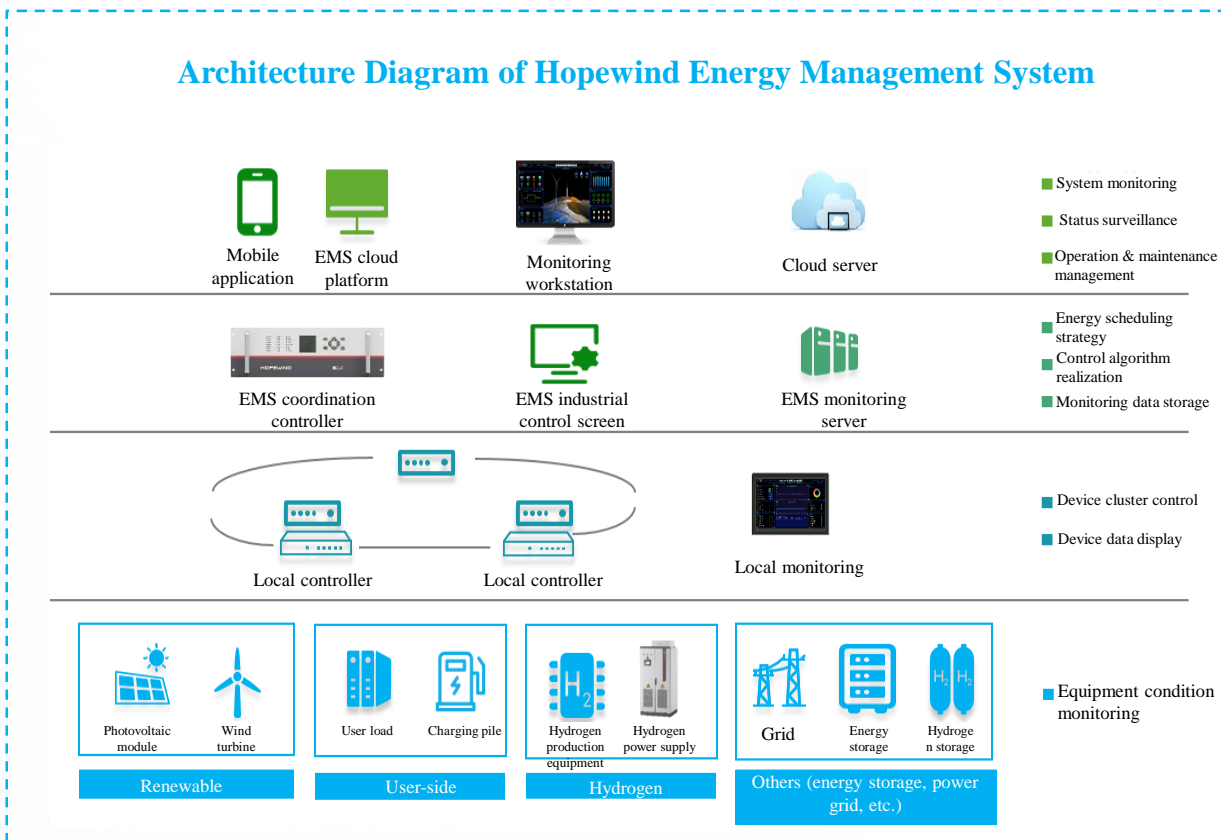# Hopewind Energy Management System

Hopewind Energy Management System

Introduction of the System

The construction of a new type of power system in China has been full-fledged and pushed forwards to an important period, so it requires great efforts to fully explore the resources for system flexibility adjustment from various aspects including power generation, grid, load and energy storage, in order to ensure the safe and stable operation of the system and the high proportion consumption of renewable energy. In response to the multi-source flexible scheduling and multi-device coordination and control requirements involved in scenarios of generation, Grid, load, and storage , our company offers safe, stable and reliable energy management system solutions. The solutions are designed with "software centralized architecture" and "hardware distributed architecture" to highly match the customer needs.

