



恒丰赛特
Eversafe Technology

恒丰赛特

EverSafe Technology

Since 1996

WIND BUSINESS



企业愿景 Company Vision

恒丰赛特始建于1996年，集团总部位于美国纽约市，中国总部位于上海张江高科技园区。公司致力于为世界各地的客户提供高科技产品和解决方案，产品涉及风电、核电、化工、航油、环保等领域，在丹麦、美国、法国、德国、瑞典、新加坡、苏州、成都、大连、天津、深圳、甘肃、广州、新疆等地均有分部。我们秉承持续帮助客户成功的理念，在国家大力鼓励新能源发展的大背景下，以专业和开放的态度为客户提供最优秀的产品和解决方案，竭力优化产业资源，帮助客户提高核心竞争力。

EST was founded in 1996 with its American headquarters located in New York and Chinese headquarters located in Shanghai. EST provides high-tech products and solutions in wind power, nuclear power, chemical industry, aviation oil and environmental protection for customers all over the world, with branches in Denmark, USA, France, Germany, Sweden, Singapore, Suzhou, Cheng Du, Da Lian, Tian Jin, Shen Zhen, GanSu, Guang Zhou and Xin Jiang. EST insist that we should help customers be successful firstly. With China government deeply developing new energy, EST will provide the best products and solutions with professional and open heart. We will try our best to optimize new energy industry resources, help customers improving their core competitiveness.

愿景 Vision

以科技、创新为驱动力，成为行业翘楚！

With technology and innovation as the driving force, become the industry leader!

使命 Mission

提供全球最先进风电解决方案！

Provide the world's most advanced wind power solutions!

价值观 Values

客户至上，以人为本！

Customer first, People-oriented!

业务领域 Business Areas

工程 --- 由美国 G&C 与 GREAT 公司共同组建，是一家集多元化技术和制造为一体的跨国公司，主要为客户提供工程项目EPC、工业自动化系统集成、安全及环境监测系统等技术服务。在美国、法国、瑞士、丹麦、中国均有分支机构。

Project---Jointly established by American G&C and GREAT company, is a multinational company integrating diversified technology and manufacturing. It mainly provides technical services such as engineering project EPC, industrial automation system integration, safety and environmental monitoring system. EST have branches in the United States, France, Switzerland, Denmark, and China.



核电 --- 引进国外先进的技术，致力于国产化生产技术与销售，公司与中广核联合申报CPR1000示范项目，安全监测系统及部分传感器的国产化项目，并做出了卓越的贡献，获得中国核电行业科学技术奖。连续获得“高新技术企业”称号。

Nuclear Power---Introduction of foreign advanced technology, dedicated to the research and sales of localized production technology. EST and China Guangdong Nuclear Power Co., Ltd. joining the CPR 1000 demonstration project, localization projects of sensor safety monitoring system, and made outstanding contributions to obtain China's nuclear power Industry Science and Technology Award. Continuously win the "High-Tech Enterprise".



风电 --- 引进国际先进主控变桨技术及产品，同时自建本地化风电团队，吸收消化国外先进技术，研发出拥有自主知识产权的稳定主控变桨系统，集成风机控制及数据分析系统，布局风场技术服务与改造，提供大数据平台管理解决方案。近5年来，在国内拥有超过上千台风机的成功业绩。

Wind Power---Introduction of international advanced technology. Meanwhile, built local team, absorbed advanced technologies, developed stable main control / pitch control system with independent intellectual property rights, integrated turbine control and data analysis system, laid out the technical service and retrofit of wind park, and provided big data platform management solutions. In the past five years, we have achieved more than 1,000 successful performances in China.



环保 --- 从事智慧环保检测与治理，工业过程分析与运维等业务，包括 VOC 气体回收及处理、工业过程气体分析与水质分析系统的技术研究和应用开发。

Environmental Protection---Working in Intelligence environmental testing and management, industrial process analysis and operation and maintenance, including VOC gas recovery and treatment, industrial process gas analysis and water quality analysis system technology research and application development.



