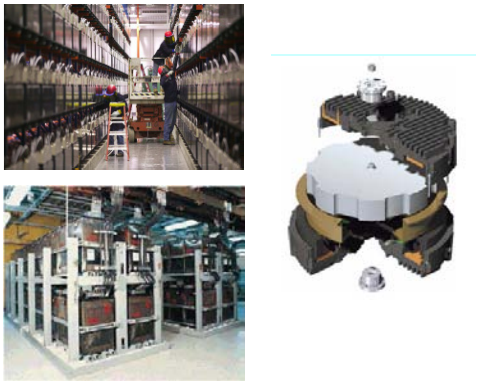
EPRI | ELECTRIC POWER RESEARCH INSTITUTE

NEW YORK INDEPENDENT SYSTEM OPERATOR

Transmission Efficiency Initiative: Host Demonstration Project

Use of Storage Technology for Improving System Utilization and Optimizing Operation of Renewable Resources



Energy storage technologies

- Demonstrate the benefits of different storage technologies to improve system utilization and reduce carbon emissions.
- Reduce wind generation curtailment
- Reduce carbon emissions by improving the operation of renewable resources
- Achieve less costly and more efficient regulation service

Project Objective

Electric system operators often must rely on reserves of conventional generation to meet changes in demand. Emerging technologies designed to store electricity can provide significant energy, economic, and environmental benefits.

Electric energy storage technologies come in many forms. Some energy storage facilities, such as conventional hydro-pump storage and compressed air energy storage, are designed to store the electric energy generated overnight when demand is low and release it during the peak hours of the day when demand is greater. Many of the newer storage technologies, such as batteries, flywheels, and supercapacitors, are designed to respond to second-by-second fluctuations in demand. This class of storage devices is known as *limited energy storage resources* (LESRs). The "limited" aspect of LESRs reflects the limited amount of time for which they can sustain energy output. The rapid response rate of LESRs makes this technology quite desirable for providing regulation service, which has traditionally been supplied by conventional hydroelectric and thermal units. The use of storage for services that require fast response helps to improve system efficiency while reducing the need to burn fossil fuels to provide this service.

Energy storage can increase the value and output of intermittent renewable resources such as wind and solar power by absorbing excess power for delivery when it is most needed. It can also help grid operators deal with the second-by-second variability of wind and solar by providing additional regulation service. Energy storage is also a highly effective means to manage transmission system congestion. At night, the combination of low demand and high levels of output from inflexible base-load facilities can result in transmission constraints that limit the ability of wind resources to deliver their output to the grid during certain hours. Suitably located storage facilities might be able to absorb wind power that would otherwise go unused and deliver that power when needed. The availability of the stored wind power during peak hours could offer lower-priced electricity and emission-free renewable power

The New York Independent System Operator (NYISO) recognizes that storage technology could complement the integration of amounts of renewable energy into the electric grid by creating a more robust, flexible, and reliable power system. However, as a provider of open access to the transmission system, the NYISO is technologically neutral and strives to facilitate the integration of all classes of resources

through the collaboration and consensus building provided by its shared governance process.

Market opportunities, combined with state and federal government funding for storage technology research, continue to enhance the prospect that energy storage resources will occupy a larger share of New York's resource mix in the future. Indeed, the growth of renewable resources, open access to the grid, competitive wholesale electricity markets in New York, and various public policy initiatives at the state and federal level have attracted the attention of energy storage resource developers. Both flywheels and large battery systems are in various stages of siting and construction in New York, and the NYISO expects that more companies will propose additional storage technologies for development in New York.

The objective of this project is to assess the economic viability of emerging storage technologies and their ability to improve system utilization, reduce CO_2 emissions, and optimize the operation of renewable resources.

Expected Benefits

One or more of the following benefits might be realized through storage technology:

- Improve integration of renewable resources by minimizing the period and amount of wind generation curtailments
- Develop more efficient congestion management that increases utilization of the New York transmission system
- Reduce overall carbon footprint by reducing congestion, facilitating greater integration of wind energy, and reducing the use of thermal plants for regulation
- Reduce the cost of regulation service

Project Plan

1. NYISO will provide information regarding wind resources and prospective and/or ongoing energy storage projects in its system. EPRI will provide information on expected installed and operating costs for various storage technologies
2. EPRI, in coordination with NYISO staff, will conduct simulations to evaluate the potential impact of these projects on transmission system utilization, reduction of carbon emissions, and efficient integration of renewable resources.
3. An initial project report will describe the evaluation of the potential economic opportunity for energy storage in high wind-penetration scenarios and the possible needs for market and operational enhancements.

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