Hopewind Energy Management System is a comprehensive control center for distributed power supply, energy storage equipment and user-side equipment. With multi-source energy scheduling and multi-device coordinated control functions, it enables to deliver solutions for various application scenarios such as **renewable energy stations, energy storage power stations, micro-grid, and green power hydrogen production according to specific needs.**

### Architecture Diagram of Hopewind Energy Management System

With highly modular design, Hopewind energy management system is characterized by customized strategy, customized configuration, cross-platform operation, etc. The system is compatible with multiple hardware platforms (industrial control computer, embedded industrial control screen) and operating systems (Linux, Windows, domestic Linx, etc.), so it can meet the requirements of operating environment in different application scenarios.

Rapid Frequency and Voltage Regulation Solutions to Renewable Energy Stations

The rapid frequency and voltage regulation system of renewable energy stations is specially designed to address the instability and volatility between the renewable energy (such as wind and solar) power station and the power system. These stations are often challenged by frequency and voltage fluctuations, peak load clipping, and power system stability.

The rapid frequency and voltage regulation system in the Hopewind renewable energy station works with the unit group control platform of the station (PPM/SCADA/EMS) to achieve AGC/AVC closed-loop control. The system offers the functions such as primary frequency modulation, inertia response, rapid voltage regulation, and coordinated control of wind/PV energy storage. The products are intended to improve the grid-related characteristics of renewable energy stations. They are in strict accordance with the technical specifications and requirements of each local power grid for renewable energy stations, demonstrating outstanding performance, stable and reliable operation.

Rapid Frequency Modulation Voltage
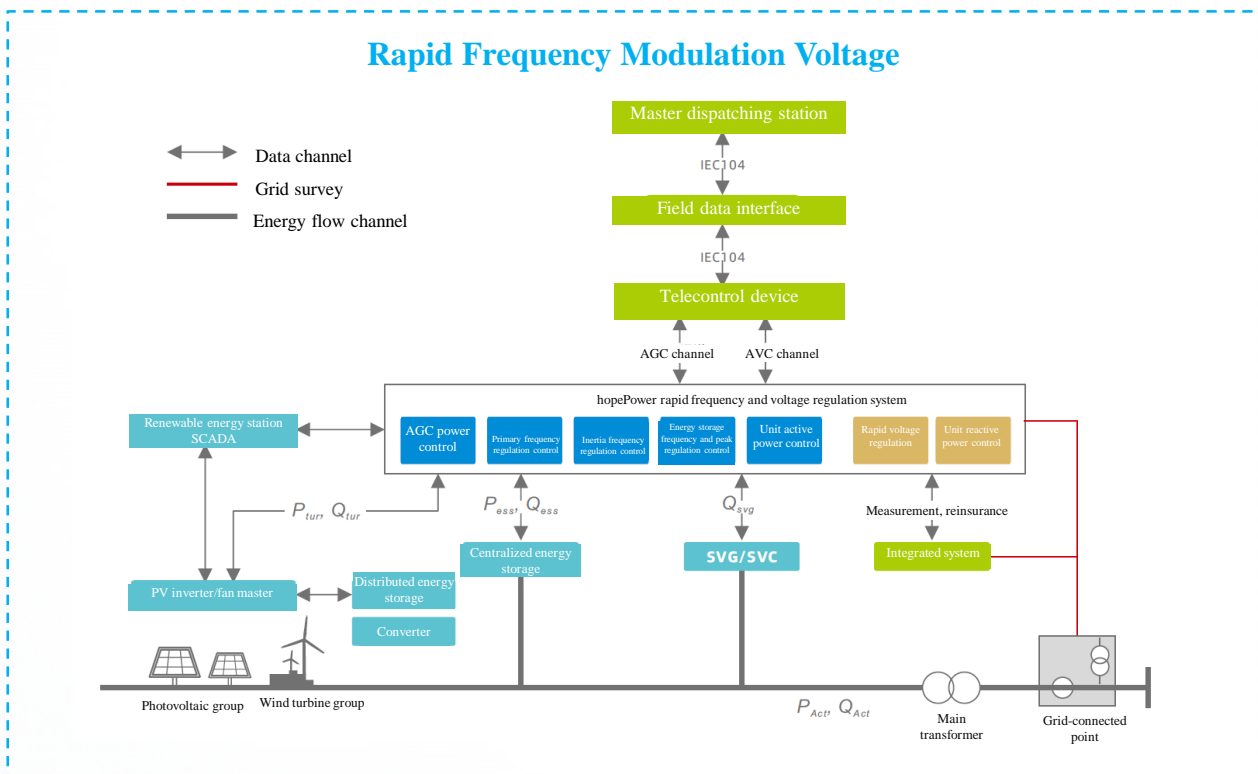
- Suitable for renewable energy station to improve the grid-connected characteristics of power station and ensure the power supply stability of power system

