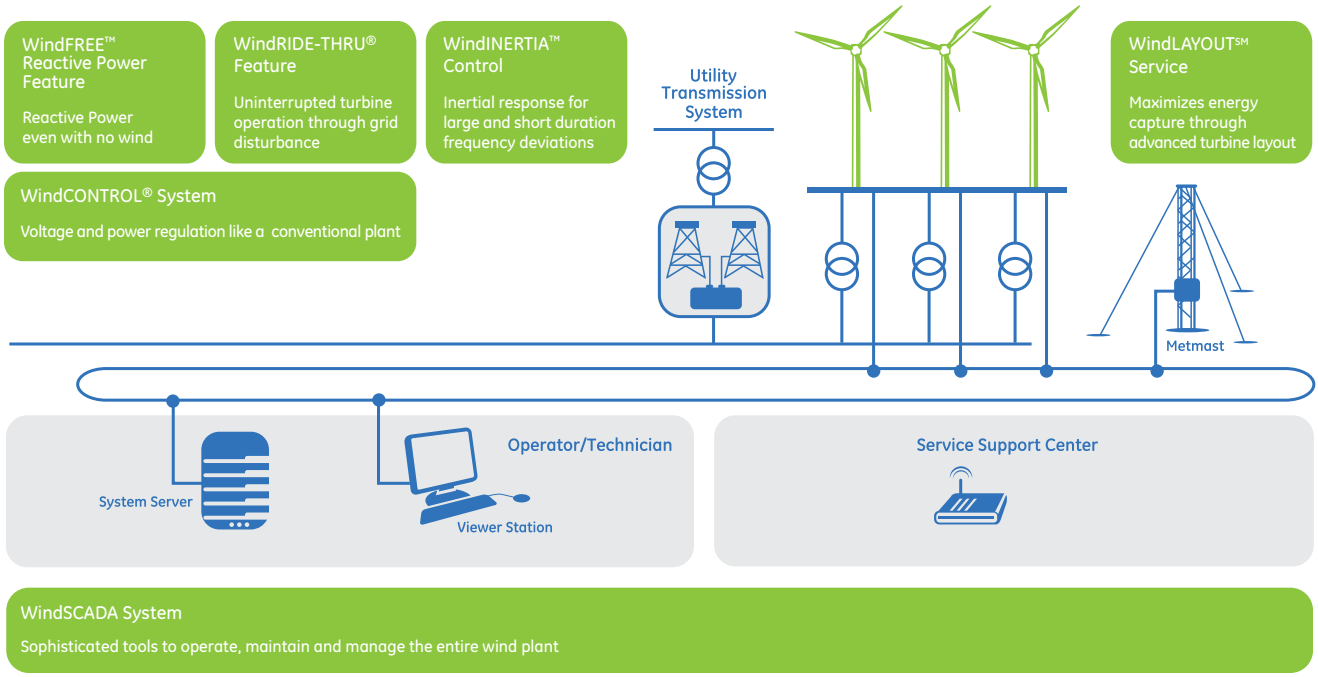
GE Energy

Solutions for Wind Power Performance

imagination at work

Performance at the highest level

GE's product and service offerings can take your wind power plant performance to a higher level with the company's patented integrated suite of controls, software and electronics, which provide grid-friendly benefits similar to those of conventional power plants.



WindCONTROL® System

GE's patented WindCONTROL® system regulates voltage and power in real time. Like a conventional power plant, the system supplies reactive power to the grid when it is needed, regulating system voltage and stabilizing weak grids.

GE provides a simple integrated system of Volt-Amp-Reactive (VAR) control by utilizing the dynamic VAR capability inherent in GE's variable speed turbines as the main VAR source—unlike other systems that may require add-on capacitors or VAR compensators. Additionally, GE's WindCONTROL® system can seamlessly integrate capacitor banks if greater VAR capability is required at your wind plant.

GE's WindCONTROL® system also controls the power of the wind plant by utilizing the company's patented variable speed technology employed by the full line of GE's wind turbines. Each turbine maintains precise torque and pitch regulation, controlling power and speed during changing wind and grid conditions.

Conventional power plants include governor droop, controlled rates of change during power setpoint changes, and controlled shutdown and startup routines. Although there may be more than 100 turbines reacting to different wind conditions at the same time, GE's WindCONTROL® system is able to make a wind power plant operate more like a conventional power plant. The WindCONTROL® system also satisfies many emerging grid code requirements related to wind plant power response.

