Ovation™ SCADA for Wind Energy Management

Features

- Integrated monitoring and supervisory control of individual wind turbine generators within a single wind farm or across multiple wind farms
- Turbine protection through protective supervisory shutdown and programmed supervisory stop
- Open and accessible control and graphics provide complete operating status details for individual turbines
- Performance optimization through power curve and production potential features
- Supervisory control of switchgear
- Battery storage integration
- Historian, diagnostics and alarm functionalities

Introduction

Worldwide, wind farms are growing in number and size as global demand for renewable energy increases. To keep pace, smarter and more efficient supervisory control and data acquisition systems for wind farms are required.

Advancements in wind generation control enable operators to monitor and control individual turbines and their communication network. SCADA technology allows for these individual wind turbine generators to be interconnected and viewed through a single platform.

Integrated Control

Emerson is an internationally recognized solutions provider and industry leader backed by decades of automation technology experience and process knowledge. Emerson solutions are specifically designed to help customers in the power generation industry manage and optimize their energy production operations.

Emerson’s Ovation™ SCADA solution can manage a wind farm generation resources, minimize turbine generator downtime and maximize their availability.

Based on the Ovation SCADA communication server, this solution features advanced control and diagnostic functions that optimize wind farm operations.

Furthermore, the Ovation SCADA architecture is based on redundant communication schemes which increases plant reliability and is flexible enough to be expanded to meet future growth demands. Emerson’s comprehensive Ovation SCADA solution ensures that wind farms operate reliably and efficiently through:

- Integrated control and monitoring of individual wind turbines within a single wind farm or across multiple farms
- Protective supervisory shutdown and programmed supervisory stop for turbine protection
- Individual turbine operation status details
Applications

Supervisory Control

Ovation SCADA provides supervisory control of a wind farm’s assets, allowing overall monitoring of individual turbines’ status and details. Ovation eliminates the “black box” and gives owners control through industry-standard SAMA graphics. Through the Ovation signal diagram viewer, users have full view of what is happening and, depending on authorization level of the operator, may make changes in the control logic.

An interactive wind farm overview graphic provides access to supervisory control of each wind turbine generator that include start, stop, reset and tag out functions. The graphic can be customized to match any wind farm’s configuration.

Protective Supervisory Shutdown

The direction and speed of wind on a farm can promptly change at any time. Adverse conditions, such as strong winds that blow directly parallel to a turbine, can potentially cause damaging vibrations to the turbine blades. Ovation’s protective supervisory shutdown will safeguard the wind turbine generator automatically when certain predefined site conditions are reached.

Programmed Supervisory Stop

A programmed supervisory stop is similar to the supervisory shutdown function except that it is based on other wind farm conditions that require turbine curtailment.

Ovation includes supervisory stops for conditions including:

- **Shadow flicker** – Depending on sunlight direction and angle, some wind farms have local regulations for adverse stroboscopic or shadow effect that wind turbine blades can have sometimes on humans looking up at the rotating turbines. Ovation SCADA can stop the turbines as necessary to alleviate the stroboscopic conditions and meet local regulations.

- **Bat or bird mitigation** – Installation of more wind turbines increases their impact on migrating bird and bat populations. Ovation SCADA helps to manage wind turbine impacts on bird and bat migrations by curtailing operations during high risk periods.

When the supervisory stop conditions have cleared, Ovation SCADA automatically restarts operations.

Turbine Operating Status Details

Shifting environmental conditions inherent in wind farms require that individual turbine operating status details be immediately viewable and manageable.

Operators have direct access to critical operating status details for the chosen individual turbine through the Ovation overview graphic. Status details are based on data received from different interfaces, such as the turbine generator controller, substation and the meteorological tower.

Power Curve

A wind turbine power curve indicates the expected electrical power output for a turbine at varying wind speeds. The power curve included with the Ovation SCADA solution tracks performance of the machine and facilitates determining intervals and requirements for blade cleaning. The power curve can be used to measure turbine efficiency and identify any turbines that are underperforming.

Production Potential

A wind farm’s production potential depends on several factors including wind speed and direction, condition of the turbine generator and local regulations.

The Ovation SCADA solution forecasts energy production potential for a pre-defined period based on the known state of factors. This feature helps customers estimate power production and plan for turbine maintenance.
Supervisory Control of Switchgear

An Ovation SCADA interface to the substation provides supervisory control of the switchgear.

While various protective switchgears automatically operate as designed, the Ovation SCADA interface allows certain manual actions (such as open or close operation) by operator demand, providing proper interlocks in the system.

Using one Ovation SCADA platform for both turbine and switchgear control improves management of all system equipment, reduces training time, simplifies the control solution and reduces maintenance costs.

Battery Storage

The Ovation platform is also capable of integrating battery storage systems into the SCADA solution. Through an energy management system for battery storage, Ovation controls charging and discharging of battery cells to regulate the ramp rates of generated power.

The Ovation SCADA solution works with the battery storage system to reduce wind farm output variability and help meet mandates for supplying power to the grid.

Maintenance, Diagnostics and Alarms

Wind turbine generator maintenance management schedules and history are easily tracked through the Ovation historian functions and reporting tools. The storage capacity of the historian can be tailored to the needs of the wind farm.

The Ovation historian provides tools for creating custom graphical trends to monitor various equipment and conditions on the farm including:

- Outside temperature
- Wind speed and direction
- Farm power output
- Percentage utilization of farm capacity
- Number of operating turbine clusters
- Production potential forecast

Diagnostic information provided by third-party systems for the turbine’s original equipment manufacturer, the meteorological tower and the substation is available in the Ovation SCADA system through data links.

Moreover, the Ovation alarm management system provides immediate notification of a potential issue which allows operations and maintenance personnel to quickly assess and diagnose problems with any wind turbines or other equipment that are part of the SCADA system. Clear fault information and first-out algorithms are used to simplify alarming for quickly addressing the root cause of an event.

Summary

The Ovation SCADA system for wind energy management is an integrated solution that provides complete monitoring and supervisory control of a wind farm’s assets.

User-friendly and easily accessible graphics allow operators to monitor and control energy generation, while the distributed architecture increases plant reliability through redundant communication schemes.

The Ovation SCADA system ensures turbine protection and maximization of asset productivity as well as total plant coordination through seamless interfaces with other in-plant assets.

As a comprehensive solutions provider, Emerson also delivers long-term support through remote and on-site technical assistance, cybersecurity solutions and operator training throughout the solution’s lifecycle.