- Support rapid frequency modulation, voltage regulation and coordinated control of wind and PV power storage to meet the requirements of local power grids

- Support hot standby backup. The master and backup units support automatic data mirroring, monitoring to ensure reliable operation of the system

- Support IEC101/104, Modbus, IEC61850 and other communication protocols to satisfy different requirements of the project

- Offer adaptive monitoring system and support test mode, suitable for frequency regulation, voltage regulation and other test items

Energy Management Solutions to Energy Storage Power Stations

Energy storage power stations are often deployed on the power generation side and the power grid side to meet the peak and frequency regulation requirements of the power system, featuring high energy storage capacity, multiple equipment and fast response. Energy management solutions to energy storage power stations are designed to realize coordinated control and real-time response of the energy storage system, and further improve the operational stability of power system, favorable for balancing the power supply and demand, improving the consumption of renewable energy and addressing the challenges of the power system.

The EMS system of Hopewind energy storage power station supports centralized or hierarchical control architecture. Thanks to the embedded real-time operating system on its coordination controller, the system enables to support multi-channel GOOSE communication, so it is possible to realize the access and real-time control of a large number of energy storage converters (PCS). Hopewind provides EMS monitoring platform with C/S or B/S architecture as needed, delivering complete and mature solutions for energy storage power stations of different scales.

Topology of the EMS System of Energy Storage Power Station
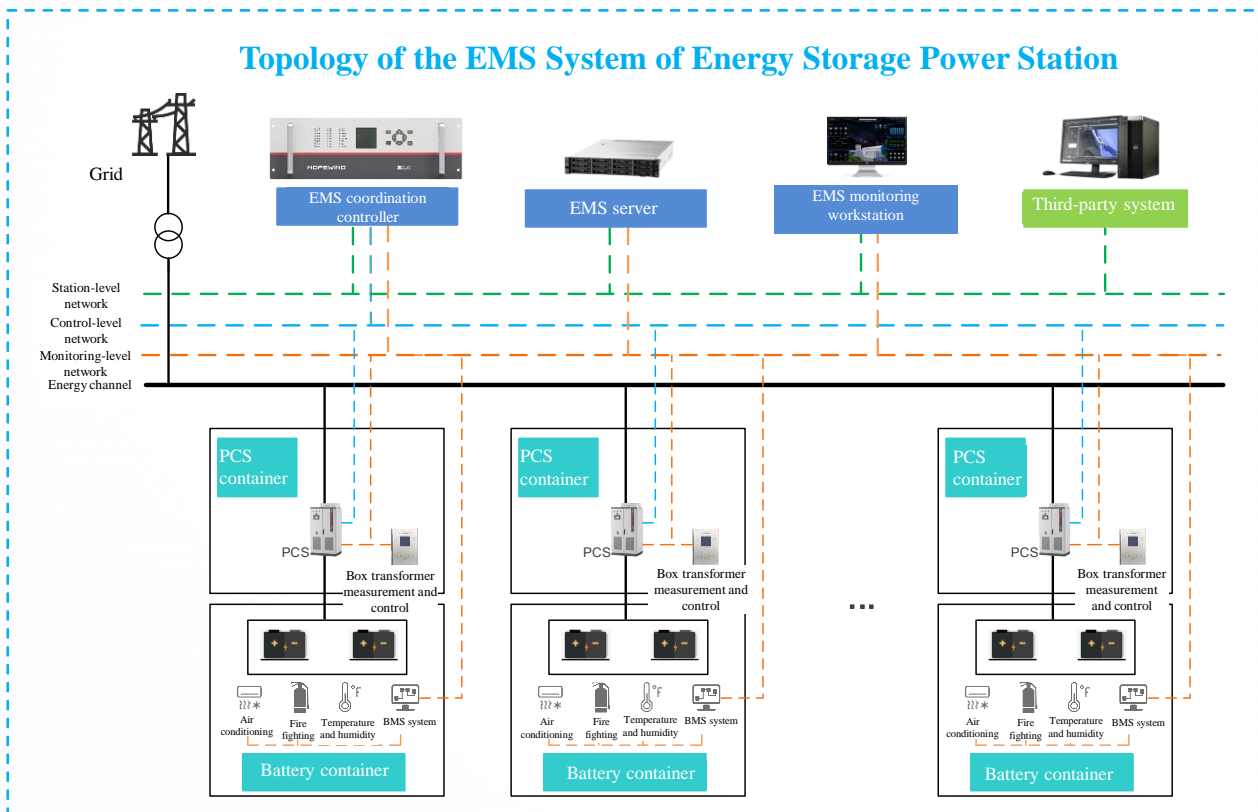
Suitable for the energy storage power station of power generation side and power grid side to fulfill the frequency and peak regulation demand of power grid and improve the power supply reliability of power system