Today there are over 6,000 of GE's wind turbine generators operating around the globe with the WindCONTROL® system. With the ability to supply and regulate reactive and active power to the grid when it is needed, this system is becoming a standard feature requested by developers and utilities. The ability to supply and regulate reactive and active power is also becoming a requirement of many interconnection agreements and GE's WindCONTROL® system assists in meeting these requirements.

WindCONTROL® system features include:

- Maximum power limits
- Power-frequency droop
- Power ramp rate limits
- Startup/shutdown
- Integrated capacitor/reactor bank control
- Line drop and voltage droop compensation

WindFREE™ Reactive Power Feature

GE's patented WindFREE™ Reactive Power feature provides smooth fast voltage regulation by delivering controlled reactive power through all operating conditions. By supervising individual wind turbines, the WindCONTROL® system ensures that the reactive power performance of a wind power plant can meet—and often exceed—the performance of a conventional (non-wind) power plant.

Even when wind turbines are not generating active power, GE's wind turbine generators equipped with the WindFREE™ Reactive Power control feature can provide reactive power.

The provision of continued voltage support and regulation provides grid benefits not possible with conventional generation, while mitigating adverse voltage impacts of wind turbines being off-line due to wind conditions.

This feature can eliminate the need for grid reinforcements specifically designed for no-wind conditions, and may allow for more economic commitment of other generating resources that will enhance grid security by reducing the risk of voltage collapse.

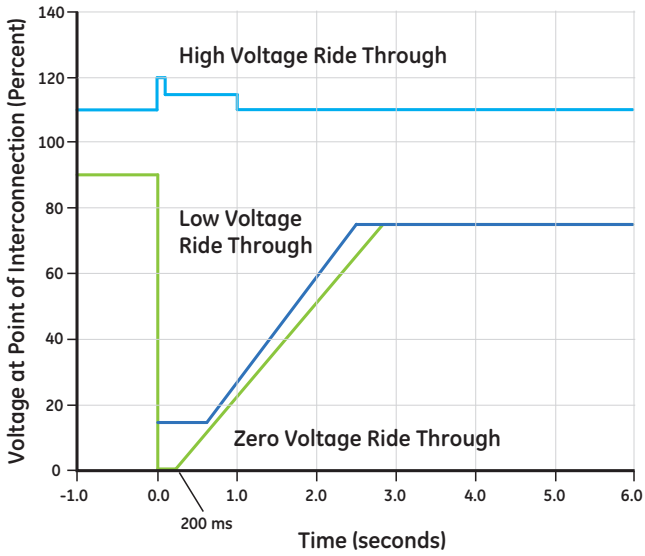
WindRIDE-THRU® Feature

With GE's patented WindRIDE-THRU® technology, wind turbines can remain on-line and feed reactive power to the electric grid through major system disturbances. This innovative feature enables wind turbines to meet transmission reliability standards similar to those demanded of thermal generators.

As wind power plants increase in size and contribute a larger share of the power industry's supply portfolio, the ability to provide truly uninterrupted service has grown in importance. Since system disturbances are a fact of life on utility grids around the world, GE continually develops progressively more disturbance-tolerant wind power plants.

Our innovative WindRIDE-THRU® technology offers Low Voltage Ride Through (LVRT), Zero Voltage Ride Through (ZVRT) and High Voltage Ride Through (HVRT) capabilities. The ZVRT package is compliant with the new U.S. Federal Energy Regulatory Commission (FERC) ride-through requirements. These WindRIDE-THRU® features are available to meet various application needs that satisfy both present and emerging ride through requirements.