发展历程

1992—美国 G&C 在纽约成立，公司主营安全监测系统
1996—美国 GREAT 公司成立，主营核电领域传感系统
2006—美国恒丰赛特公司由美国 G&C 与 GREAT 公司共同组建，在纽约成立
2007—在法国巴黎成立了欧洲办事处
2008—入驻中国，在上海成立了恒丰赛特实业（上海）有限公司
2012—与中广核联合申报 CPR1000 国产化研发与应用项目立项
2013—复旦大学环境科学与工程学院联合研发项目成立
2014—恒丰赛特实业（上海）有限公司获批上海市高新技术企业
2015—与上海电力大学联合研发和生产光纤传感系统
2016—与上海电力大学联合开发装卸车系统数据平台
2017—与清华大学联合研发大数据平台管理系统
2018—拥有完整自主知识产权和专利的风电主控、变桨、SCADA、PPM、智慧能源管理系统产品面世

Development Path

1992—American G&C was established in New York, focus on safety monitoring system
1996—American GREAT company was established, mainly in the park of nuclear power sensing system
2006—American EST Company was founded by American G&C and GREAT company, located in New York
2007—Established a European office in Paris, France
2008—Entered China and established EST in Shanghai
2012—Jointly filed with CGNPC to declare CPR1000 localization R&D and application project
2013—R&D project with Environmental Science and Engineering of Fudan University was established
2014—EST was approved as the Shanghai High-tech Enterprise
2015—Joint development and production of fiber optic sensing systems with Shanghai Electric Power University and application and sales
2016—Joint R&D of big data platform management system with Tsinghua University
2017—Joint research and development of big data platform management system with Tsinghua University
2018—Launched the wind main control and pitch control and SCADA and PPM and Intelligence energy management products with complete independent intellectual property rights and patent

公司大事件 Company Event

1996

与中广核签订DCS系统框架协议

Signed a DCS system framework agreement with CGNPC

1998

石油罐区油气回收系统成功发布，并取得UL认证

The oil and gas recovery system of the oil tank area was successfully released and obtained the UL certification

2002

成功研发光波导分布式温度测量系统，并成功应用与呼和浩特炼油厂

Successfully developed optical waveguide distributed temperature measurement system and successfully applied it with Hohhot Refinery

2008

Wince嵌入式数据采集与检测系统研发成功，取得TUV认证，并成功应用于中石化长输管线泄露与安全系统示范工程机器人远程移动控制软件

Wince embedded data acquisition and detection system has been successfully developed, obtained TUV certification, and successfully applied to Sinopec long-distance pipeline leakage and safety system demonstration project

2010

机器人远程移动控制软件研发成功

Successful development of robot remote mobile control software

2016

获得核电行业科学技术三等奖

Received the third prize of science and technology

2017

与中国工程院院士、清华大学计算机学院及华为下属公司共同合作开发大数据管理平台，成功应用在核电及民航系统

Cooperated with tsinghua university and huawei subsidiaries to develop big data management platform, which has been successfully applied in nuclear power and civil aviation systems

2018

拥有完整自主知识产权和专利的风电主控、变桨、SCADA、PPM、智慧能源管理系统产品面世

Launched the wind main control and pitch control and SCADA and PPM and Intelligence energy management products with complete independent intellectual property rights and patents

研发成果 R & D results

风电事业部

- 2012—代理先进风电主控、变桨系统、SCADA系统，吸取丰富的风电经验，成立风电团队
- 2013—整合风电供应链，风电布局完成
- 2014—协助厂家获得主控、变桨系统GL认证，产品出口至国外
- 2015—引入变流器系统，整合为电控三合一系统，应用于国内风场
- 2016—销售主控系统、变桨系统、变流器系统、液压系统等累计突破1000套
- 2017—自有风电相关专利超过15个，与中国工程院院士、清华大学计算机学院及华为下属公司共同合作开发风电大数据管理平台，研发智慧风场系统
- 2018—拥有完整自主知识产权和专利的风电主控、变桨、SCADA、PPM、智慧能源管理系统产品面世

Wind Power Department

- 2012—Introducing advanced wind power main & pitch control system, SCADA system, drawing rich experience, establishing wind power team
- 2013—Integrate the wind power supply chain and complete the wind power layout
- 2014—Assist manufacturers to obtain GL certification of main control and pitch system, and export products to foreign countries
- 2015—Introducing converter system, integrated into electronically controlled three-in-one system, applied to domestic wind park
- 2016—Sales of main control system, pitch system, converter system, hydraulic system, etc. exceeded 1000 sets
- 2017—More than 15 patents related to wind power, cooprtion with the School of Computer Science of Tsinghua University and Huawei's affiliated companies jointly develop a wind power big data management platform and develop a Intelligence wind park system.
- 2018—Launched the wind main control and pitch control and SCADA and PPM and Intelligence energy management products with complete independent intellectual property rights and patents