Enable the coordinated control of over 100 energy storage PCS to effectively achieve SOC balance among multiple energy storage systems

Have station, monitoring, and control-level networks that are mutually independent, and support dual network connection to ensure system communication stability and security

Support C/S and B/S monitoring schemes, complete monitoring functions, and enable panoramic monitoring of the operating status of energy storage power station

Support a variety of communication protocols and IEC61850 protocols, as well as customized strategies; highly adaptable to the project requirements

400-8828-705
www.hopewind.com

HOPEWIND

Micro-grid Energy Management Solutions

Micro-grid, a new type of network structure, is a system unit consisting of distributed power supply, energy storage device, energy conversion device, load and protection device, etc. Micro-grid can fully promote the large-scale access of distributed power supply and renewable energy, and achieve the highly reliable supply of various energy forms of load, so it has wide application prospects in isolated islands, urban areas and remote rural areas.

Hopewind micro-grid EMS system serves as the brain and control center of micro-grid, and the software is highly modular. It supports customized system configuration and customized strategies such as off-grid and grid-connected control logic, which can meet the needs of micro-grid configuration in different system. Besides, Hopewind micro-grid EMS system also supports cloud platform deployment to realize remote monitoring, maintenance and management.

Topology of the Micro-grid EMS System
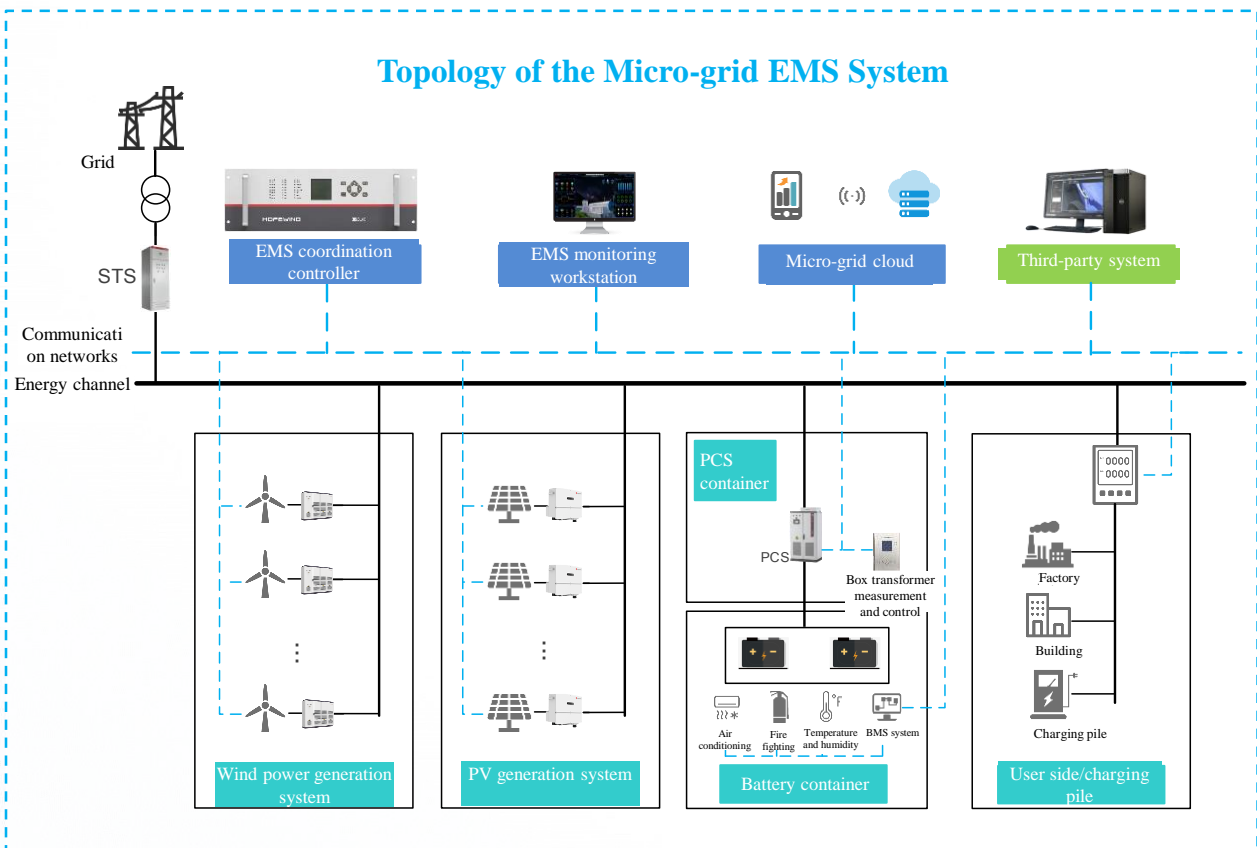
- Suitable for off-grid and grid-connected micro-grids in scenarios involving multi-energy complementation, spontaneous self-use, and remote areas without electricity

- Applicable for micro-grids of different scales in offering industrial control screen, coordination controller and other schemes for project cost reduction