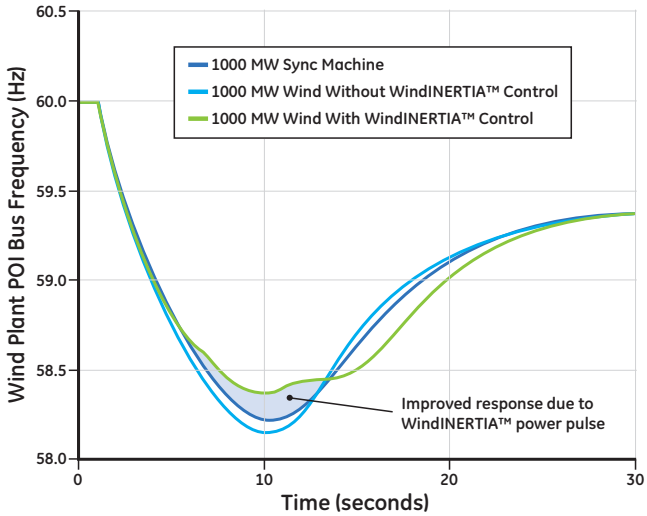
GE's Standard WindRIDE-THRU® Offerings



WindINERTIA™ Control

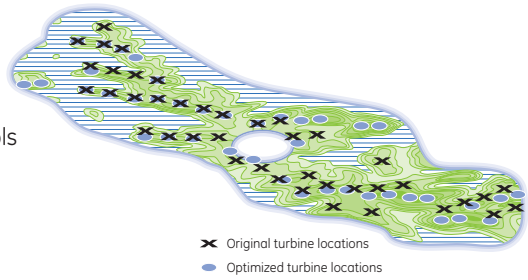
GE's patented WindINERTIA™ control provides an inertial response capability for wind turbines that is similar to that of conventional synchronous generators during under-frequency grid events. By utilizing the mechanical inertia of the rotor, GE has designed the WindINERTIA™ power pulse characteristics to provide a 5% to 10% increase in turbine power over operational wind speeds. The duration of the power pulse is up to several seconds and benefits the grid by allowing other non-wind power generation assets time to respond by increasing power production.

Simulated System Response Following a Trip of a Large Generator



WindLAYOUT℠ Service

GE's WindLAYOUT℠ Wind Plant Optimization service provides an opportunity to increase annual energy production by optimizing the turbine layout for a site. This service utilizes a powerful set of technically advanced optimization tools that directly integrate turbine performance, mechanical loads, site conditions, and project constraints for maximizing energy production. These optimization tools can be tailored to customer needs based on cost and financial metrics that drive wind power plant development.



WindSCADA System

GE's WindSCADA system provides a broad set of intuitive tools for operation and maintenance of the wind power plant. From production reports to wind turbine monitoring and control, these tools meet the needs of the operator, maintenance staff, and owner.

Operator/Technician Maintenance Tools

The WindSCADA viewer application is used for operation and maintenance of the equipment. This viewer is accessible from any wind turbine as well as from the operations and maintenance building. It also can be used remotely with a secure Internet connection or a telephone line. To address the ever-growing security requirements in SCADA systems, user access control is integrated into the entire system and provides an audit trail for all activity.

Owner Tools

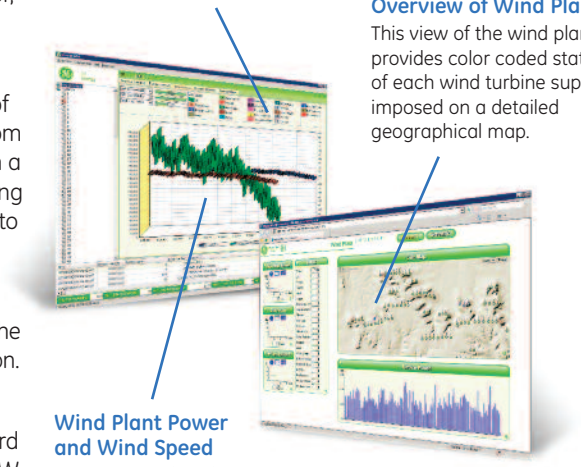
A large set of production and maintenance reports are available to enhance the owner's ability to drive productivity across all aspects of the wind plant operation.

WindSCADA Compact

GE also offers the WindSCADA Compact system, which provides the standard WindSCADA software capability for wind plants with rated capacities of 50 MW or less. GE's WindSCADA Compact is a cost-effective solution for smaller wind plant owners who do no have a substation or control room for accommodating the standard SCADA system rack.

Wind Plant Status
Color coded summary of how many wind turbines are in each mode.

Web-based Graphical Overview of Wind Plant
This view of the wind plant provides color coded status of each wind turbine super-imposed on a detailed geographical map.



Wind Plant Power and Wind Speed
Recent time plot of wind speed and generated power.

GE Energy is one of the world's leading suppliers of power generation and energy delivery technology. We provide our customers with equipment, service and management solutions across the power generation, oil and gas, transmission and distribution, distributed power and energy rental industries.

As one of the world's leading wind turbine suppliers, our current product portfolio includes wind turbines with rated capacities ranging from 1.5 MW to 3.6 MW and support services reaching from development assistance to operation and maintenance. We currently design and produce wind turbines in Germany, Spain, China, Canada and the U.S.

Our facilities are registered to ISO 9001:2000. Our Quality Management System, which incorporates our rigorous Six Sigma methodologies, provides you with quality assurance backed by the strength of GE. We know that wind power will be an integral part of the world energy mix in this century and we are committed to helping our customers design and implement energy solutions for their unique energy needs. Every relationship we pursue bears our uncompromising commitment to quality and innovation.

To find out more about how you can increase the performance of your wind power plant, contact your GE Energy representative at:

www.ge-energy.com/wind

imagination at work

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