

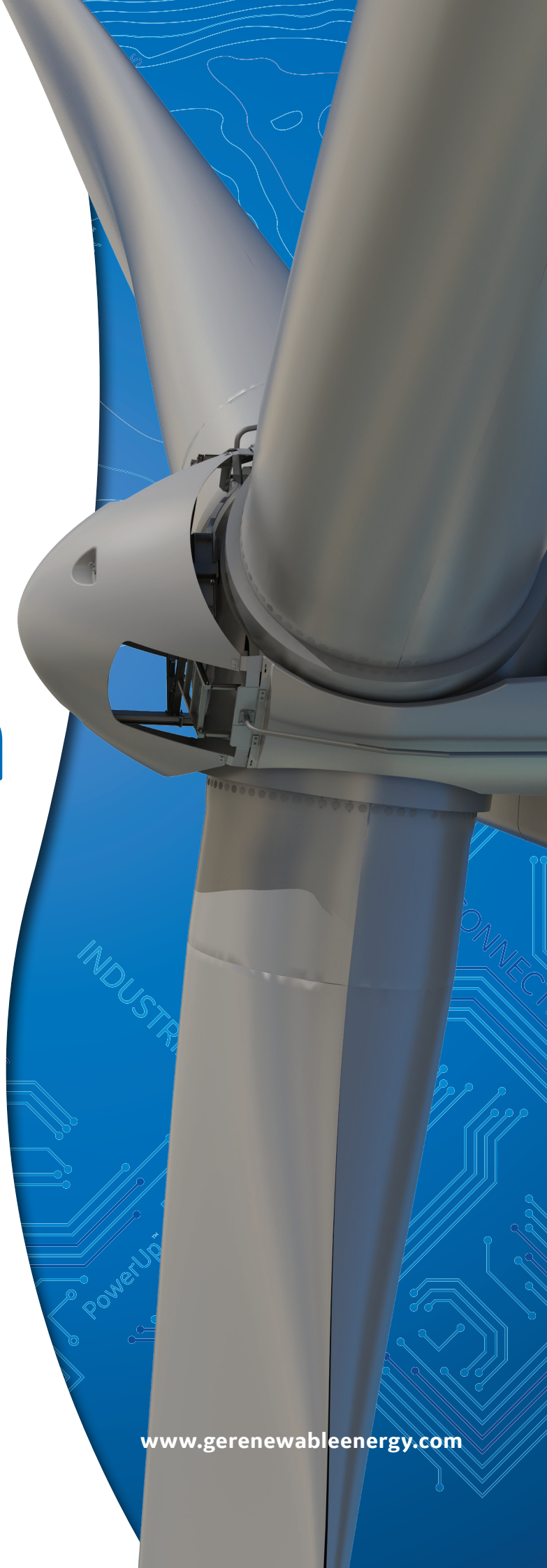
GE Renewable Energy

GE's 2 MW Platform

PROVEN, RELIABLE WIND
ENERGY SOLUTIONS
YESTERDAY, TODAY,
AND TOMORROW.



www.gerenewableenergy.com



GE'S 2 MW PLATFORM

Since entering the wind industry in 2002, GE Renewable Energy has invested more than \$2.5 billion in next-generation wind turbine technology to provide more value to customers—whether at the turbine, plant, or grid level. Using advanced analytics, GE Renewable Energy is redefining the future of wind power, delivering with proven performance, availability, and reliability. With the integration of big data analytics and the industrial internet, we can help customers manage the variability that comes with this resource for smooth, predictable power. Our onshore product portfolio includes wind turbines with rated capacities from 2.0 to 4.8 MW and flexible support services that range from basic operations and maintenance to farm or fleet level enhancements.

For more information visit our website:

www.gerenewableenergy.com

2 MW Platform

GE's 2 MW Platform of onshore wind turbines has more than 5.5 GW installed and operating today. Building on that success, GE offers a 127-meter rotor option for 2.2-2.5 MW rated wind turbines. Featuring the best-in-class capacity factor and a significant improvement in Annual Energy Production (AEP) within the 2 MW range, the 2 MW-127 demonstrates the next step in turbine technology and efficiency, reducing the cost of energy for customers with low and medium wind speed sites.

GE's 2.0-2.5 MW, 116-meter rotor wind turbine offers 10,660 square meters in swept area, with an Annual Energy Production (AEP) of 11,832 MWh at 8.0 m/s (at a 2.5 rating, 90m HH). GE's proprietary 56.9-meter blade is designed specifically for the 2.0-2.5 MW rating of this platform, enabling lower loads and improved performance.

GE's stringent design practices enable a platform of products engineered for exceptional performance and availability. The use of selected components from proven product platforms ensures consistent workhorse performance and reliability. The 2 MW Platform drivetrain and electrical system architecture provide improved performance along with greater wind turbine energy production. Other critical components have been scaled from the existing platforms to meet the specific technical requirements of this evolutionary turbine.

Today, GE's 2 MW Platform wind turbines come equipped and ready to utilize GE's Predix core applications, including its Asset Performance Management (APM), Cybersecurity, and Business Optimization (BO) solutions. The digital suite of apps enables improved business outcomes, including lifecycle extension of the customers' windfarms and the improvement of overall farm economics.

GE's 2 MW Platform of onshore wind turbines set the benchmark for consistent performance, reliability, farm level AEP, and efficiency.

[†] Comparative statements refer to GE technology unless otherwise stated.

