



IQ Energy Inc.

The Smart Choice in Renewable Energy

5245 Creekbank Road, Mississauga, Ontario, Canada L4W 1N3
www.IQEnergyInc.com info@iqenergyinc.com

PRODUCT OVERVIEW



Northern's NorthWind 100/19 wind turbine provides cost-effective, highly reliable renewable energy in demanding environments.

The NorthWind NW100 Simplicity by Design

Designed specifically for extreme weather in remote village power and distributed generation applications, the NW100/19 is a state of the art, utility-scale wind turbine. Northern Power Systems has drawn on 25 years of experience to engineer a wind turbine that provides cost-effective, highly reliable renewable energy in demanding environments.

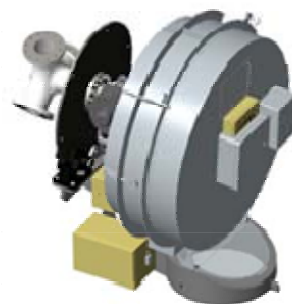
Designed to meet the needs of small utilities and independent power producers, the NW100/19 has the following features:

Simplicity

High reliability and low maintenance were the focus in developing the NW100/19. The design integrates industry proven robust components with innovative design features to maximize wind energy capture in severe and remote locations. The turbine features a minimum of moving parts and vulnerable subsystems to deliver high system availability. The uncomplicated rotor design allows safe, efficient turbine operation.

- Direct drive generator eliminates the drivetrain gearbox

Dualfail-safedisk brake and electrodynamic braking system eliminates blade brakes



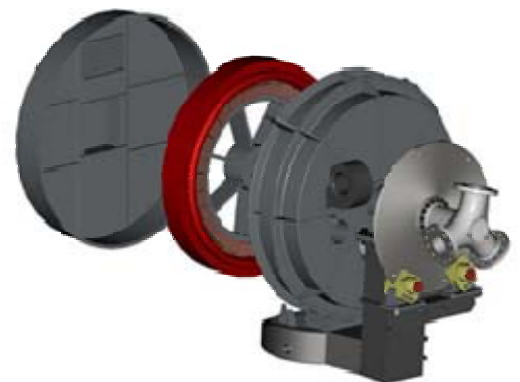
Serviceability

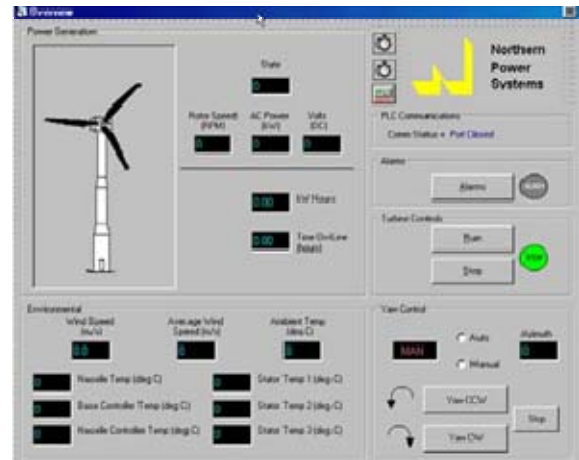
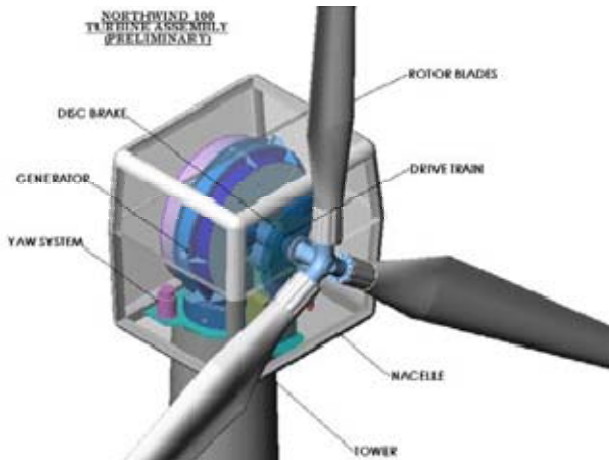
All service activities can occur within the tubular tower or nacelle housing, providing complete protection from severe weather conditions. Designated work areas provide ample room to perform service activities.

