Abstract for EWEA 2015

10 MW Wind R&D Park with a 1 MW storage system in Canadian climate

General-Integrating Wind Power into the electricity market

Presenting Author: Scott Harper

Co-Authors: Marianne Rodgers, David Watson

Intro

Canada, as of the end of 2014, had 9694 MW of wind power installed with 2014 being a record year for wind power in the country. Now 7th in the world in installed capacity, Canada has taken a leadership role in wind power especially relating to cold weather climates and wind power integration. To understand the challenges and opportunities for wind integration, the Wind Energy Institute of Canada (Institute), with assistance from the federal government, invested in a 10 MW Wind R&D Park with a 1 MW/2 MWh storage system which it owns and operates. The Institute is examining how having energy storage can benefit a wind park and the electricity network, by using it for a variety of test cases.

Approach

In the past year time-shifting, demand/energy reduction, and fossil fuel displacement were tested by the Institute. The Institute is working with our local utility to understand the value of the services which can be provided from a storage system and how to monetize these values.

Main body

Time-shifting of wind energy was accomplished through set time of day schedules which were set the day before based on the wind forecast. Due to forecast errors this resulted in infrequent charging during periods with no wind power. This power was purchased from the utility which is considerably more expensive than our wind power and we are required to pay an expensive demand charge ($7.44 Cdn/kW). Due to these costs and the limitations of the batteries SCADA system, the Institute developed logic to ensure charging was only performed when sufficient wind power was available. This logic was further developed for the demand/energy reduction strategy that was deployed in December 2014. This strategy discharged the battery at 120 kW when the wind power reached 0 kW to ensure that all the power drawn by the turbines and substation during low wind periods was supplied from our storage system. In January 2015 the Institute in partnership with our local utility, discharged the storage system during periods of high load and low wind in order to displace on-island fossil fuel generation which is used infrequently when PEI's import cable is at maximum capacity. In this month 6 such discharges were achieved, providing 10.6 MWh of high value electricity during times of peak need.

Conclusion

From these three scenarios the Institute has shown that their storage system has been able to provide grid services but that the financial incentives in order to be reimbursed for these services is

undeveloped in the current electrical pricing system available to the Institute. The interactions between the many SCADA systems in our Wind R&D Park has proved to be an unexpected difficulty and the Institute has developed the controls necessary for the various use cases. The Institute has been yet unable to find a financially viable scenario for its storage system, but is continuing to develop new scenarios and work with its partners to correctly monetize the ancillary services provided by the storage system.

Learning Objectives

The Institute is looking to bring our experience and learn from others in order to better understand the changes which are imminent to our grids as renewable energy continues to displace fossil fuel sources which have historically provided the ancillary services. Our valuable asset is available for usage by the renewable energy industry, battery producers, academia, utilities, system operators and other partners to test how storage can be used to address their specific problems.