Turn up. Tune up.
Wind PowerUp*

Making your machines brilliant

Introduction

GE is pleased to introduce Wind PowerUp from GE Predictivity™, a results-based, customized software-enabled platform created to increase a wind farm's output by up to 5%, taking into account environmental conditions. For a typical U.S. wind farm operator using GE's 1.5-77 turbine, a 5% increase in energy output translates to up to 20% increase in profit per turbine.

PowerUp is available for turbine models across GE's installed base and is part of GE's brilliant turbine platform, which harnesses the Industrial Internet to drive higher power output and create new revenue streams for wind farm operators.

PowerUp is executed through a cooperative, phased approach that takes a holistic view of the assets, system and network.

Technical Differentiation

When PowerUp is activated, a GE software program performs a complete before-and-after wind farm power performance analysis, validating the performance improvement. By adjusting performance dials that include speed, torque, pitch, aerodynamics and turbine controls, PowerUp helps maximize the power output of a wind farm.

Commercial Differentiation

PowerUp is available as a platform that continues to increase a wind farm's output as new GE technologies are introduced. PowerUp is a flexible, outcome-based, commercial offering (OPEX, CAPEX) that allows wind farm operators to pay only for validated performance improvements.

GE's PowerUp offering can also be incorporated into a new or existing Operations and Maintenance contract.
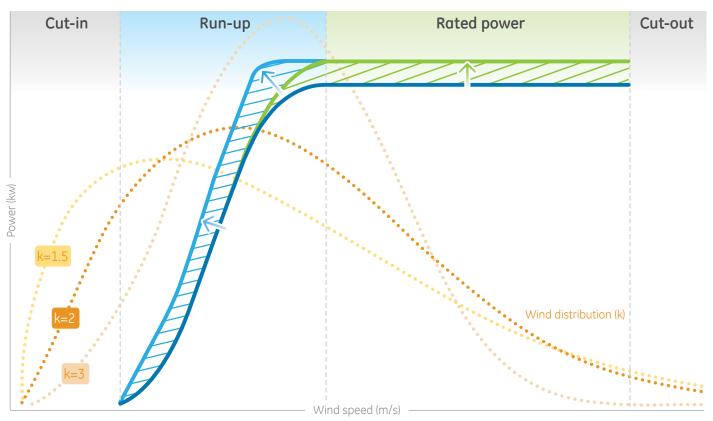
Validation Methodology

GE's PowerUp platform, which includes multiple performance upgrade technologies by turbine type, applies a validation methodology consistent with established IEC standards.

Using a baseline power curve, performance gains will be calculated at the farm level through historical SCADA data.

By validating the actual amount of energy gained from GE's PowerUp platform, this approach can simplify the financial evaluation of the project.

imagination at work

PowerUp performance curve

| Cut-in | Run-up | Rated power | Cut-out |

Power (kw)

k=1.5

k=2

k=3

Wind distribution (k)

Wind speed (m/s)

The PowerUp platform uses a suite of performance dials and levers to fine tune a wind turbine's operation and help enhance its energy production. Through a detailed loads, reliability and performance analysis utilizing historical SCADA data, a turbine will lock in the best settings from an iterative tuning process. Based upon a turbine's specific wind regime and characteristics, the end result will be a customized PowerUp that seeks to maximize annual energy production. More details on the performance dials and levers are as follows:

Speed
The rate at which the drivetrain moves, measured in rotations per minute (rpm). Speed (balanced with torque) directly affects bearing rotations, gear rotations, generator voltage and blade noise.

Torque
The torsional force that flows through the drivetrain, measured in Newton-meters. Torque, balanced with speed, directly affects bearing thrust, gear contact stress and generator current.

Pitch
The position of the blade on the turbine that determines the aerodynamic efficiency of the rotor. Pitch directly affects the energy yield, mechanical loads, and thrust through the drivetrain.

Yaw
The position of the turbine nacelle as it relates to the wind direction. Nacelle yaw position directly impacts the energy yield and mechanical loads.

Aerodynamics
The efficiency of a blade configuration to extract energy from the wind, as measured by the rotor coefficient of power (Cp). Efficiency is directly affected by the blade profile, surface finish, lift and drag. The maximum theoretical value for efficiency is 59%, also known as the Betz limit.

Turbine Controls
The brain of the wind turbine. Wind turbine controls manage the interaction between the components, the environment and the operator to produce energy reliably.