The Wind Energy Institute of Canada (Institute), 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.

The Institute received funding through NRCan’s Clean Energy Fund and a loan from the province of PEI to own and operate a Wind R&D Park that features five 2 MW wind turbines and a 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.

### CURRENT RESEARCH PROJECTS

#### WIND ENERGY STORAGE AND GRID INTEGRATION:
Objective is to understand the benefits energy storage can offer in wind energy integration.

**GOALS:**
- Determine best battery operational plan for the Institute, the grid, and the battery, both technically and financially
- Lifetime analysis on the battery
- Educate the industry on the benefits of using storage systems

#### SMALL WIND TURBINE PERFORMANCE STUDY:
Objective is to study small wind turbine performance to establish baseline performance and determine causes of performance issues.

**GOALS:**
- Determine whether small wind turbines meet performance expectations
- Determine the cause for any discrepancy between expectations and actual performance

#### SERVICE LIFE ESTIMATION:
Data Analytics for Turbine Component Service Life

Objective is to use performance and condition monitoring data to determine wind turbine service life.

**GOALS:**
- Identify trends in maintenance issues
- Assess changes in loading conditions
- Identify causes for underperformance and component wear
- Map structural aging

#### Impact of Wakes and Cliffs on Wind Speed and Turbulence
Objective is to understand the impact of wakes and cliffs on wind speed and turbulence and how this affects wind turbine performance and service life.

**GOALS:**
- Spatially map wind speed and turbulence to form a database that can be used for physical and numerical simulations
- Correlate wind speed and turbulence data to turbine performance and condition monitoring results

#### Climate Change Project
Objective is to understand the impact climate change will have on wind resource extraction and its impact on service life.

**GOALS:**
- Provide 30 years of climate data to determine future climate predictions through statistical downscaling
- Improve long-term planning with regard to turbine types and locations
- Improve the long term return on investment of wind energy systems

### CONTACT:
Marianne Rodgers, Ph.D.
Scientific Director
(902) 882-2746 Ext 207  Marianne.rodgers@weican.ca

![Wind R&D Park Capacity](www.WEICan.ca)

<table>
<thead>
<tr>
<th>NORTH CAPE WIND R&amp;D PARK</th>
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<table>
<thead>
<tr>
<th>Wind R&amp;D Park Capacity</th>
<th>10 MW</th>
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<tbody>
<tr>
<td>Number of Wind Turbines</td>
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<tr>
<td>Storage Capacity</td>
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<td>Storage Rating</td>
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<td>Inverter Model</td>
<td>S&amp;C Purewave</td>
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<td>Battery Model</td>
<td>GE Durathon</td>
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<tr>
<td>Temperature Range</td>
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<tr>
<td>Topography</td>
<td>10 m cliffs and 300° ocean exposure</td>
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</tbody>
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**WIND R&D PARK PERFORMANCE STATISTICS (APR’14 TO MAR’15):**
- 41.7 GWh energy produced
- 95% + Availability
- 47% + Capacity Factor

**BATTERY STATISTICS (MAR’14-JUL’15):**
- 3 services tested
- 230 MWhs delivered
- Up to 76% AC-AC efficiency for month long scenario