The Wind Energy Institute of Canada (WEICan), located in North Cape, Prince Edward Island, has been leading the development of wind energy across Canada through technical testing and consultation; research, development and demonstration; and outreach since its formation in 1981. As a national research facility and independent wind farm and battery energy storage system operator, with strong industry ties, the Institute is well-positioned to lead research in the advancement of wind energy.

WEICan owns and operates a Wind R&D Park that features five 2 MW wind turbines and an energy storage system with a 1 MW/2 MWh capacity. The Institute views this infrastructure as a laboratory that is available for research and is open to collaboration with interested parties.

**WIND TURBINE PERFORMANCE**

Since commissioning in 2013, the Institute’s 10 MW Wind R&D Park turbines have generated over 136.6 GWh of energy.

**Attributes of the Wind R&D Park’s DeWind D9.2 turbines:**
- Reliable operation in harsh coastal environment and cold weather
- Direct medium voltage tie-in of the D9.2’s 13.8 kV synchronous generator
- Voltage control capabilities providing stability to utility grid presents a unique opportunity to view impact on grid

**2015 Performance Statistics (January 2015 to December 2015):**
- 44.9 GWh energy produced
- 95% + Availability
- 51% + Capacity Factor

**Wind R&D Park Wind Turbine Specifications:**
- Installed Turbine Capacity: 10 MW
- Number of Wind Turbines: 5
- Model: DeWind D9.2
- Frequency: 60 Hz
- Cut In Wind Speed: 4 m/s
- Cut Out Wind Speed: 25 m/s
- Operating Temperature Range: -30°C to +40 °C

**BATTERY ENERGY STORAGE SYSTEM (BESS)**

**BESS Performance Statistics (March 2014 to September 2016):**
- 5 services tested
- Up to 76% AC-AC efficiency

**Battery Energy Storage System Specifications:**
- Storage Capacity: 2 MWh
- Storage Rating: 1 MW
- Inverter Model: S&C Purewave
- Battery Model: GE Durathon

**RESEARCH PROJECTS HIGHLIGHTS**

Wind energy storage and grid integration:

Objective is to understand how wind turbine operation and energy storage can offer benefits in wind energy integration into the grid. Scenarios tested include:
- Demand/Energy Avoidance
- Automatic Generation Control
- Diesel Displacement
- Time Shifting

**Service Life Estimation:**

The Institute is interested in how factors such as complex terrain, high capacity factors, icing and severe weather, cold climate, and delayed maintenance cycles will impact turbine service life and/or performance degradation.

a) **Data Analytics for Canadian Commercial Wind Industry**
   - Data collection from SCADA, log books, condition monitoring equipment, met masts, to estimate wind turbine service life

b) **Impact Of Wakes And Cliffs On Wind Speed And Turbulence**
   - Collaborative study of the impact of wakes and cliffs on wind speed and turbulence and how this affects wind turbine performance and service life.

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