Power Quality

The most common generator utilized in the wind industry is a gear driven asynchronous (induction) generator. Induction generators must be connected to a stable voltage source for excitation and reactive power (VAR) support. While large power grids can easily provide this support, power quality and system stability is compromised in distributed generation and village systems where the power grid is typically "soft and unbalanced."

NPS has solved this issue with the NW100/19. Our synchronous, variable speed direct drive generator





and integrated power converter increases energy capture, while eliminating current in-rush during control transitions. This turbine can be connected to large power grids and remote wind-diesel configurations without inducing surges, effectively providing grid support rather than compromising it.

System Description

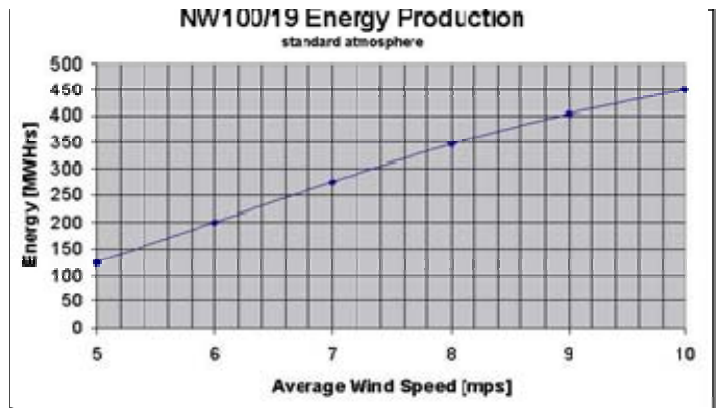
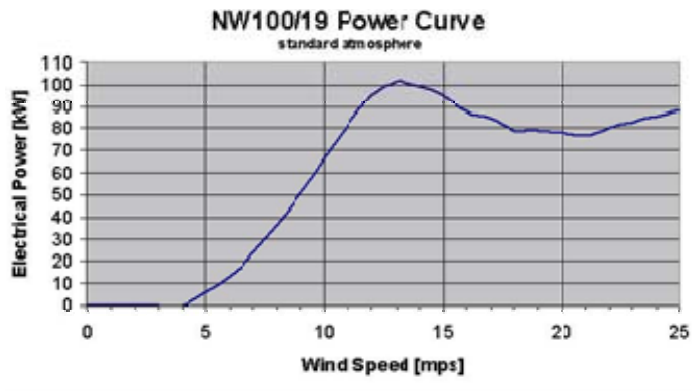
The variable speed, stall controlled turbine rotor assembly consists of three fiberglass reinforced plastic (FRP) blades bolted to a rigid hub, which mounts directly to the generator shaft. This simple, robust design eliminates the need for rotating blade tips, blade pitch systems, and speed increasing gearboxes.

Using a state-of-the-art airfoil design increases the blade's aerodynamic efficiency and renders them insensitive to surface roughness caused by dirt build-up and insects. The advanced FRP-resin infusion molding process ensures a high-quality blade while the root connection guarantees it will meet extreme temperature requirements.

The direct drive generator is a salient pole synchronous machine designed specifically for high reliability applications. Electrical output of the generator is converted to high quality AC power that can be synchronized to conventional or weak isolated grids. The advanced power conversion system also eliminates the inrush currents and poor power factor of conventional wind turbines. The output complies with IEEE 519-1992 power quality specifications.

The variable speed direct drive generator/converter system is tuned to operate the rotor at the peak performance coefficient, and also allows stall point rotor control to contend with wide variation in air density found in the target applications.

The safety system consists of a spring applied, pressure released disk brake mounted on the generator shaft for emergency conditions, and an electrodynamic brake system that provides both normal shutdown and emergency braking backup functions.



