Energy Storage Opportunities in New York City

Delivering value, resiliency, and security for commercial electricity users and grid operators

New York City is one of the most energy-intensive urban environments in the world. The peak summer load of Con Edison's service territory (NYC and Westchester County) approaches 14 GW of demand—almost a quarter of the peak demand in all of California. In addition, while nearly 60 percent of the state's electricity is consumed in the New York City area, only 40 percent of it is generated there. This urban grid delivers energy primarily through an underground network, which makes managing and maintaining the system an expensive and challenging endeavor to continue to meet the rapidly growing peak load. As part of the solution—and as an alternative to building out traditional grid infrastructure, Con Edison and other utilities are looking at microgrids to cover peak loading (and improve load factor), optimize delivery systems, and make the grid more efficient and reliable.

The Birth of REV: The Grand Plan for New York's Electricity Grid

For the first 100 years or so, utilities had their revenues tied to how much electricity a customer used. Based on a longstanding regulatory model, the greater the usage, the greater the revenue (and utility earnings). Today's utility industry faces a long list of challenges—from aging infrastructure and stagnant demand growth to federal emissions standards and increased renewables penetration. But rather than tackle these issues separately, New York's Reforming the Energy Vision (REV) initiative seeks to solve one overarching problem at the root of all: The utility business model is not aligned with societal goals and the rapidly evolving electric grid that they oversee.

REV came about in direct response to the reality of climate change and the devastating impact of Hurricane Sandy. The state needed to develop a more resilient grid while determining ways to induce third-party renewable energy developers to engage in a new grid operating model. Building out renewable and other distributed energy resources at the edge of the grid could help resolve the loss of power during extended outages. But it would also solve another major need: meeting peak power demands on critical days.

Stacking the Deck of Benefits

The DEN.OS-managed energy storage system, which is also the first lithium-ion-based microgrid to be approved in the city, can provide multiple functions, including revenue-generating grid services:

- **BQDM Load Relief Compliance:** Called when the day-ahead forecast is projected to be 93% of the summer forecasted peak
- **Demand Charge Management:** Optimizes load management from the combined solar + fuel cell + building load + battery operations
- **Market Participation:** Based upon day-ahead hourly pricing
- **Resiliency:** Provides back-up power for critical facilities in the event of a grid outage

Revenue decoupling was a key to the solution. Utilities now have incentives to help customers use less energy. But with REV, instead of having utilities passively resist solar and other distributed energy resources, REV aims to align utilities' business objectives with societal goals and let them harness the full potential of technologies that have the potential to modernize and improve the grid.

The REV vision is to integrate distributed technologies into the grid to the point where they help manage the increasingly complex needs of New York's power systems. Thanks to REV, Con Edison has been empowered to solve the problem in a less traditional but far more cost-effective way: by making the grid more efficient, creating a new model for earning returns for shareholders.

Meeting Demand: Distributed Resources and 'Managed Inventory'

As loads grow over time, different networks become constrained. In Brooklyn and Queens, there are three networks served by the Brownsville substation that have reached their capacity and are expected to be stressed by 53 MW of additional load in the summer of 2018. This region is now the target of a comprehensive urban energy efficiency and load reduction plan called the Brooklyn-Queens Demand Management (BQDM) program.

The BQDM program presented a new way for New York-based utilities to think about how to design and operate grid infrastructure projects. Without initiatives like BQDM, the Brownsville substation would need a $1.2 billion upgrade to meet the stress created from the projected overload. Such a huge capital outlay is even more difficult to justify because overloading is predicted to occur, on average, on only four days during the summer cooling season.

Utilities have traditionally only had one way to earn a profit for their shareholders. To align the interests of ratepayers and utilities to ensure that we have a grid that can meet peak demand, utilities have been allowed to earn set returns on capital equipment deployed. Under this type of incentive structure, they have been encouraged to "build to meet the peak." Prior to the introduction of grid-connected energy storage and the wider deployment of solar PV and other distributed energy resources, the grid was a "just-in-time" inventory system.

Supply needed to match demand or the grid would become unstable. Energy flowed in one direction, from generation through transmission and local distribution to load. Today, as we introduce new distributed resources at the grid edge, we can balance supply and demand with a "managed inventory" method.

In Brownsville, the peak load growth was faster than anticipated and the urgency heightened. However, this section of the grid doesn't peak in the daytime, but rather from 8:00 pm to midnight, when most of the load served is residential and the summer peak is driven by air conditioning demand. In New York City, the boroughs outside of Manhattan have the best potential for distributed solar PV, but solar peaking production at noon doesn't solve the local system challenge of an evening peak. By coupling solar with energy storage, this renewable resource can be shifted to a time in the day when it provides the greatest value.

Leading the Market in New York City

For more than five years, Enel X has held the leadership position in behind-the-meter energy storage systems in New York City. Since our first installation at the Glenwood Management-owned Barclay Tower in 2012, we've deployed more than a dozen customer-sited projects that provide multiple services to save commercial users money and support the grid.

More recently, Enel X joined forces with L+M Development Partners, an owner-developer of mixed-income residential properties, and local utility Con Edison, to build the first load relief microgrid in the city's stressed electricity network. A distributed 400 kW solar PV system was installed at the 625-apartment Marcus Garvey Apartments complex, coupled with a fuel cell to help support some of the base-loading of a 3 MW peaking load.

A 300 kW / 1200 kWh battery storage system was also installed, controlled by Enel X's DEN.OS intelligent software, which manages this virtual power plant. The battery system stores solar energy during the midday period and returns it to reduce peak loads between 8:00 pm and midnight. On days when loading is not critical, the microgrid is used to reduce demand charges incurred based on Con Edison's delivery rate. If there is a grid outage, the apartment complex's management office and community center are powered by the microgrid to provide local resiliency.

A key aspect of the Marcus Garvey project is the ability of DEN.OS to ensure that the facility self-consumes the energy it generates, without exporting to the grid. That capability directly aligns with Con Ed requirements, which helped facilitate the interconnection and permitting process. This is one of many examples of how Enel X storage solutions optimize distributed energy assets, build revenue streams, ensure resiliency and deliver greater value for C&I users. And a key reason for our continued leadership in the New York City storage market.