资质证书 Certifications

技术专利

已获得专利33项；获得著作权5项；15项专利正在申报。

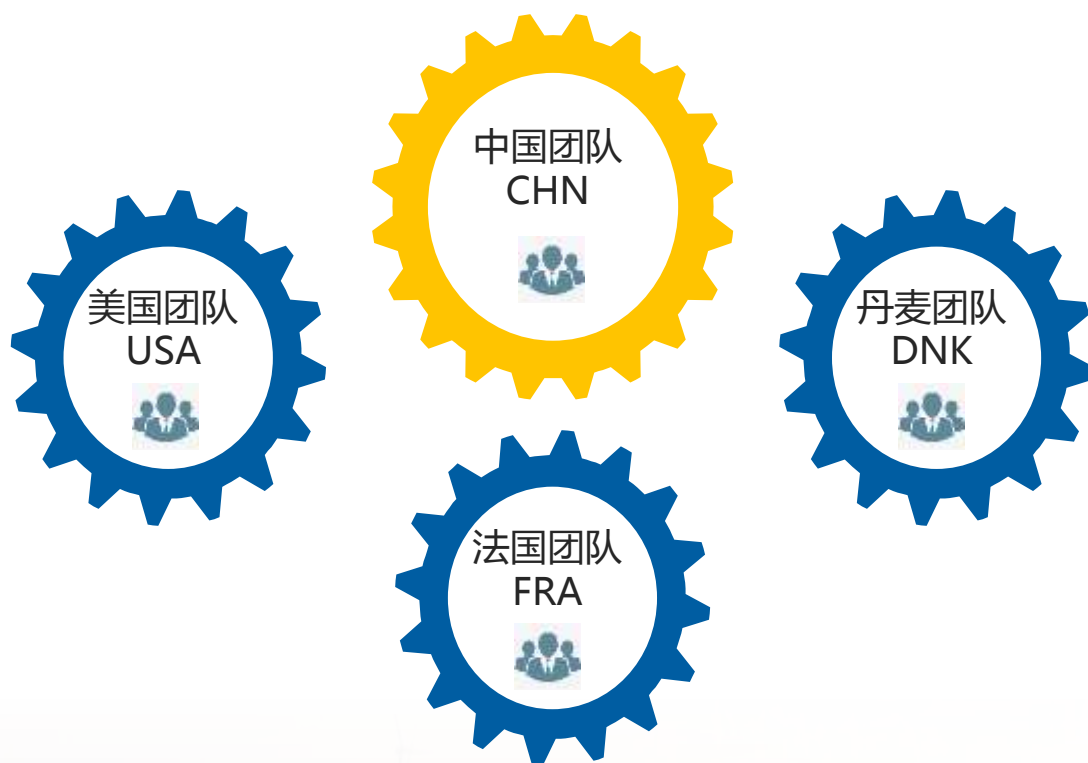
Technology patent

33 patents have been obtained; 5 copyrights have been obtained; 15 patents are being declared.



风电研发团队

Wind Power R&D Team



中国研发中心
CHN R&D Center

主控\变桨\SCADA\PPM\一次调频
TMC\PMC\SCADA\PPM

美国研发中心
USA R&D Center

AI\云平台\无线电力传输\模式识别
AI\ Cloud \ Wireless power
transmission \ Pattern recognition

风电事业部
WP Dept.

