

GE Renewable Energy

CAPACITY FACTOR LEADERSHIP  
IN CLASS S WINDS

GE's  
1.85-87



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Since entering the wind industry in 2002, GE Renewable Energy has invested more than \$2 billion in next-generation wind turbine technology to provide more value to customers—whether at the turbine, plant or grid level. Through the use of 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 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 1.6-3.4 MW and flexible support services that range from basic operations and maintenance to farm- or fleet-level enhancements.

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### GE's 1.85-87 Wind Turbine

GE's 1.85-87 wind turbine is designed for Class S winds, targeting 8.5 m/s, and offering an 11% increase in swept area and an extra 150 kW output at rated wind speed compared to the 1.6-82.5 turbine—resulting in a 10% increase in Annual Energy Production (AEP) at 8.5 m/s. This increase in blade swept area allows greater energy capture and extra output at rated wind speed, and drives improved project economics for wind developers. GE's proprietary Advanced Loads Control allows siting of the 1.85-87 wind turbine in Class S wind regimes, combining drive train sensors and capabilities of the Mark\* V1e turbine controller to individually pitch blades and improve loads handling performance.

GE's stringent design procedures result in a turbine designed for high performance and availability with the same reliable performance as the rest of GE's 1.x fleet.

### Building Upon the Proven 1.5 MW Platform

The evolution of GE's 1.5 MW turbine design began with the 1.5i turbine introduced in 1996. The 65-meter rotor diameter turbine soon was increased to 70.5-meters in the 1.5s, then to 77-meters in the 1.5sle turbine that was introduced in 2004. Building on the exceptional performance and reliability of the 1.5sle, GE introduced the 1.5xle with its 82.5-meter diameter in 2005. Subsequent improvements in design led to the introduction of the 1.6-82.5 turbine in 2008 followed by the 1.68-82.5 and 1.6-87 in 2011, and ultimately the 1.85-82.5 and 1.85-87 in 2013. Built from the maturity of its predecessors, this evolution ensures increased capacity factor while increasing AEP and application space.

Designed with high-reliability to ensure continued operation in the field, GE's 1.85-87 wind turbine builds on the exceptional availability of its predecessors.

## Technical Description

GE's 1.85-87 wind turbine is a three-blade, upwind, horizontal axis wind turbine with a rotor diameter of 87-meters. The turbine rotor and nacelle are mounted on top of a tubular steel tower, providing a hub height of 80-meters. The turbine uses active yaw control to keep the blades pointed into the wind. The 1.85-87 wind turbine is designed to operate at a variable speed and uses a doubly fed asynchronous generator with a partial power converter system.

### Specifications:

- Designed and certified to IEC 61400-1:
  - Class S: 8.5 m/s average wind speed; 14% turbulence intensity
- Standard and cold weather extreme options
- Standard tower corrosion protection; C2 internal and C3 external with optional C4 internal and C5 external 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

- Higher AEP than its 1.5 predecessors by incorporating GE's 1.6-100 gearbox and longer 42-meter blades
- Capacity factor leadership in high wind sites
- Designed to meet or exceed the 1.5 MW platform's historic high availability
- Grid friendly options are available:
  - Enhanced Reactive Power, Voltage Ride Thru, Power Factor Control
- Wind Farm Control System; WindSCADA\*
- Sharing of components with family products
- Available in both 50 Hz and 60 Hz versions for global suitability

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## Construction

**Towers:** Tubular steel sections provide a hub height of 80 meters.

**Blades:** Proven 42-meter blades.

**Drivetrain components:** GE's 1.85-87 uses proven design gearboxes, mainshaft, and generators with appropriate improvements to enable the larger rotor diameter in Class S winds.

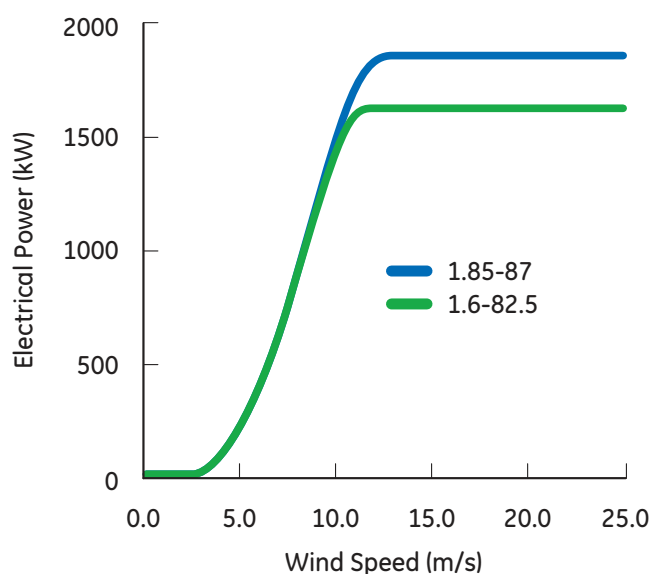
## Enhanced Controls Technology

The 1.85-87 wind turbine employs GE's patented Advanced Loads Control. This feature reduces loads on turbine components by measuring stresses and individually adjusting blade pitch.

## Condition Monitoring System

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 as an option on new GE units and as an upgrade.

## Power Curve



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TORQUE

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CONNECTED MACHINES

YAW

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