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Wind farm automation: Turning the Eaton solution to your advantage

The development of innovative technologies to efficiently produce, transmit and deliver electricity is a goal for Eaton, a leader in the Smart Grid industry.

In the past years, Eaton has created automation technologies to enhance the reliability and efficiency of wind power industry. Throughout its work on the subject, Eaton has understood that this technology requires specific solutions in order to use this clean and inexhaustible source of energy at its fullest.

In the last decade, governments all around the globe have commissioned hundreds of wind farms automation projects, turning wind into a more powerful asset and promoting it as a clean and innovative source of energy. The current public interest and government investments ensure that this emerging industry's activities will only be increasing in the upcoming years.

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Powering Business Worldwide

Wind farm project automation requirements

The emergence of wind farm projects in the past years led to the development of new standards and requirements in data acquisition and monitoring systems.

First, wind farm data has to be collected from several heterogeneous data sources. Indeed, the new generation of wind farm communication systems is mainly based on three types of data sources: wind turbines, weather stations and substation data. Substation data is essentially gathered from Intelligent Electrical Devices (IEDs).

Second, the collected data needs to be communicated to several clients such as Supervisory Control and Data Acquisition (SCADA) systems deployed at control centers (CC), substation local Human Machine Interface (HMI), and off-site data historians.

Third, wind farm data is collected in a raw format and may not be helpful for the decision-making process. Therefore, it will be necessary to perform advanced operations, such as data correlation between different data sources, and advanced calculations to help end-users in forecasting and making decisions.

Eaton provides leading innovative products, expertise and services to help you meet the above requirements in your wind farm projects.

Eaton essentials for the successful automation of wind farm projects

A wind farm includes a certain number of wind turbines usually deployed over a very large territory. Therefore, centralization and transmission of strategic data coming from the acquisition systems is quite a challenge. As always, Eaton is prepared to automate these wind farm projects and efficiently gather this crucial information with its global Smart Grid product line. At the center of this offer lies the Eaton's flagship product for any automation project: The SMP Gateway automation platform.

SMP Gateway: The core of a successful wind farm automation project

The SMP Gateway automation platform is a crucial asset for any wind farm project.

First, the SMP Gateway can easily communicate with various IEDs, using a large number of protocols, and concentrates the data retrieved from each of them. The SMP Gateway displays the same flexibility on the control center side, processing the concentrated IED data and transmitting it to any master station or control center using standard or proprietary protocols. This data concentration ability gives the opportunity of not having to connect each device individually to the control center, thus reducing considerably the amount of wiring.

Communication between wind turbines and the SMP Gateway is made possible by very specific standards. The SMP Gateway supports among others the IEC 61850 and IEC 61400-25 standards; the IEC 61400-25 is an IEC 61850 specialization created specifically to provide steady information exchange for wind farms' surveillance and management. Furthermore, Eaton produces one of the few data concentrators that support the IEC 61400-25 standard, making it an important asset for any wind farm automation project. With the SMP Gateway supporting these standards and their corresponding protocols, it is much easier to gather the data coming from the turbines. Eaton was one of the first to fully support the IEC 61850-MMS and IEC 61400-25 protocols on its substation gateway.

Thus, the SMP Gateway has the possibility to easily transfer all processed and translated data to the SCADA using protocols like DNP3, IEC 61850-MMS, IEC 60870-5-104, etc. The performance and reliability of the SMP Gateway can be improved tenfold using these TCP/IP-based protocols through the optional SMP Gateway fiber-optic Ethernet connectors. As such, Eaton is well positioned to offer an innovative and avant-garde solution to all wind farm automation demands in terms of IEC 61850 and IEC 61400-25.

The second important feature of the SMP Gateway is the integrated Soft PLC module. Based on the IEC 61131-3 standard, this module has complete access to the SMP Gateway data, allowing it to run control and automation algorithms on the data coming from the wind turbines and making it available to multiple clients according to their needs. For example, Soft PLC will process the collected data and generate non-operational information that will serve for production and wind power forecasting, as well as operational information such as turbine status, turbine counters, active power of each turbine and total power of the wind farm. Furthermore, periodic statistical information can be generated, reducing communication bandwidth usage between the master station and the substation.

Integrating these communication protocols and calculation capabilities, the SMP Gateway represents a Smart Grid solution for wind farm automation and the most aligned with Eaton customer requirements. With this solution, Eaton has successfully delivered a large number of wind farm automation projects involving various turbines from different manufacturers.

Visual T&D: The ideal HMI for local operation and control

Visual T&D is a Human Machine Interface (HMI) that interacts with a substation environment in real-time and with minimum configuration effort in order to provide immediate access to all data points.

This product has been created to become the default HMI for local operation and control of a substation and to help the on-site supervision and control of IEDs. As part of the Eaton solution for wind farm automation, one of its greatest advantages is its interoperability and integration capacity with the SMP Gateway automation platform. Visual T&D is also easily configurable to integrate the SMP Gateway, which reduces engineering costs.

Moreover, among the various expenses included in a wind farm project, Visual T&D is an affordable but valuable investment for the success of the automation of a whole wind power operation.