丹麦研发中心
DNK R&D Center

叶片降载\储能\核控算法
Blade load reduction / Energy storage
/ Control algorithm

法国研发中心
FRA R&D Center

海上风电\浮式平台
Offshore wind power / Floating
platform

EST智慧能源全生命周期管理系统

EST Intelligence Energy Life Cycle Management

风电机组远程诊断和维护管理
Wind turbines remote diagnosis and maintenance management

远程机舱
振动检测
Remote nacelle
vibration monitor

远程塔筒
振动检测
Remote tower base
vibration monitor

远程叶片
振动检测
Remote blade
vibration monitor

远程风机
大部件检测
Remote wind
turbine main
part monitor

变桨
检测
Pitch
monitor

发电机
检测
Generator
monitor

变流器
检测
Converter
monitor

齿轮箱
检测
Gearbox
monitor

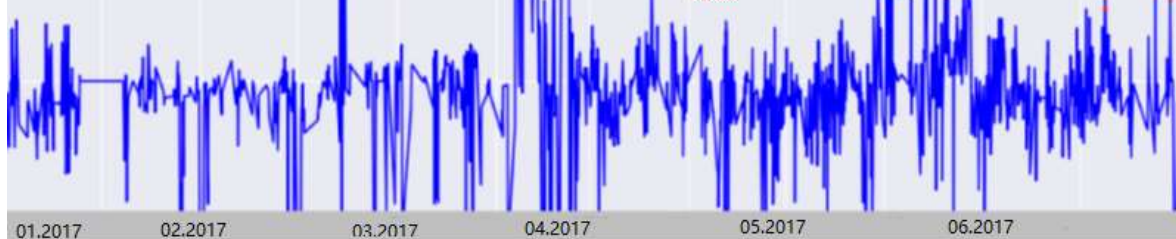
偏航
检测
Yaw
monitor

.....

恒丰云 | 智能远程运维



红点是齿轮箱轴
承AI预测残差故
障点



EST智慧能源全生命周期管理系统

EST Intelligence Energy Life Cycle Management

风电机组远程智能运行管理
Wind turbines remote Intelligence operation management

风速数据
记录和分析
Wind speed
record and
analysis

故障数据
记录和分析
Turbine fault
record and
analysis

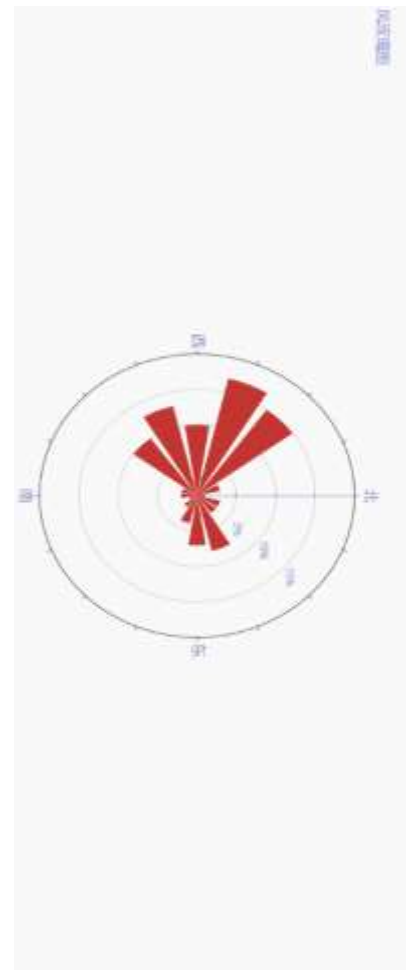
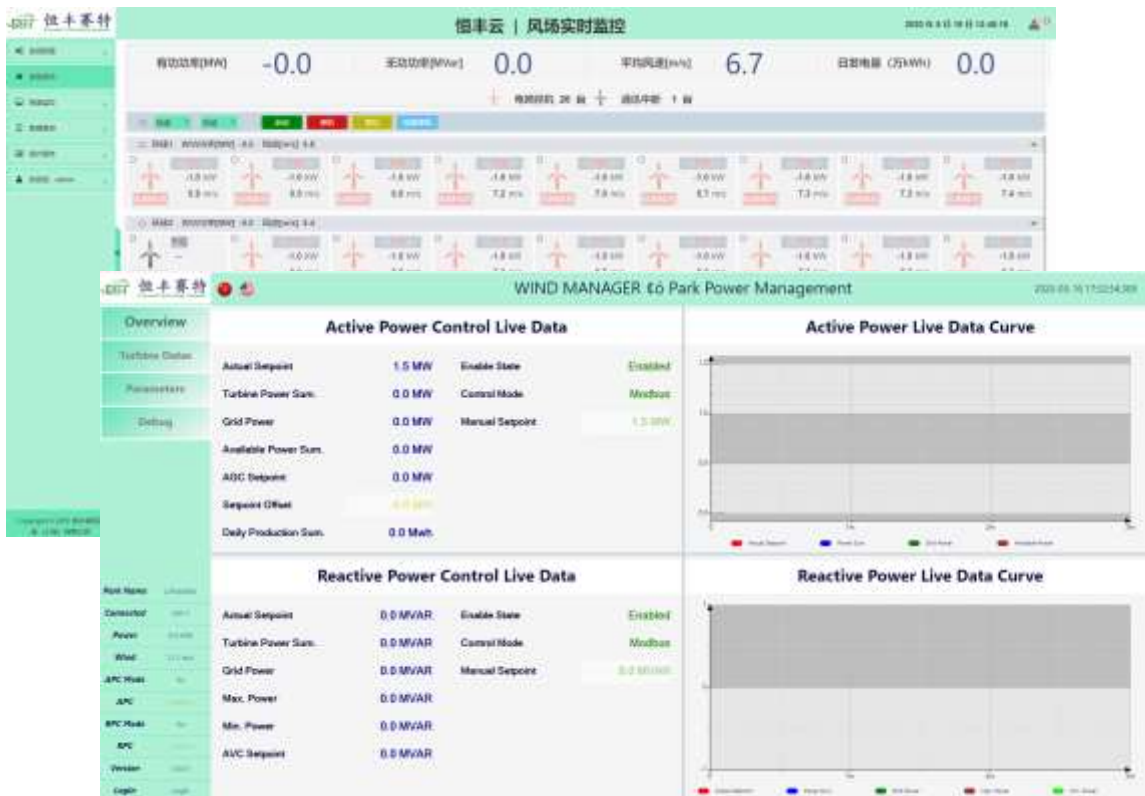
风速数据
记录和分析
Wind speed
record and
analysis