Building Upon Proven GE Technology

The evolution of GE's 2 MW Platform began with the introduction of a 1.5 MW turbine (the 1.5i) with a 65-meter rotor in 1996. That product evolved to a 70.5-meter rotor turbine, called the 1.5s. A 77-meter rotor machine called the 1.5sle was introduced later in 2004. Building on the exceptional performance and reliability of the 1.5sle, GE introduced the 1.5xle, which had a 82.5-meter rotor, in 2005. Subsequent improvements led to the introduction of the 1.6-82.5 turbine in 2008—followed by the 1.6-87 in 2011, and ultimately the 1.85-82.5 and 1.85-87 in 2013. Ongoing investment in the industry workhorse resulted in 100-meter rotor machines with the introduction of GE's 1.6-100 and 1.7-100 wind turbines.

Evolving from these predecessors, the GE 2 MW Platform of onshore wind turbines today provide even greater capacity factor while also increasing the AEP of GE's product offerings.

Significant component enhancements have resulted in a substantial performance increase, enabling the use of the 116 and 127-meter rotors, and a nameplate range of 2.0-2.5 MW (with applicable rotor). New aerodynamics and blade structural enhancements have enabled greater blade lengths, which, in conjunction with an upgraded electrical system, improved controls, and improved power conversion capabilities, have enabled increases in nameplate, capacity factor, and AEP.

Made for high reliability, and with more than 5.5 GW of equivalent units installed and operating today, GE's 2 MW Platform has a proven record of providing excellent availability for our customers.

Technical Description

GE's 2 MW Platform is a three-blade, upwind, horizontal axis wind turbine with a rotor diameter of either 116 or 127-meters. The turbine rotor and nacelle are mounted on top of a tubular steel tower. The 2 MW-127 is offered at an 89-meter hub height, and the 2 MW-116 is offered at 80-meter, 90-meter, and 94-meter hub heights. To keep the blades pointed into the wind, the 2 MW-116 uses a passive yaw control system, and the 2 MW-127 uses an active yaw control system. GE's 2 MW Platform operates at a variable speed and uses a doubly fed asynchronous generator with a partial power converter system.

Specifications:

- 2.0 to 2.7 MW rating with a 116-meter rotor: Engineered to IEC 61400-22 ed 3, Class IIS/IIIS
- 2.2 to 2.5 MW rating with a 127-meter rotor: Engineered to IEC 61400-22 ed 3, Class IIS/IIIS
- Standard and cold weather extreme options
- Standard tower corrosion protection: C2 internal and C3 external with internal and external C4/C5 options available
- Rotational direction: Clockwise viewed from an upwind location
- Speed regulation: Electric drive pitch control with battery backup
- Aerodynamic brake: Full feathering of blade pitch

Features and Benefits

- 2.0 to 2.7 MW with a 116-meter rotor and 2.2 – 2.5 MW with a 127-meter rotor
- Higher AEP than their GE 1.x MW predecessors by incorporating a larger gearbox scaled for GE's 2 MW Platform and longer blades (116-meter rotor with 56.9-meter blades and 127-meter rotor with 62.2-meter blades)
- GE's 2 MW Platform has a proven record of providing excellent reliability, and availability for our customers, with more than 5.5 GW installed and operating today.
- Grid-friendly options include enhanced reactive power, voltage ride through, and power factor control.
- Wind Farm Control System; WindSCADA*
- 2 MW-116 available in both 50 Hz and 60 Hz versions; 2 MW-127 available in 60 Hz
- With variable nameplate offerings, GE has the flexibility to meet a variety of customer needs in capacity factor, noise, and operating life.
- GE's 2 MW-127 enables best-in-class capacity factor and improved AEP in the 2 MW range for lower wind speeds. GE's 2 MW-116 continues to be our most competitive offering for higher wind speeds and more challenging wind conditions.
- GE's 2 MW Platform onshore wind turbines are compatible with GE's Digital Wind Farm technology, powered by the Predix* software platform, enabling the lifecycle extension of customers' wind farms and the improvement of overall wind farm economics.

Construction:

Towers: Tubular steel sections provide a hub height of 89-meters for GE 2 MW-127 onshore wind turbines and 80, 90, and 94-meters for GE 2 MW-116 onshore wind turbines.

Blades: 56.9-meter blades (116-meter rotor), 62.2-meter blades (127-meter rotor).

Drivetrain components: GE's 2 MW Platform uses an enhanced gearbox, main shaft, and generator with appropriate improvements to enable the 116-meter rotor in higher wind speeds, and the 127-meter rotor in lower wind speeds.

Enhanced Controls Technology

The 2 MW Platform wind turbine products employ enhanced control features including:

- GE's patented Advanced Loads Control reduces loads on turbine components by measuring stresses and individually adjusting blade pitch.
- Controls developed by GE Global Research reduce extreme loads, including those near rated wind speeds, to improve Annual Energy Production (AEP).

Condition Monitoring System (optional)

GE's Condition Monitoring System* (CMS) and SCADA Anomaly Detection Services, a complementary suite of advanced condition monitoring solutions, proactively detect impending drivetrain and whole-turbine issues, enabling increased availability and decreased maintenance expenses. Built upon half a century of power generation drivetrain and data anomaly monitoring experience, this service solution is available for GE's 2 MW Platform.



TORQUE

PROVEN, RELIABLE WIND ENERGY SOLUTIONS YESTERDAY, TODAY, AND TOMORROW.

www.gerenewableenergy.com

DIGITAL WIND FARM

WindSCADA™

CONNECTED MACHINES

YAW

INDUSTRIAL INTERNET

* Trademark of General Electric Company

Copyright © 2018 General Electric Company. All rights reserved.

GEA31820C (02/2018)