SMP distributed I/O: A worthwhile addition at the substation level

The SMP I/O and SMP IO-2230 platforms are Remote Terminal Units (RTU), which main function is to monitor up to 34 or 64 binary/analog data points. Moreover, they ensure data integrity between the data point and the SMP Gateway automation platform, thanks to the support of the DNP3 protocol. It also allows control operations through binary output points.

These SMP distributed I/O platforms were designed for an easy integration and a minimized configuration with the SMP Gateway automation platform, along with the ability to communicate using fast and reliable GOOSE messaging. In addition, the SMP I/O form factor of 1U makes it very easy to install in a rack. These SMP distributed I/O platforms also help trim down costs and save time by reducing both required wiring and configuration.

The Eaton global solution for wind farm automation

Knowing that engineering costs for the automation of a wind farm primarily include the setup and integration of devices, the price to pay for these operations can be quite high.

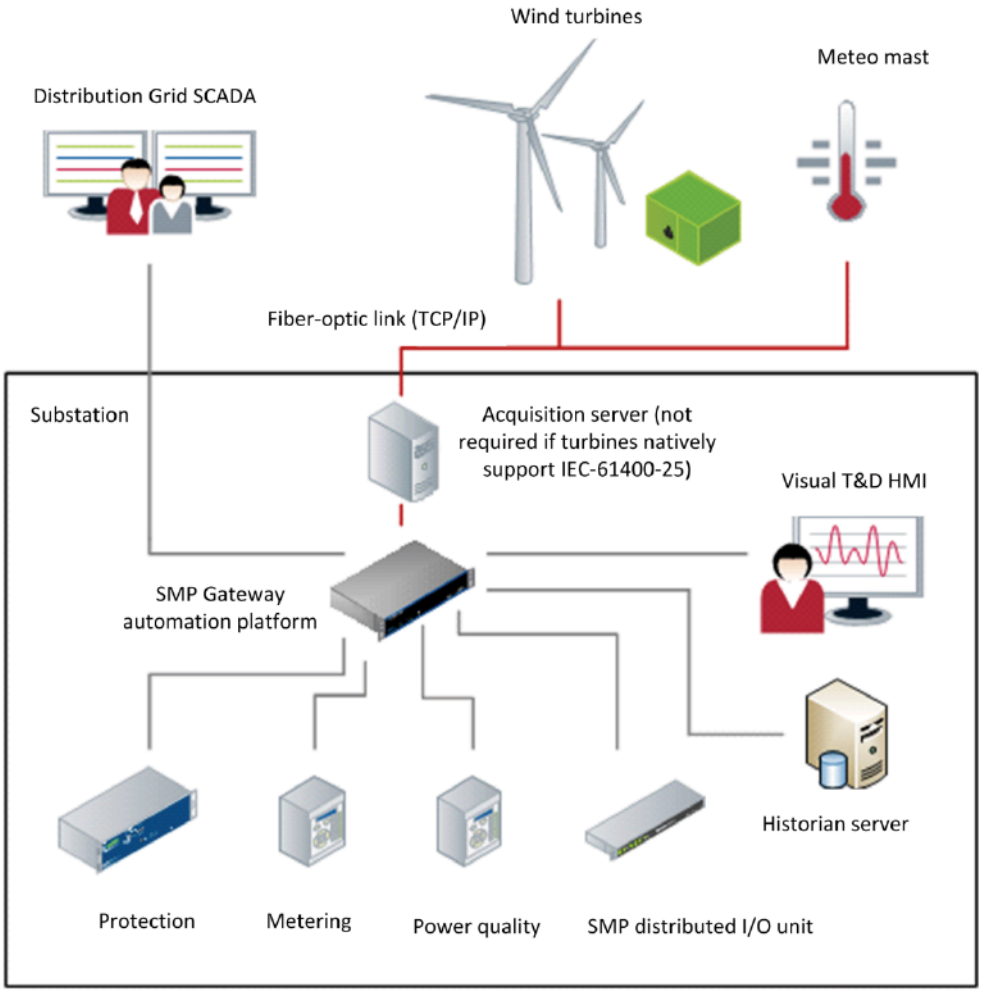
However, Eaton products interoperability facilitates the integration of its combined devices and software for the automation of wind-propelled installations, offering customers a turnkey solution to drastically reduce engineering expenses.

This solution is based on the numerous communication protocols and standards that are integrated and supported by Eaton's products that are listed above. This greatly eases the configuration of Eaton devices and allows a smooth retrieval and exchange of operational data.

A great asset of this Eaton solution is the data concentration capacity of the SMP Gateway automation platform and its interoperability with other IEDs which facilitate the data transfer to the SCADA or control center.

In addition, Visual T&D can easily access the SMP Gateway and allows efficient monitoring and control operations directly within the substation. This link between the SMP Gateway and Visual T&D can save a lot of configuration time that would be unavoidable with another HMI. Also, the SMP distributed I/O platforms can be seen as an alternative IED for input/output operations that can be easily integrated with the SMP Gateway automation platform in order to easily transmit the information about the data acquisition of other IEDs.

In order to tackle wind farm automation challenges, Eaton offers a strong engineering expertise for the project management, the implementation of automation solutions and the integration of the substation IEDs and turbines. This makes Eaton a valued partner for your wind farm projects.



Getting assistance

If you have any questions regarding the performance, application, testing or repair of this or any other component of this product, do not hesitate to contact us. Our staff will be happy to assist you.

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