NYSERDA Research and Development

Helping innovative technologies in the **Electric Power Transmission and Distribution Sector come to life.**



In New York State, the electric transmission and distribution networks lose approximately 8 -10% of total electrical energy before even getting to the customer. Renewable and alternative energy solutions both centrally located and distributed are becoming a larger percentage of electricity production. Existing transmission lines have limits on how much electricity they can carry and are often called upon to deliver more. These are just a few of the technological changes and challenges facing those who operate the grid. By improving system monitoring and methods for the delivery of electricity, utilities can improve their efficiency and productivity, reduce the severity of unplanned outages, and give consumers more control over how they use electricity. NYSERDA, through

the Electrical Power Transmission and Distribution Smart Grid Program, helps support the development of advanced technologies that improve the reliability, efficiency, quality and overall performance of the electric power delivery system for users across New York State.

Finding Solutions

The goal of the Smart Grid Program is to collaborate on the development and deployment of a smart grid that accommodates a diverse supply of generation resources, enhances overall grid performance, and enables customers to reduce costs, energy consumption, and environmental impact. NYSERDA's Smart Grid Program has partnered with industry experts to focus on specific technology areas such as grid scale energy storage, transmission and distribution automation and management, renewable and distributed energy resource integration, advanced modeling and controls, and advanced sensors, devices and systems. NYSERDA works with entities such as the New York State Smart Grid Consortium to coordinate the efforts of key energy stakeholders towards the realization of the program goals.

NYSERDA also coordinates with other state and federal entities on transmission and distribution related research efforts. The program funds research studies, engineering studies, product development, and demonstration projects focused on smart grid initiatives that provide economic growth opportunities for many years to come.





Featured Example

Lower Cost Energy and Zero CO₂



As part of the Smart Grid Program, NYSERDA awarded \$2 million to Beacon Power, LLC towards the deployment of a 20 MW advanced flywheel-based energy storage system in Stephentown, NY. The facility provides the New York Independent System Operator with fast-response frequency regulation to help maintain balance between generation and load on the electric system of New York State. The Stephentown facility consists of 200 flywheels connected to the grid that can inject or absorb up to 20 MW. Individual flywheels, comprised of carbon fiber composite material and installed in underground concrete housings to mitigate noise and safety risk, can raise or lower frequency as needed in real-time. This technology has highly attractive performance attributes. low variable operating costs, and produces zero direct CO₂ greenhouse gas or other emissions.

What is the significance of this project? The electric power delivery system must maintain a frequency of 60 Hz to ensure a high level of reliability. Grid operators accomplish this by requiring generators to increase or decrease power output in response to frequency deviations on the grid. Not all generators can reliably operate in such a variable way, and generators that do so suffer a loss in efficiency and incur higher operating costs due to added fuel consumption and increased maintenance. Beacon's 20 MW plant has been designed to provide frequency regulation services by absorbing electricity from the grid when there is too much, and storing it as kinetic energy in a matrix of flywheel systems. When there is not enough power to meet demand, the flywheels inject energy back into the grid, thus helping to maintain proper electricity frequency. An additional benefit of the Beacon flywheel plant is to **support the integration of greater amounts of intermittent renewable power resources such as wind and solar.**

Learn more at nyserda.ny.gov

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise and funding to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce their reliance on fossil fuels. NYSERDA professionals work to protect our environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York since 1975.