- With modular design, the system can provide customized configuration and strategies to a specific project, and seamlessly meet the the project needs
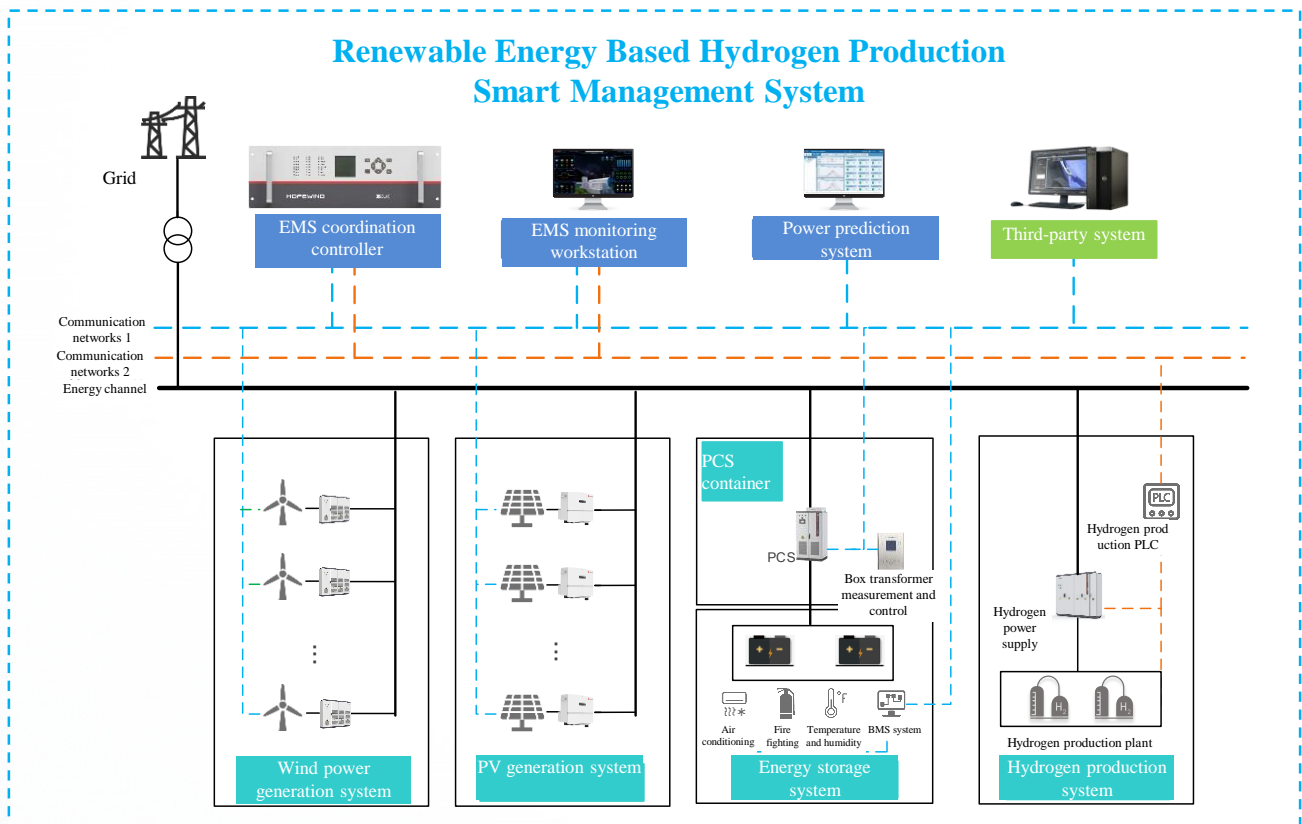
- Support localized deployment and cloud platform management, making unattended and remote maintenance possible

HOPEWIND

Renewable Energy Hydrogen Production Energy Management Solutions

Green power hydrogen production is to produce hydrogen directly from solar energy, wind energy and other renewable energy, and there is hardly greenhouse gases produced in the production process, but renewable energy power generation presents intermittence and fluctuation. Therefore, energy management system is employed to ensure the production, storage and utilization of renewable energy, and guarantee the stable operation of the power system and reliable power supply of hydrogen production equipment.

Hopewind Renewable Energy Based Hydrogen Production Smart Management System (EMS), supports multi-source energy scheduling and multi-equipment coordinated control, and it customizes green power hydrogen production control strategy to address the control characteristics and boundary constraints of hydrogen production equipment. In this way, it can realize the efficient use of renewable energy, secure the safe and reliable operation of hydrogen production system, maximize the hydrogen production efficiency, and provide visualized monitoring of green hydrogen production system.

Renewable Energy Based Hydrogen Production Smart Management System

Grid

EMS coordination controller

EMS monitoring workstation

Power prediction system

Third-party system

Communication networks 1
Communication networks 2
Energy channel

PCS container

PCS

Box transformer measurement and control

Hydrogen production PLC

Hydrogen power supply

Air conditioning

Fire fighting

Temperature and humidity

BMS system

Hydrogen production plant

Wind power generation system

PV generation system

Energy storage system

Hydrogen production system

- Suitable for hydrogen production in renewable energy stations, micro-grid hydrogen production and pure off-grid hydrogen production

