, or contract with, Dominion. But some may, and those projects may be subject to Dominion's requirements. We emphasize that their internal requirements are not in line with national standards and would result in significantly smaller projects being constructed on a given piece of land. Conversations around their safety requirements, specifically their 25' spacing rule, are ongoing.

12. *Touch on how this is profitable to the energy storage developer. Do they get ROI for resale of power during peak demand?*

Energy Storage developers make their revenue through one or more out of several avenues:

- PJM capacity market
- Energy arbitrage - projects can buy and sell energy 24/7 through the PJM wholesale market and take advantage of differentials in locational prices.
- Ancillary services - projects can bid into PJM markets to provide frequency regulation and reserves
- Smaller projects may operate "behind-the-meter" and allow cooperative, municipal and commercial/industrial energy users to manage peak demand charges and energy purchases. Residential projects may take advantage of utility-specific programs related to demand management et al.
- Unlike utilities, third party storage developers do not get a guaranteed ROI for capital investments.

Topic: Miscellaneous

13. *We are seeing a rise in permit requests for a particular solar provider with a less than stellar track record of customer service, installation, etc... what's the best consumer programs to educate them on what to look for when considering solar providers?*

One of the best resources that may be useful to look at is provided by the NC Sustainable Energy Association called the NC Solar Consumer Guide but it is applicable to any solar development. Also, the Solar Energy Industries Association (SEIA) has developed a "solar business code" that outlines what good practices must include.

14. *If I were a large University and considering battery storage on my campus what would be the things to consider in my decision? Basically, how would you sell this?*

University campuses are great places to accelerate the transition to 100 percent renewable energy because they are major energy users and the commitments have large impacts. Campuses are also good test beds for innovative technology demonstration and they use students to educate them at every stage of that process. There are several ways campuses are making the transition to 100 percent renewable energy – reducing their energy consumption, obtaining their electricity from renewable sources, meeting heating/cooling and other building needs with renewable energy and transitioning the campus away from reliance on fossil fuels, including the move to electric vehicles. There is no reason not to add energy storage systems to the list of other technologies. As one example, California State University in 2011 installed what was then the largest battery storage project at a college campus and it reduced the university's electric energy costs by more than $3.3 million. The primary selling point for this is likely to be around managing the peak demand charges of the campus, as well as integrating renewable energy more effectively to meet renewables targets and allowing solar energy to contribute to resiliency efforts by providing energy when the grid is down.

15. *What is the panel's view of distributed storage to complement rooftop solar, such as for large energy users like data centers and cold storage facilities?*

Storage can be a great complement to distributed solar systems. The business case for that will depend a large part upon how any given end-users' tariffs are structured. Users with a variable load profile prone to intermittent and short-duration peaks are a great fit for storage to help manage demand charges.

Large energy users that have a very consistent and flat load profile like data centers and cold storage on their face would seem to have less of an economic value proposition for storage because their demand charges, which are typically set by their maximum demand at any point during a month, will be very difficult to mitigate using short-duration storage. But large logistics companies that have renewable energy goals are starting to procure storage as a way to better integrate renewables in real time and ensure that their load is being matched by renewable energy on an hour-by-hour basis, not simply on a yearly basis.