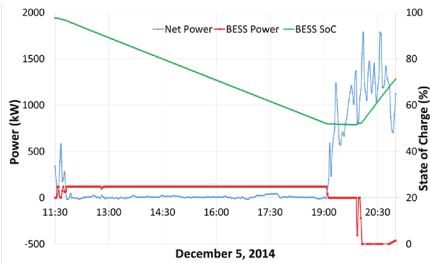


# Wind Energy Institute of Canada

Leading the development of wind energy across Canada through research, testing, innovation, and collaboration.

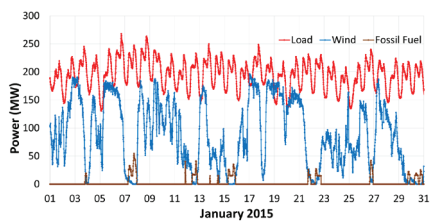
**Wind Energy Integration through Energy Storage** As a national research facility and independent wind farm and battery energy storage system (BESS) operator, with strong industry ties, the Institute is well-positioned to lead research in the advancement of wind energy integration. Below are current BESS research projects.

## CURRENT BESS RESEARCH PROJECTS



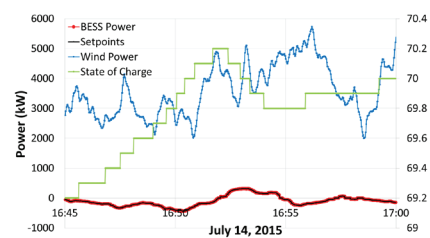
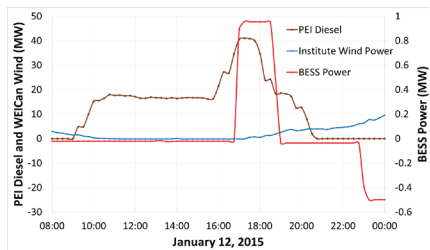
### DEMAND/ENERGY AVOIDANCE - DECEMBER 2014

- Wind energy was stored and released to the turbines during low wind periods for the turbine's auxiliary loads
- The battery supplied 8,517 kWhs which would have been purchased from the utility at a higher price
- Lengthy no-wind periods drained the battery so energy was purchased from the grid resulting in a demand



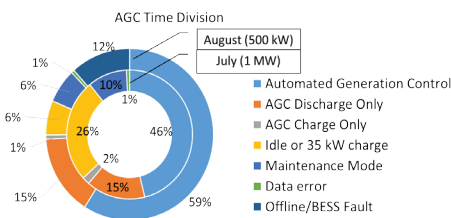
### DIESEL DISPLACEMENT - JANUARY & FEBRUARY 2015

- Wind energy was time-shifted by the BESS to times of greatest demand in Prince Edward Island (PEI)
- During periods of high load and low wind PEI uses fossil fuel generators which are costly and used infrequently
- In 2014 there were 30 occurrences of on-island generation to offload the submarine cables, the generators are also used for other security of supply situations
- In January, the Institute in cooperation with the utility discharged 10.6 MWhs of high value electricity over 6 discharges during these high demand periods
- Due to the heating required during idle periods to keep the battery at 280°C the BESS efficiency was 50.2%. The charge/discharge cycle AC efficiency was 76.3%



### AUTOMATED GENERATION CONTROL - JULY & AUGUST 2015

- Automated generation control (AGC) is used to ensure that the frequency does not deviate from the nominal despite unexpected changes in generation and demand
- Storage is being proposed to replace providers of AGC which are being displaced by wind generation
- Storage can offer double its nameplate by being able to absorb and release power
- In July 2015 the entire 1 MW of capacity was offered and tested with a historical regulation signal. Charging was only permitted when wind power was over 1 MW, which was the case for 56.6% of the testing period
- In August 2015 500 kW of capacity was offered for AGC, which decreased the wind power need to 500 kW which was available for 78.4% of the testing period
- The AC-AC round-trip efficiency in July was 75.9% and in August was 60.7%.



## NORTH CAPE WIND R&D PARK



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## POTENTIAL RESEARCH PROJECTS

Voltage Support | Grid Capacity | Stacked Services | Wind Prediction Firming

The Institute is looking forward to collaborating with system operators, utilities, industrial customers, and academic or other research facilities to help the industry learn and benefit from energy storage.

### CONTACT:

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