电场监控
Wind Park
monitor

电量数据
记录和分析
Production
record and
analysis

电场运维
Wind Park
operation and
maintenance

能量管理
Power
Management



EST智慧能源全生命周期管理系统

EST Intelligence Energy Life Cycle Management

微电网能源智能管理
Micro grid energy
Intelligence management

风电机组



光伏机组



风能储能变流器



光伏储能变流器



锂电池



EST
智慧能源管理
EST
Intelligence Brain
Energy management



住宅



工厂



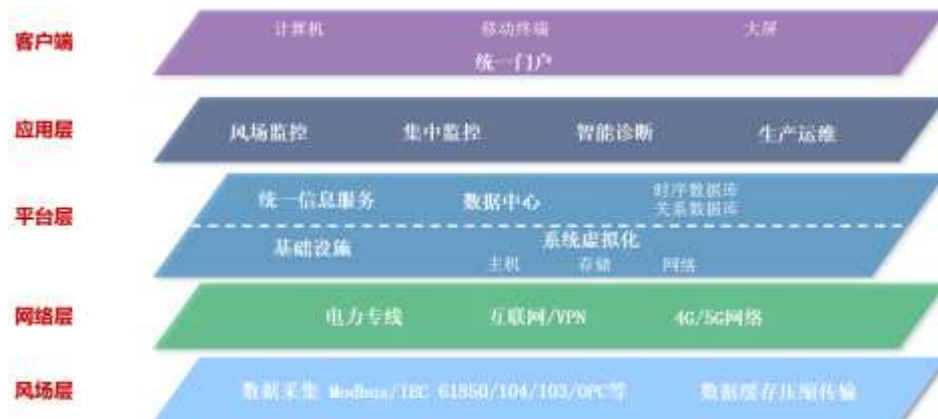
化工

智慧运维综合管理平台 Intelligent Operation & Intelligent Maintenance

产品描述

Products Description

- 智慧运维综合管理平台 WM_IOIM;
- 包括风场监控 (SCADA)、远程集中监控、智能诊断、生产运维;
- 基于分布式模块化设计,配置灵活,支持跨平台部署,扩展方便;
- 支持多种工业协议,Modbus、104、101、OPC等
- 秒级数据读取、显示、存储和查询;
- 互联网前端显示技术,页面友好,用户体验感好;
- Intelligent Operation & Intelligent Maintenance WM_IOIM;
- Wind Park SCADA, Remote Monitor, Intelligent Analysis, POM
- Based On Distributed Modular Design, Flexible Configuration, Support Cross Platform Deployment, Easy Expansion;
- Modbus、104、101、OPC.. Protocols
- Second Class Data Reading, Display, Storage And Query;
- Internet Front-End Display Technology, Friendly Page, Good User Experience;



智慧运维综合管理平台 Intelligent Operation & Intelligent Maintenance

风场监控 Wind Park SCADA

- 数据采集、显示、存储和传输；
- 实时监控、声光报警、风机控制（风机启停复位等）；
- 历史数据查询，事故追忆；
- 统计分析；
- Data Reading, Displaying, Storage And Transmission;
- Real Time Online Monitoring, Audible Visual Alarm, Turbine Control(Start\Stop\Reset..)
- History Data Query And Turbine Snapshot
- Statistical Report And Analysis;

