



Northern Power[®] 100 Wind Turbine General Specifications

A01465 Rev E



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1 Introduction

This document presents key specifications for the Northern Power® 100 wind turbine with a 21 meter rotor and 37 meter tower. Specifications for the Northern Power 100 are provided in Table 1, with certain details deferred to the appropriate section(s) of this document. Where applicable, alternative specifications are given for the Northern Power 100 Arctic wind turbine.

Table 1 Northern Power 100 General Information

General Configuration	
Model North	ern Power® 100
Design Class	IEC WTGS IIA ¹ (Standard Turbine 50/60 Hz) IEC WTGS S (Arctic Turbine)
Drive Train	Direct drive (gearless architecture)
Generator Type	Permanent magnet - synchronous
Power Regulation	Variable speed; stall control
Orientation Up	wind
Yaw Control	Active
Number of Blades	3
Rotor Diameter	21 meters (69 feet)
Performance	
Rated Electrical Power at standard conditions	100 kW
Approximate Rotor Speed	60 RPM
Cut-in Wind Speed	3.5 meters/second (7.8 miles/hour)
Rated Wind Speed	15 meters/second (34 miles/hour)
Cut-out Wind Speed	25 meters/second (56 miles/hour)
Noise	55 dBA at 85 meters (55 dBA at 278 feet)
Control System	
Controller Type	DSP-based multi-processor embedded platform
Monitoring System	SmartView® Monitoring System

¹ International Electrotechnical Commission Wind Turbine Generating System, 61400-1 ed2

Safety System	Designed to IEC 61400-1 ed2, redundant braking	
Communications Protocol	ModbusTCP	
Tower System		
Approximate Hub Height	37 meters (120 feet)	
Tower Configuration	3 section tubular monopole, nested for shipping	
Approvals and Conformity	60 Hz Turbines (Approved to)	50 Hz Turbines (Conformance with)
UL	1741 UL 1004-4 CSA C22.2 107.1-01 CSA C22.2 100-04	EN 60204-1 EN 12100-1, 2 EN 6100-6-2:2005 EN 6100-6-4:2007N
Unit Mass		
Nacelle and Rotor Mass	7,200 kilograms (15,900 pounds)	
Tower Mass	14,000 kilograms (30,900 pounds)	
Standard Conditions	60 Hz Turbines	50 Hz Turbines
Elevation Sea	Level	
Air Temperature	15 degrees Celsius (59 degrees Fahrenheit)	
Air Density	1.225 kilograms per cubic meter (Specific Volume: 13.08 cubic feet per pound)	
Class S Conditions (Arctic Turbine)	60 Hz Turbines	50 Hz Turbines
Elevation Sea	Level	
Air Temperature	-10 degrees Celsius (14 degrees Fahrenheit)	
Air Density	1.34 kilograms per cubic meter (Specific Volume: 11.95 cubic feet per pound)	

2 Environmental Specifications

This section provides the environment specifications for the Northern Power 100 turbine.

Table 2 Ambient Turbine Conditions

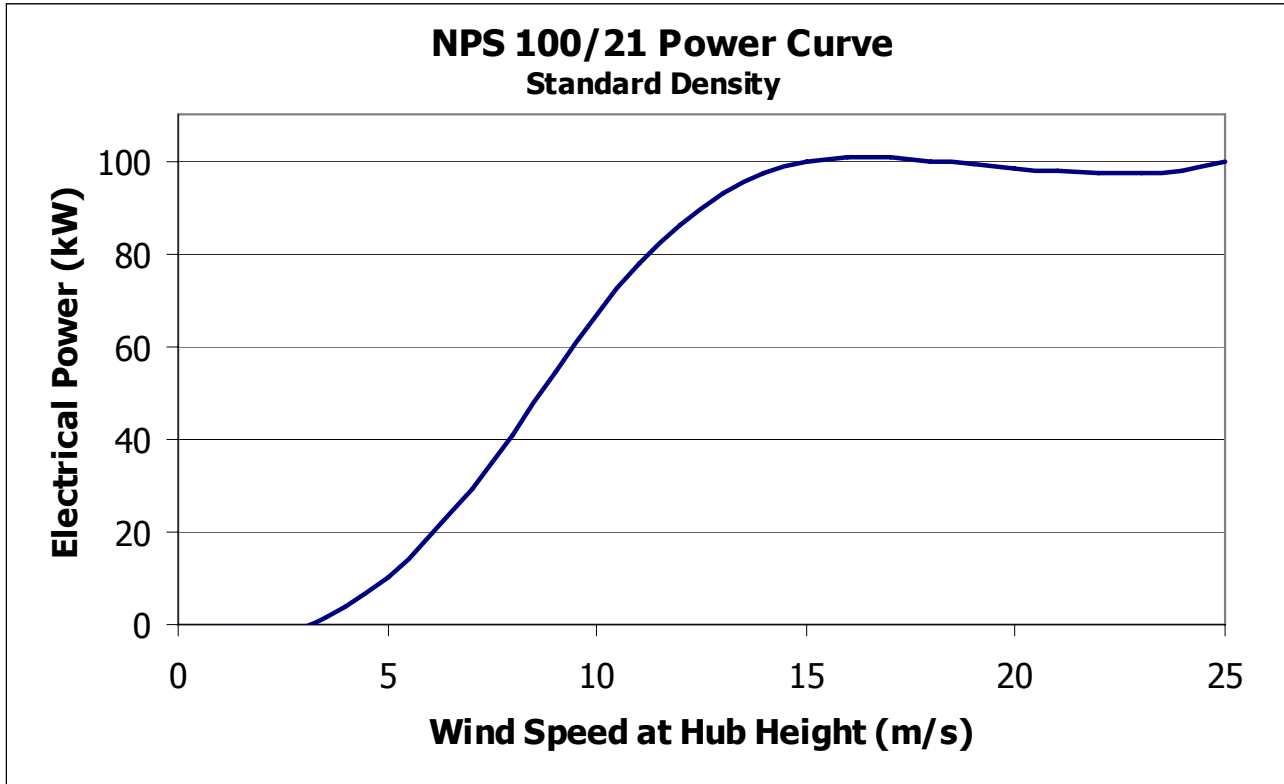
	Standard Turbine	Arctic Turbine
Operational -20	°C to 50°C (-4 °F to 122°F) -40	°C to 50°C (-40 °F to 122°F)
Storage -40	°C to 55°C (-40 °F to 131°F) -40	°C to 55°C (-40 °F to 131°F)
Maximum Elevation	1,000 meters above sea level	1,000 meters above sea level

