

# Wind Energy Institute of Canada

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

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, an energy storage system with a 111.5 kW/223 kWh capacity, and a 109 kW solar photovoltaic (PV) array. WEICan views this infrastructure as a laboratory that is available for research and is open to collaboration with interested parties.

## Wind R&D Park Turbine Statistics

Wind Capacity	10 MW
No. of Wind Turbines	5
Wind Turbine Model	DeWind D9.2
Hub Height	80 m
Rotor Diameter	93 m
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

## ASSET MANAGEMENT RESEARCH ACTIVITIES

As wind farms age, owners question whether to invest to maintain assets, expand operations, or discontinue investments. Bankability, reliability, and long-term performance are critical issues for wind turbine investors, owners, operators, and manufacturers.

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

Data including SCADA, meteorology, maintenance logs and reports, and condition monitoring systems are being used to enhance understanding of turbine component aging and improve wind farm operations and maintenance.

### Drive Train

- WEICan replaced 6 gearboxes in 4 turbines in 2017-2018.
- WEICan has had 9 generator failures in 4 turbines since 2016.

These are serious operational issues for WEICan, but they also present research opportunities. Most research in this area focuses on simulations. However, at WEICan failures are analyzed with actual operational data

- SCADA
- Condition monitoring
- Borescope images
- Oil particle count data

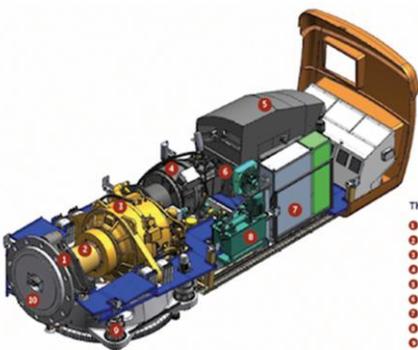
### Wind Turbine Lubricants

ExxonMobil and WEICan began demonstrating the capabilities of ExxonMobil's next generation formulations of wind turbine lubricants and greases in WEICan's turbines in spring 2022. This demonstration will allow optimization of flushing protocols and will address foaming issues that have been observed in WEICan's turbines.

### Wind Turbine Blade Leading Edge

WEICan has experienced wind turbine blade leading edge erosion since 2014. In 2016 WEICan began a field study with four leading edge protection products. WEICan monitored blade leading edges using cameras from the ground and drones. In summer 2019 most products had to be reapplied. A new product is being applied to all turbine blades in summer 2021 and summer 2022.

WEICan represents Canada in IEA Wind Task 46: Erosion of Wind Turbine Blades. As part of this task, site conditions are monitored—precipitation, icing, etc. to determine their impact on blade erosion. Additionally, WEICan is contributing to a model to predict annual energy production loss, standardization of damage reports, potential for erosion safe-mode operation, and verifying the accuracy of leading edge erosion performance loss models based on field observations.



The equipment

- 1 Main bearing
- 2 Rotor shaft
- 3 Main gearbox
- 4 Wind Drive
- 5 Generator cooling
- 6 Synchronous generator
- 7 Control cabinet
- 8 Hydraulic unit
- 9 Yaw drives
- 10 Hub



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