智能诊断 Intelligent Analysis

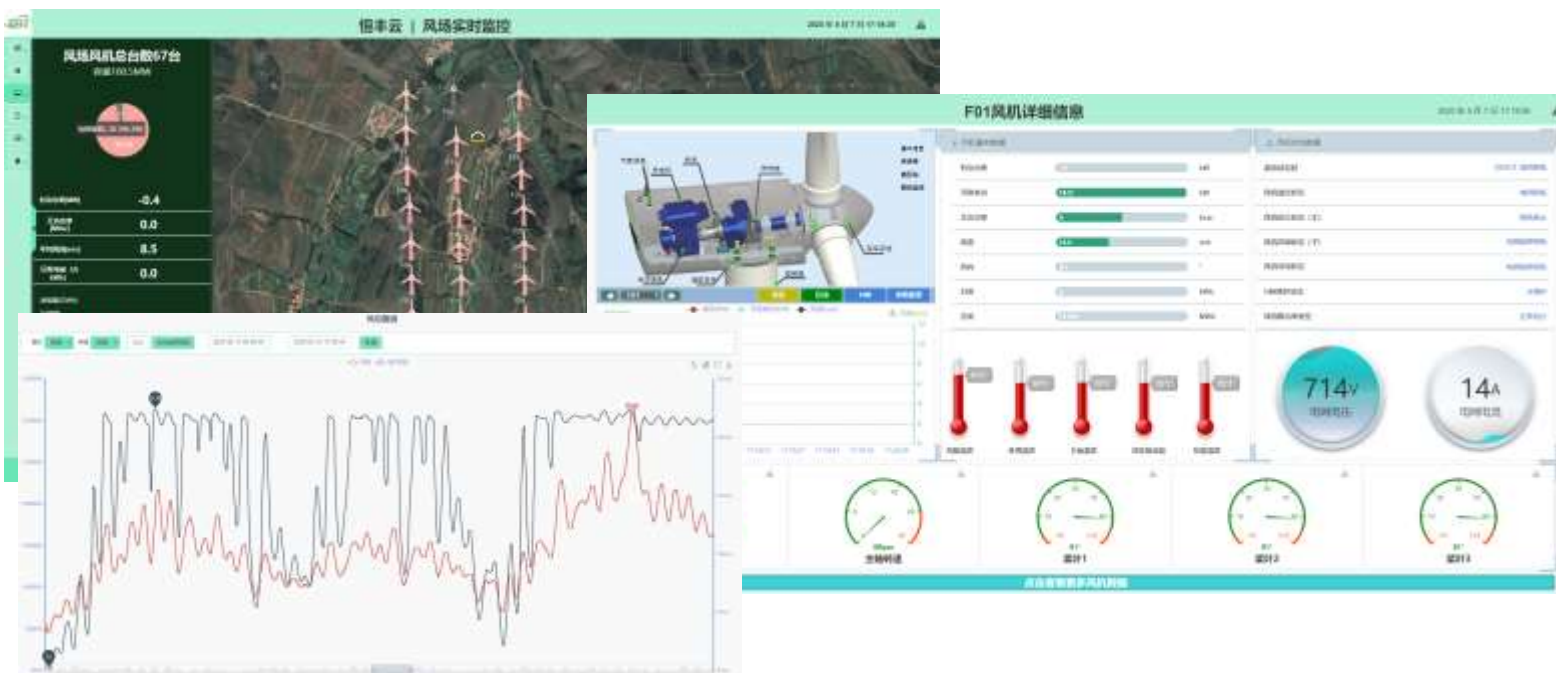
- 机组故障分析；
- 大部件运行诊断；
- 运行指标统计（电量、效率、能耗等）；
- Turbine Faults Analysis;
- Operation Diagnosis Of Big Parts;
- Operation Index Statistics (Production, Efficiency, Energy Consumption, etc.);

远程集中监控 Remote Centralized Monitor

- 风场数据采集、显示、存储和传输；
- 风场监控、声光报警；
- 风场对比，事故追忆，数据查询；
- 统计分析、移动巡检
- Data Reading, Displaying, Storage And Transmission;
- Wind Parks Real Time Online Monitoring, Audible Visual Alarm
- Wind Parks Comparison, Data Query And Snapshot
- Statistical Report And Analysis, Mobile Inspection

生产运维 Production Operation Maintenance

- 数据查询，报表统计；
- 故障告警、检修管理；
- 备件管理、安全管理、开票管理；
- Data Query, Report Statistics;
- Fault Alarm And Maintenance Management;
- Spare Parts Management, Safety Management, Invoicing Management;