Table 3 IEC WTGS² Conditions

Parameter	Class IIA	Class S (Arctic Turbine)
Annual Average Wind Speed at hub height, V_{avg} (maximum annual average)	8.5 meters/second (19 miles/hour)	8.3 meters/second (18.5 miles/hour)
Reference Wind Speed at hub height, V_{ref} (10-minute average)	42.5 meters/second (95 miles/hour)	40.6 meters/second (90.5 miles/hour)
Extreme Wind Speed at hub height (3-second gust, 50-year recurrence period) V_{e50}	59.5 meters/second (133 miles/hour)	56.0 meters/second (125 miles/hour)
Characteristic turbulence intensity at 15 m/s, I_{15}	0.18 (defined by IEC 61400-1 ed2)	0.18 (defined by IEC 61400-1 ed2)
Design lifetime	20 years 20	years

² International Electrotechnical Commission Wind Turbine Generating System, 61400-1 ed2

3 Power Curve and Energy Production



Power Curve Data				
Vm (m/s)	Power (kWe)		Vm (m/s)	Power (kWe)
			14	97.3
			15	100.0
4	3.7		16	100.8
5	10.5		17	100.6
6	19.0		18	99.8
7	29.4		19	99.4
8	41.0		20	98.6
9	54.3		21	97.8
10	66.8		22	97.3
11	77.7		23	97.3
12	86.4		24	98.0
13	92.8		25	99.7

Annual Energy Production	
Annual Average Annual Wind Speed (m/s)	Output (kWh)
4.0	77,000
4.5	110,000
5.0	145,000
5.5	183,000
6.0	222,000
6.5	260,000
7.0	298,000
7.5	334,000
8.0	368,000
8.5	400,000
Rayleigh Distribution	

The annual energy production shown is calculated at standard conditions with a 100% availability factor.

4 Electrical Specifications

4.1 Section Overview

This section defines the electrical specifications for the Northern Power 100 wind turbine. NPS 100 wind turbine scope of supply includes turbine equipment up to and including the fused disconnect and junction box located at the bottom of the tower. Specifications herein refer to turbine output at the base of the tower.

4.2 Turbine Output Specifications

These specifications refer to the base of the tower and the fused disconnect

Table 4 Northern Power 100 Output Specifications

	60 Hz Turbines	50 Hz Turbines
3-Phase Output Voltage	480 VAC (+/-10%)	
Nominal Active Power Output	100 kW	
Maximum Reactive Power	+/-45 kVAR	

5 Disclaimers and Reservations

Weather and altitude beyond standard conditions may affect system performance. High turbulence can reduce system performance.

The turbine controls may safely stop operation or delay startup when ambient conditions appear to be within specification. Various safety, environmental and situational variables will cause the turbine's control system to behave this way.

Following periods of grid outage and/or extended low temperatures, a time allowance for warm-up must be expected; the time will vary based on ambient conditions and the duration of the conditions.

A variety of conditions can affect turbine performance, including but not limited to maintenance, site conditions, climatic conditions and electrical grid conditions. These general specifications do not guarantee performance or operability at a particular site.

The Northern Power 100 Arctic wind turbine includes additional heaters, which may increase parasitic load at lower ambient temperatures.

Turbines may be installed in coastal environments, but should not be subjected to sea spray. The lifetime maintenance costs of a turbine will vary based on site conditions, including wind, precipitation, temperature, and corrosivity of the air. Corrosivity of the air varies based on the local atmospheric conditions at the site including time of wetness, acidity, and salinity.

The values stated in metric (SI) units shall be regarded as the standard. The inch-pound (IP) units shown in parenthesis shall be for reference only. Northern Power is continually developing product upgrades, modifications and improvements, and as a result reserves the right to change or alter these specifications at any time.