

# Digital Energy Solution

## — Wind Power Generation



© Chengdu Vantron Technology Co., Ltd. All rights reserved.

## Technical Background

The Fourth Industrial Revolution, or Industry 4.0, brings digital technology and physical technology together through data, contributing to the generation of interconnected enterprise operating modes featuring quick response to customer needs. From supply chain to intelligent factory, enterprises are using AI, robotics, edge computing technology, and cloud to make smarter and more timely decisions.

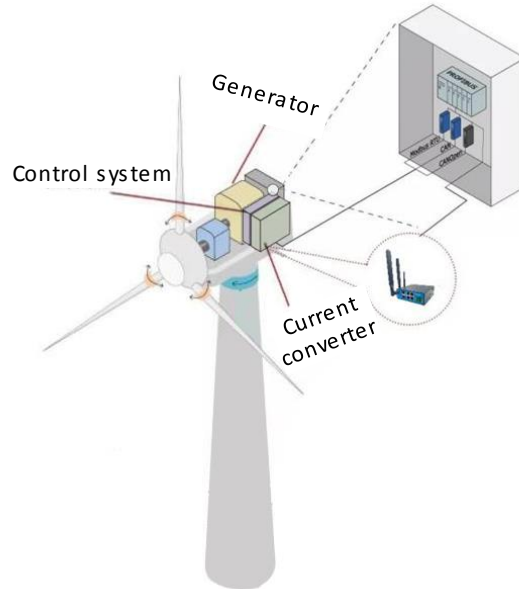
Industrial Internet of Things (IIoT) solutions often involve interconnected sensors and other edge devices to help enterprises improve product quality and enhance operational efficiency. Digital solutions combining data collection and analysis can effectively take advantage of IIoT for data analysis in almost real time, working loads integration, production optimization, and predictive maintenance, which together facilitate the automation process. Such solutions benefit enterprises in many ways such as reduced cost, accelerated time-to-market, improved production security and efficiency, and prolonged operating time.

## Industry Overview

The working principle of wind power generation goes like this: the wind rotates the turbine blades to convert the kinetic energy of the wind into mechanical energy, which is then converted into electrical energy by the generator in the nacelle. The voltage from the wind generator is usually 690V AC after the converter which is subsequently boosted to 35kV by the step-up transformer next to the tower. The combined power from the generator set is then converged to a collector line and transmitted to the transformer substations through the overhead lines. Transformer substations will again boost the voltage to 110kV or higher to feed to the electrical grid and distribute to thousands of homes.



In this process, the power converters and generators are usually used together so that the amplitude, frequency, and phase of the voltage output from the stator side of the generator are same as those of the grid. In this sense, variable speed constant frequency power generation is realized, the generation efficiency and quality are optimized, and the utilization of the wind energy is improved.



## Common Pain Points

“ Most of our converters use CAN and CANopen interfaces, which seems to be no problem when the master controller applies CAN/CANopen protocol for communication. However, today, a lot of master controllers are from Siemens and use PROFIBUS DP or PROFINET protocol to communicate, which poses a challenge for us. ”

— Customer A

“ If we use different gateways for different protocols, we have to prepare to increase cost and expand installation space. This also poses a latent problem of quality control, product testing and certification by different vendors. Moreover, we prefer not to change the hardware or software of the converters that perform stably in the field. ”

— Customer B

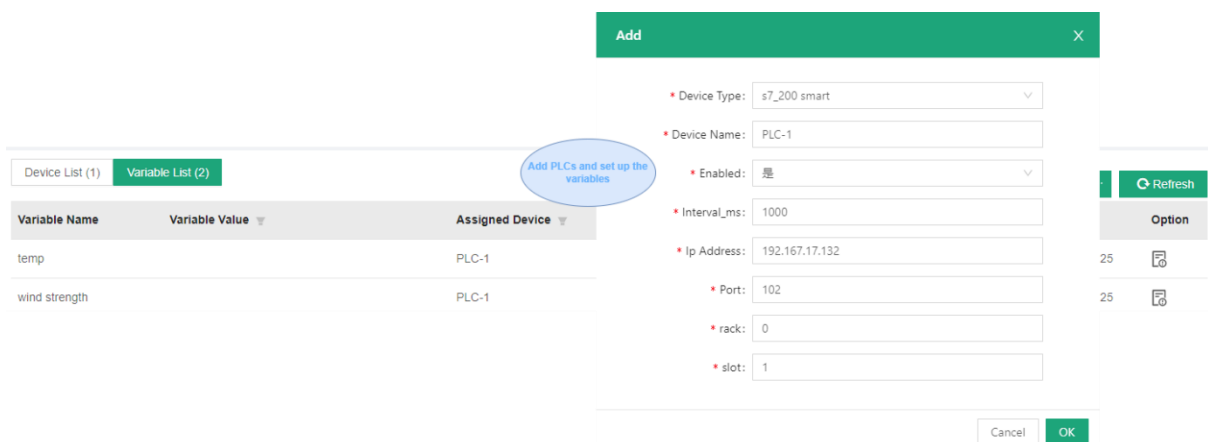
“ In most cases, wind turbines are installed in harsh environments like the wilderness, mountains, and seashores that are far away from the city. We need to make sure that the systems run in a stable and reliable manner because it might cause huge loss if there is a system failure or shutdown. ”