风场功率协调控制系统 Wind Park Power Management System

产品描述

Products Description

- 风场功率协调控制系统 WM_PPM;
- 风场有功功率、无功功率智能控制;
- 风场一次调频控制、无功调压控制;
- 参与电力系统调峰，增强电网对风电的消纳能力;
- 支持多种通讯规约，如Modbus、IEC101\104等;
- Wind Park Power Management System WM_PPM;
- Wind Park Active Power, Reactive Power Intelligent Control;
- Wind Park Frequency Control, Reactive Voltage Control;
- Participate In Peak Load Regulation Of Power System And Enhance The Capacity Of Wind Power Absorption Of Power Grid;
- Communication Protocols: Modbus, IEC 104\101..



风场有功功率、无功功率智能控制

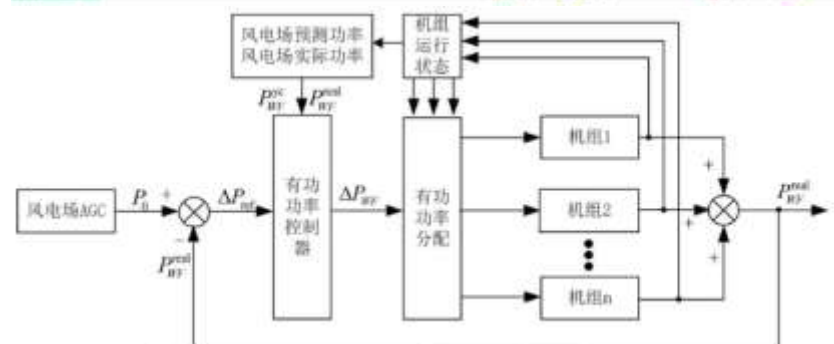
Wind Park Active Power, Reactive Power Intelligent Control

特性：

- 聚类算法 + 分群特征值 + PI控制;
- 高低风快速响应策略;
- 智能启停控制策略;
- 均衡风场风机负荷，延长使用寿命;
- 零点控制功能;
- 标杆风机接入;
- Q/GDW 1392-2015;
- Q/GDW 11273-2014;
- Q/GDW 11274-2014;

Features :

- Clustering & Algorithm Clustering Eigenvalue & PI control;
- High And Low Wind Fast Response Strategy;
- Intelligent Start/Stop Control Strategy;
- Balance The Turbine Load Of the Wind Park And Extend The Service Life;
- Zero Point Power Control;
- Model Turbine Connection And Control;
- Q/GDW 1392-2015;
- Q/GDW 11273-2014;
- Q/GDW 11274-2014;



