Lincoln Park Grid Support Center

Supporting New York's Transition to Cleaner Energy

Grid Support vs. Generation:

To keep the lights on, we need power generators that put large amounts of electricity onto the grid and support services that provide small doses of electricity to balance and stabilize the flow of power. It's similar to how an airplane needs large wings to fly as well as smaller flaps to control its direction and lift.

The Lincoln Park grid support center is uniquely designed to provide support services, known in the industry as ancillary services[1], rather than just generating power onto the wholesale market. This means that the project will be much smaller than a typical power plant, will operate only when needed and can use batteries to meet many of the grid's reliability needs.

Most of the grid support services we use today are provided either by large coal or gas plants with extra capacity, or by smaller, inefficient gas "peaking" plants.

Supporting the Grid While Making Room for Wind and Solar

Current wind and solar technologies cannot provide grid support services because they can only generate electricity when the wind is blowing or the sun is shining. To deliver wind and solar power to consumers, grid operators need support services provided by some other type of generation. The Lincoln Park project provides support services without competing against renewables to sell power.

Large coal or gas plants cannot provide support services unless they are also generating power that competes with wind and solar. For example, large baseload plants can't shut down on windy nights, and smaller gas plants can't throttle down during the sunniest part of the day if they need to be quickly restarted when the sun goes down at night. The result is excess energy generation that can crowd out renewables and force wind and solar plants to curtail[2] their output.

The Lincoln Park project is different. It does not need to compete against low-cost wind and solar power and will provide services only when called upon. The project is designed to quickly shut down or start up to meet the demands of the grid.

Lower Emissions in a Small, Flexible Footprint

The Lincoln Park project is unique design that is an improvement on both combined cycle gas plants and peaking plants. Large, combined cycle gas plants generate electricity with the lowest overall relative emissions of any type of fossil fuel plant[3]. These plants use a combination of gas and steam turbines to efficiently generate electricity. The nature of this process requires combined cycle plants to be large (often 1,000 MW or more) and makes their operation relatively inflexible (often requiring several hours to start and shut down). Combined cycle power plants are expensive to build and need to generate power as much as possible to be financially viable.

Peaking plants generally use simple-cycle combustion turbines that produce electricity only from the mechanical energy of the combustion process (without exhaust heat recovery). These projects, while inexpensive to build, are usually smaller (often less than 100 MW), less efficient and have higher emissions[4] than combined cycle plants. These plants often only run during periods of very high demand and do not provide other ancillary services such as spinning reserves or frequency regulation. Like combined cycle projects, simple-cycle turbines need to run for a certain amount of time once started and often have recovery periods that prevent the turbines from restarting soon after they shut down. These requirements often mean that peaking plants continue running after they are needed and cannot restart if a second peak in demand develops soon after shutdown.

The Lincoln Park project uses a different type of generator; a pair of reciprocating engines combined with a battery system. This approach allows the project to have similar emissions to that of a large, inflexible, combined cycle project with much more flexibility and a smaller footprint. The use of batteries allows the project to provide regulation and reserve services without running the engines, and the fast start and stop times of the engine allow it to operate only for the precise amount of time required to meet peak demand.

	Combined Cycle	Simple Cycle	Lincoln Park Hybrid
Emissions	Low	High	Low
Typical Size (MW)	Large	Small	Small
Footprint (Acres)	Large	Small	Small
Water Consumption	High	Moderate	None
Flexibility	Low	Moderate	High
Energy Cost	Very Low	High	Low
Role	Baseload and Services	Peaking Only	Services & Peaking
Renewables	Competition	Supplement	Support & Supplement

Improving Battery Technology and Changing Market Rules

The Lincoln Park project will be one of the first in the country to combine reciprocating engine generators with batteries. Like a hybrid car, the batteries and engines will work together to reduce fuel consumption as they provide services to the grid. Batteries will often be used for the initial response to a call for services by the grid operator, and many times, the batteries will be able to provide the required services without the power from the engines. The engines will be used when longer-term power is called for by the grid operator.

In the future, battery technology may replace the need to use generators altogether, but the engines are necessary today to make the project reliable and successful. In addition, the footprint of a battery-only project with sufficient capacity to meet the grid requirements would require much more land than the current project. Projects like Lincoln Park represent an important step forward in the integration of battery storage to the grid and are a cleaner and smaller alternative to large coal and combined cycle gas plants. Deploying projects like Lincoln Park will help battery technology advance and will result in lower costs, higher energy density, and other battery improvements in the future.

In addition to required technology improvements and cost reductions, the energy market rules in New York need to be refined to fully allow batteries to participate and compete with traditional peaking plants and other resources. The New York grid operator (NYISO) and other state agencies have begun the process to change the market rules to allow for stand-alone battery projects to fully participate in the market, but the regulations may not be finalized for several years.

1. *These services include: Frequency Regulation (matching the second-to-second variation in electricity usage), Spinning Reserve (having the ability to quickly provide energy if a power plant or grid infrastructure unexpectedly goes offline), and Capacity/Peaking Power (the capability to generate when electricity usage is at its highest and most power plants are already operating at maximum capacity).*

2. *Curtailment of renewable generators often occurs when there is more energy generation than there is demand in a particular area. Many thermal plants are designed to operate around the clock (baseload) or start up in the morning and shutdown at night (intermediate) and cannot have their output reduced below a certain level. This forces the grid operator to require renewable generators to reduce their output even when there is sufficient wind or solar energy to otherwise allow them to generate more electricity.*

3. *The typical efficiency across the current fleet of combined cycle projects in New York is 45%. A new combined cycle plant, such as the Cricket Valley project under construction in Dutchess County, NY, typically has an efficiency of 48.5 to 50%. Source: 2016 State of the Market Report for the New York ISO Markets; May 2017 by the Market Monitoring Unit for the New York ISO.*

4. *Typical efficiency across the current fleet of peaking projects in New York is 23%. Source: 2016 State of the Market Report for the New York ISO Markets; May 2017 by the Market Monitoring Unit for the New York ISO.*