— Customer C

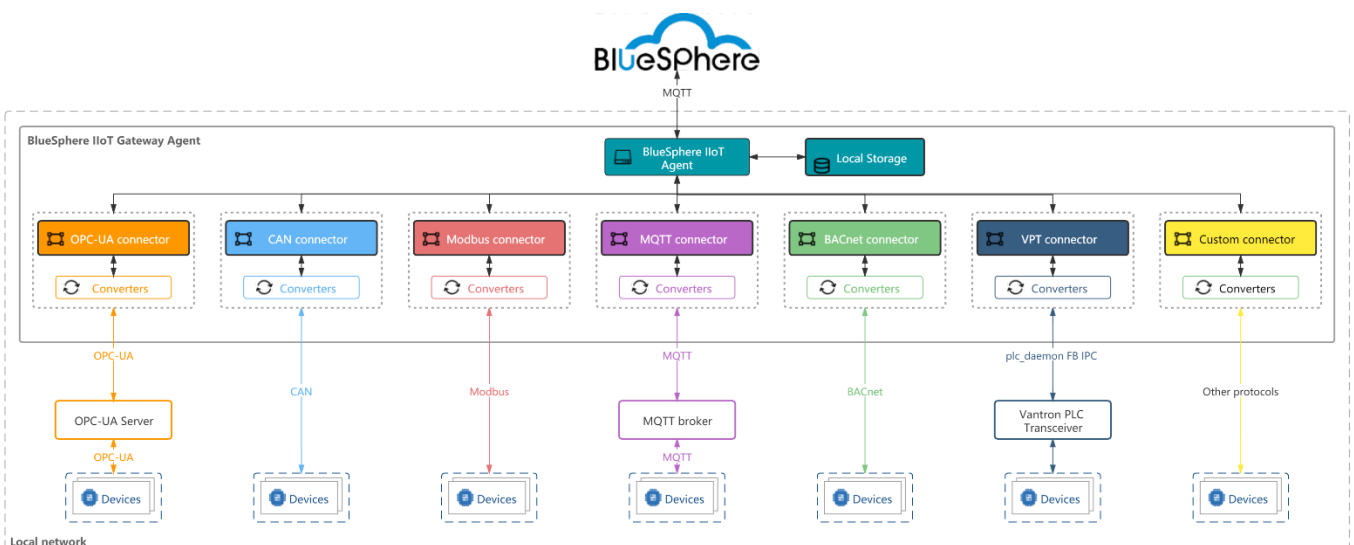
## Solution

It is required that the master controller inside the converter communicate with the master controller in the generator set. In this way, the data will be uploaded to the master controller of the generator set in a quick, stable and secure manner, and the control commands of the generator set will be delivered to the converter in a timely manner.

Our edge computing gateway solution supports a variety of real-time transport protocols for industrial fields, including the prevailing Modbus TCP/RTU, CAN and Siemens S7, etc. It also supports edge computing and provides custom development of software to achieve seamless communication with the master PLCs. The gateways feature high performance and high stability in harsh environments so that customers don't have to worry about frequent maintenance.



In addition, the deployment of BlueSphere IIoT, a cloud-based industrial IoT platform, enables intelligent monitoring of field devices involved, data visualization and energy efficiency analysis, saving customers up to 90% of the time for implementation and development of the project. The platform also enables remote control and OTA update of various devices, monitors the real-time operation status and pushes alarms for early warning. As such, customers can have a profound understanding of the site situation and take corresponding measures in a timely manner.



The wind turbine control system is complicated, requiring the master control system to work closely with the operational systems to realize the efficient transformation of the wind energy to electric power. As a crucial component of the system, the stable operation of the current converter system is the key to ensure constant frequency power generation. Our solution involves the embedded VantronOS (self-developed operating system) and edge computing gateways. Therefore, wind power converter can be seamlessly connected to the main control system without worrying about communication problems.

## **About Vantron**

Since 2002 established by two Silicon Valley entrepreneurs, Vantron Technology has been a pioneer in connected IoT devices and IoT platform solutions. Today, Vantron serves countless customers all over the world, some of them are Fortune 500 companies. Products lines cover edge intelligent hardware, IoT communication devices, industrial displays and BlueSphere device management cloud platform.

Vantron has over 20 years of experience in R&D of embedded edge intelligent hardware like SOMboard and motherboard, and provided users with various embedded solutions with ARM and X86 architecture, from Linux to Windows, from embedded to desktop level, from gateway to server. At the same time, we provide our users with system clipping, driver transplantation and other services.

Vantron industrial display systems, ARM and X86 series, are equipped with Rockchip, NXP, MediaTek, Intel and other high-performance processors. It supports various operating systems such as Windows, Linux, and Android. Diverse wireless communications keep your device online all the time. Multiple installation methods make it suitable for a variety of application scenarios. Features like waterproof, dustproof, shatter resistant guarantee the best performance in any environment.

Vantron has been a solution provider of IoT Gateways for many years, having accumulated very rich experience in this field. The products support both wired and wireless communication access to make remote operation and maintenance possible. From electricity and transportation to smart retail, medical and warehousing, Vantron IoT communication device can be deployed anywhere in any business section. Up to now, Vantron's IoT Gateway solutions have helped many companies finish their digital transformation, significantly improved efficiency of manufacturing and productivities.

Vantron BlueSphere device management platform, a software product, is playing a big role in Vantron overall IoT solution. Today, Vantron puts more focus on offering complete cost effective, leading-edge yet reliable solutions to help customers carry out their visions.