- Calculate the hydrogen production planning curve based on power prediction to improve renewable energy consumption and hydrogen production efficiency

- Stabilize the fluctuation in renewable energy power generation and reduce the influences of renewable energy power generation on hydrogen production system

- Use the control algorithm considering the operation characteristics of hydrogen production equipment, ensuring the reliability of hydrogen production system and prolong the service life of equipment

- Deliver the system architecture and networking scheme of multi-source energy scheduling and multi-device coordination control

Production Design

Hopewind energy management system is equipped with customized embedded real-time control platform. The control platform works in the "Real-time core + Communication core" mode, and enables real-time control and communication. It supports millisecond-level control tasks and rapid communication of various device, or seeks expansion of the number of control objects by virtue of the hierarchical control mechanism, thus meeting the needs of different application scenarios.
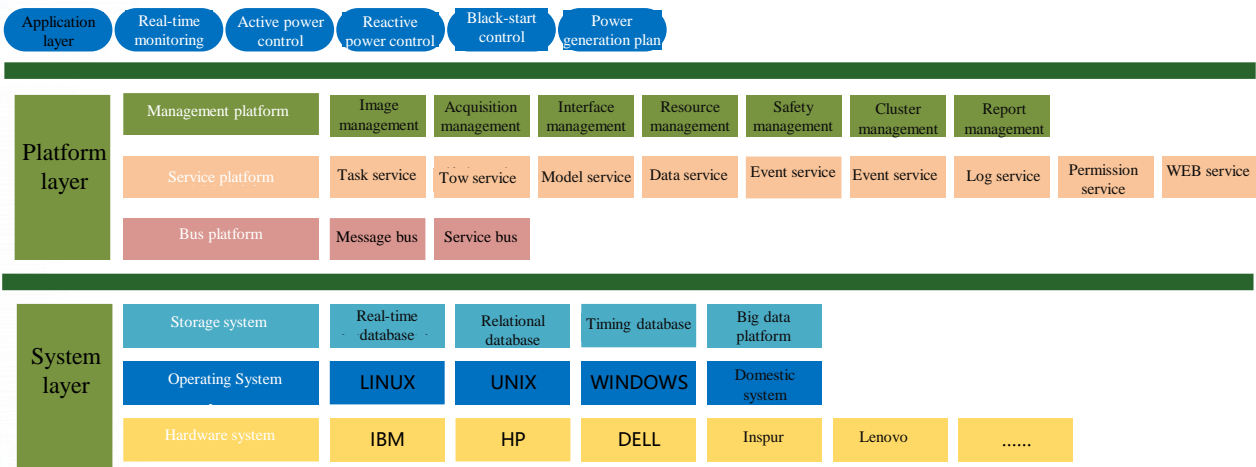

EMS coordination control unit

Specifications

Specifications			
Power supply	220Vac/50Hz (dual power)	**Communication protocol**	Modbus TCP/RTU、IEC101/104、IEC61850（GOOSE、MMS）
Communication interface	4*RJ45、2*RS485、6*SFP（GOOSE）	**Acquisition channel**	Support six-channel power acquisition
IO interface	16*DI、8*DO、8*AO	**Measurement accuracy**	Frequency measurement accuracy ≤ 0.001Hz, voltage and current measurement level 0.2
Operating System	Embedded Unix, Linux	**Timing mode**	In case of NTP and IRIG-B time code standards, the timing error should be ≤ 1ms
Working temperature	-40℃ to +65℃	**Hot standby backup**	Switching time ≤ 100ms
Storage temperature	-45℃ to +85℃	**Dual networking**	Support networking of network A and Network B via different protocols
Relative humidity	0–95%, no condensation, no icing	**Fault detection**	Support fault self-test and self-startup
Protection grade	IP30	**SOE recording**	≤ 1ms for devices on the same space layer

EMS monitoring platform

Hopewind EMS energy management system monitoring platform is developed to improve the energy efficiency, reduce the cost, ensure the compliance, promote sustainability and provide data support so that companies and institutions can better manage and optimize their usage of energy. The new generation of monitoring platform supports a variety of application scenarios on the user side and power grid side, software integrated SCADA, graphical model integration, topology management analysis, modular design, configuration design and other cutting-edge application technologies. It is able to provide complete and mature solutions for the monitoring of renewable energy stations, energy storage stations, micro-grids and hydrogen production stations of different scales.

