

Research Project Summary

Contractor

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Contract Details

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Innovation - Research Study

Technology Types

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Enabling More Wind Power in New York with Modular PFC Technology

Background

In this engineering study, Smart Wires will work with their partners Right Analytics, and the New York Power Authority (NYPA), to evaluate the ability for a **modular power flow control (MPFC)** technology to reduce the curtailment of wind-powered generation and to enable further integration of wind resources throughout New York State. The study will analyze the potential for this MPFC technology to support wind generation in New York State, and will include system sizing, potential locations, estimated costs of such solutions, and the additional volume of wind generation that can be supported with these potential solutions. Conventionally, interconnecting new generation and abating curtailment requires extensive network upgrades. Reconductoring, substation updates, and new transmission lines are costly traditional solutions that take years to complete. Significant untapped capacity exists in most networks. MPFC can aid transmission owners to unlock this capacity – supporting regulatory targets while benefiting ratepayers and developers alike. These power-electronics-based devices balance network power flows by pushing power off overloaded circuits or pulling power onto underutilized circuits. By unlocking transfer capabilities, MPFC technologies can enable New York State to integrate more wind into their existing electrical grid with lower levels of curtailment under most wind power flow scenarios and can help meet the state’s clean energy goals.

Project Description

The project objective is to evaluate the potential a modular power flow control (MPFC) technology (Smart Wires) to unlock wind generation resources in New York State which includes studying; the future generation queue and assessing where the wind resources will grow in the state; developing the potential

scenarios for these new generation resources; assessing the impacts of these new wind resources on the state's electrical grid; developing the potential MPFC locations and sizing solutions; and provide an economic assessment of these potential solutions. The study will be conducted in collaboration with the New York Power Authority (NYPA). The first goal of the project is to identify the locations, capacities, and types of the existing and in-queue wind generation, as well as future wind generation for the selected study years. The second goal is to develop the planning scenarios for the 2030 target year, which include, the system topology, the generation dispatch, and the ratings and location of the new wind generation resources. This will include accurate and flexible wind load profiles for the targeted locations. The third project goal is to assess the impacts of these deployments of wind generation in the 2030 target year across New York State. This will include determining the locations and sizes of the MPFC devices required to ensure system security under the proposed wind generation deployments, assessing intact and contingency conditions, confirming that the potential solutions are reproducible, and conducting power flow analysis. Finally, the last project goal will quantify the impacts of the MPFC devices through the annual production cost for the 2030 target year.

Benefits


This project has the potential to create numerous benefits for the state. We are confident the MPFC technology can both reduce the curtailment of the state's current wind generating assets and enable more rapid integration of wind projects in the development queue. Based on prior studies, assuming that levels of curtailment and capacity factors for wind remain constant, we believe that MPFC deployed throughout the state can decrease curtailment by a minimum of 85 GWh/year by 2023.

Project Results

In this project, the ability for MPFC technology having the potential to reduce the curtailment of wind-powered generation and to enable further integration of wind resources throughout New York State is studied. The study is broken into five work packages (WP): (1) wind generation queue assessment, (2) planning scenario development, (3) wind generation impact assessment, (4) MPFC planning solution and sizing, and (5) economic assessment. A detailed methodology for each WP is presented, as well as results including location, size and wind integration benefit of various MPFC deployments in New York grid. The analysis is conducted by studying all Renewable Energy



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pockets of New York grid, as these are defined by NYISO. The analysis shows that the potential wind power capacity of the region can be increased by 309 MW with 5 MPFC deployments. This is equivalent to an increase of wind power integration of approx. 62MW per MPFC deployment of 1 device per phase. The expected Avoided Curtailment Saving from each deployment is estimated between \$5.1M - \$9.9M per year, or \$76.5M - \$148.5M for 15 years. Considering that the cost of a MPFC deployment with 1 device per phase is in the range of \$3.9M – \$5.4M, the deployment cost for all 5 solutions is approx. \$19.5M – \$27M. The respective Avoided Curtailment Savings from all MPFC solutions are estimated at approximately \$576M over 15 years.