NW100/19 Technical Specifications

Design Specifications

Turbine Class	IEC WTGS Class I
Design Life	30 year
Design Standards	In Accordance with IEC 1400-1

Performance

Nominal Power Rating	100 kW
Rated Wind Speed	13 m/s (29mph)
Cut-In Wind Speed	4 m/s (9mph)
Cut-Out Wind Speed	25 m/s (56mph)
Survival Wind Speed	70 m/s (157mph)

General Configuration

Rotation Axis	Horizontal
Orientation	Upwind
Yaw Control	Active
Number of Blades	3
Hub Type	Rigid
Drive Train	Direct Drive
Power Regulation	Stall

Rotor

Diameter	19.1 m
Swept Area	284 m ²
Speed Range	45-69 RPM
Speed @ rated power	68.5 RPM
Structural Configuration	Flange Mounted Blades, Rigid Hub
Power Regulation	Variable Speed Stall
Rotor Rotation	Clockwise (Viewed from Upwind)
Pitch Angle	-0.75° @ tip, nominal
Coning	0°

Blades

Airfoil	S819, S820, S821 Series
Material	Fiberglass Reinforced Plastic (FRP)
Lightning Protection	Standard Integrated System

Drive Train

Configuration	Variable Speed Direct Drive
Tilt Angle	4°
Generator Type	Salient Pole Synchronous
Insulation Class	NEMA H
Generating Speed	45-69 RPM
Generator Rating	100 kW w/ 1.15 Service Factor
Generator Output	575 VAC
Speed Control	IGBT Controller

Grid Connection

Grid Voltage	480 VAC std: 380-30kW available
Grid Frequencies	50/60 Hz

Braking Systems

Mechanical Brake	Main Shaft Disc Brake w/ Dual Spring Applied Calipers
Electro-Dynamic Brake	Parking and emergency backup

Yaw System

Type	Active Upwind
Damping system	Adjustable Friction
Yaw Drive	Electrically Driven Planetary Gearbox
Yaw Bearing	Slew Ring

Tower

Type	Tubular
Hub Height	25/30/35 m (82/98/115 ft)
Material	Steel
Corrosion Protection	Marine Paint

Service Environment

Tower	Fully Enclosed, Ladder Way
Nacelle	Fully Enclosed

Controller

Type	Northern WTGS-100 Controller, Microprocessor-based
Functions	Complete Supervisory Control and Data Acquisition
Remote Control/ Monitoring Software	Integrated SmartView™ Access
Power Electronics	IGBT Pulse Width Modulation (PWM) Converter
Power Quality	IEEE 519-1992

Environmental Specifications

Temperature Operating Range	-46°C to 50°C (-50°F to 122°F)
Lightning Protection	In Accordance with IEC 61024-1
Icing	Ice cover to 30 mm (1 in)
Seismic Loading	Zone 4

Masses

Rotor	761 Kg (1 680 lbs)
Nacelle (excluding rotor)	6325 Kg (13 950 lbs)
Tower (25m)	6500 Kg (14 330 lbs)





IQ Energy Inc. is a leading provider of renewable energy solutions with a focus on grid-tied solar and wind projects.

IQ Energy provides consulting, supply and installation services, and site assessments for residential and commercial needs.

Development

The NW100/19 turbine was developed by NPS with support from cooperating agencies within the U.S. government, including the National Aeronautics and Space Administration (NASA); the National Science Foundation (NSF); the Department of Energy (DOE); and the DOE-funded National Renewable Energy Laboratory (NREL). Siemens-Westinghouse acted as a subcontractor to NPS in developing the innovative direct drive generator subsystem.

Turbine certification testing is being carried out at the National Renewable Energy Laboratories National Wind Test Site at Rocky Flats, CO. This testing is near completion and will result in a Type Testing Conformity Statement, which validates the turbine safety systems and structural design. Turbine testing also includes Type Characteristic Measurements that prove the performance and acoustic signature of the turbine.

NPS wind turbines at the South Pole and the Antarctic coast have operated in more extreme conditions than any other turbines, including winds to 198 mph (88.5 m/s) and temperatures to -112°F (-80°C.) This experience gained in harsh, remote conditions has been incorporated into key NW100/19 design decisions affecting configuration, materials selection, performance characteristics, and deployment procedures.

For further information contact:

John Vasquez

IQ Energy Inc.

5245 Creekbank Road, Mississauga, ON

(416) 410-6220

jv@iqenergyinc.com