Application layer	Real-time monitoring	Active power control	Reactive power control	Black-start control	Power generation plan

Platform layer

Management platform	Image management	Acquisition management	Interface management	Resource management	Safety management	Cluster management	Report management
Service platform	Task service	Tow service	Model service	Data service	Event service	Event service	Log service	Permission service	WEB service
Bus platform	Message bus	Service bus					

System layer

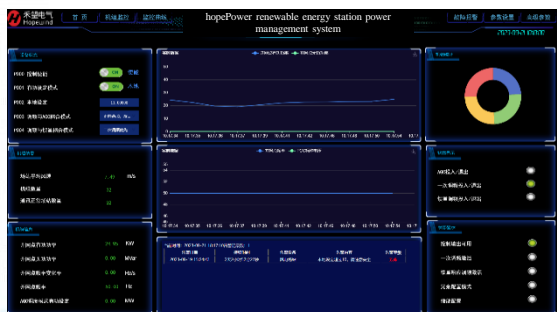| Storage system	Real-time database	Relational database	Timing database	Big data platform		
Operating System	LINUX	UNIX	WINDOWS	Domestic system		
Hardware system	IBM	HP	DELL	Inspur	Lenovo	......

Hydrogen production EMS monitoring
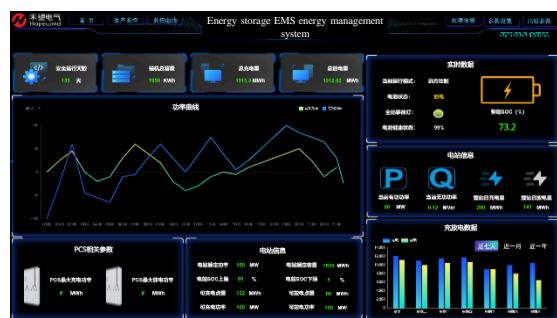
Energy storage EMS monitoring

Renewable energy distribution and storage monitoring

Rapid frequency and voltage regulation monitoring of renewable energy station

System features and functions

01

Stable operation

The control platform employs high-performance chip and real-time operating system, so the software and hardware are highly stable

02

Efficient and reliable

Adopt the software of modular design; support customized strategy, power distribution optimization, high control accuracy; support fault locating, recording and historical querying

03

Green power hydrogen production planning curve

Work out the hydrogen production planning curve according to renewable energy power prediction and system equipment status, to improve the hydrogen production efficiency

04

Support hot standby backup configuration

Support master and backup configuration and automatic master/backup switching to improve the system reliability

05

Multi-scenario applications

Offer solutions for various application scenarios such as power generation side, power grid side, user side and hydrogen production

06

Integrated architecture design

Customized integration and integrated design of various function modules

07

Support customized strategies

Support conventional control mode selection, automatic/manual adjustment, and also support customized strategy development to the customer needs

08

Quick response function

Receive the power control instructions from the upper system, enable fast processing of the energy storage system, and the delay in execution of power instruction is <20ms

09

Rapid frequency regulation function

Support real-time monitoring of the frequency at grid-connected points, adjust the system active power autonomously according to the primary frequency regulation drooping curve to meet the requirements of relevant specifications

10

Planning curve tracking

Support customized charging and discharging strategies at an interval of 5 minutes to obtain peak valley price spread arbitrage

11

SOC-balanced control

Through smart power distribution, optimize the SOC differences between batteries to achieve balanced status of the energy storage systems

12

Off-grid and on-grid switching

Through real-time monitoring of off-grid and grid-connected device status, switch the off-grid and grid-connected control strategies; support different operation modes

150 GW $^+$
SHIPMENTS WORLDWIDE