风场功率协调控制系统 Wind Park Power Management System

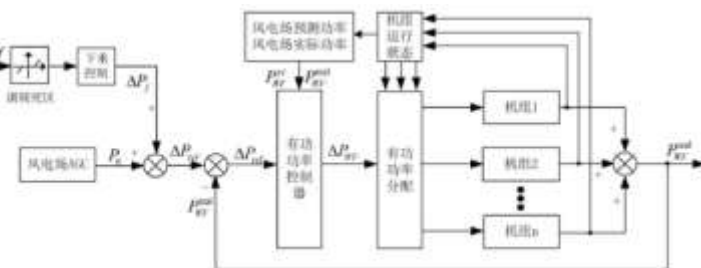
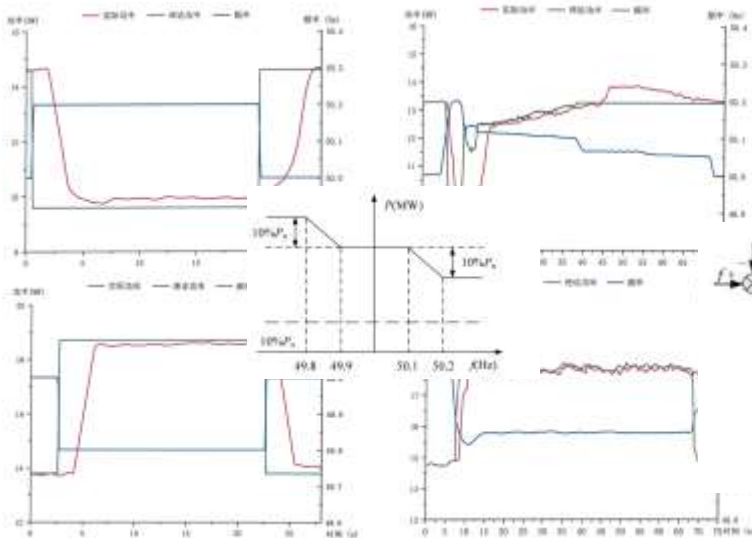
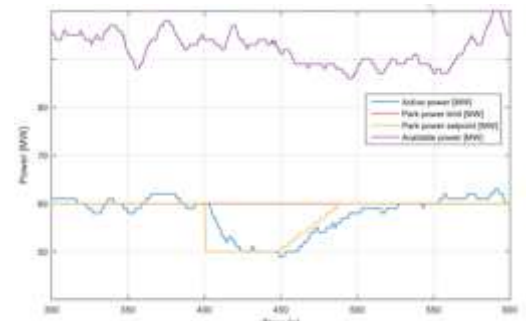
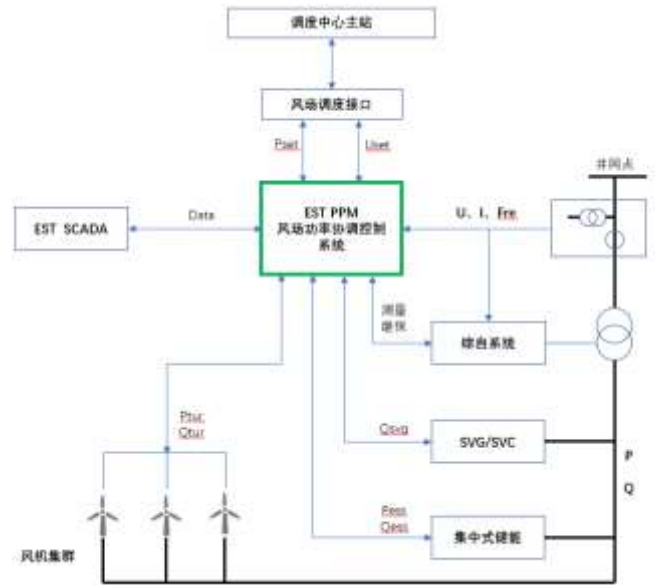
风场一次调频、无功调压 Wind Park Primary Frequency Control and Reactive Voltage Control

特性：

- 高精度电网采集模块，0.001Hz，采样周期60ms；
- 一次调频功能，下垂特性曲线参数可调节；
- 电网异常判断，闭锁调频控制功能；
- 一次调频录波分析功能；
- 一次调频本地测试功能；
- 满足西北电网对风场一次调频功能的现行要求；
- 无功调压分配模式可调节；

Features :

- High Precision Power Grid Measurement Device, 0.001Hz, 60ms;
- Primary Frequency Control Function, Adjustable Parameters Of Droop Characteristic Curve;
- Abnormal Judgment Of Power Grid, Blocking Frequency Control Function;
- Control Function;
- Primary Frequency Modulation Recording And Analysis Function;
- Local Test Function Of Primary Frequency Modulation;
- Meet The Current Requirements Of Northwest Power Grid For The Primary Frequency Regulation Function Of Wind Farm;
- The Distribution Mode Of Reactive Voltage Regulation Is Adjustable;



→ 主控解决方案 (智能控制) Main Control System Solution (Intelligence control)

提高
AEP

主控技术特点

Features of Main Control System

通过自适应偏航控制消除偏航误差
功率曲线Knee Booster拐点优化
智能双模控制
最优风轮能量捕获
智能额定功率提升
阵风控制
涡流发生器

通过以上功能的优化，可以提高风机 AEP to 2%-4%。

Eliminate yaw error by adaptive yaw
Power curve Knee Booster inflection point optimization
Intelligent dual mode control
Optimal wind wheel energy capture
Intelligent rated power boost
Gust control
Vortex Generator

Through the optimization of the above functions, the turbine AEP can improved by 2%-4%.



通过自适应偏航控制，
消除偏航误差

Eliminate yaw error by adaptive yaw control

自适应偏航控制消除误差原理：

SCADA将风机的相对角度，风向，功率，风速等数据进行上传到服务器，服务器算法会对以上数据进行分析，并下发风机偏航偏移指令，通过在不同工况下，寻优到最优偏航偏移角度，而从提升发电效率。

Principle of adaptive yaw elimination error:

SCADA uploads the relative angle, wind direction, power, wind speed and other data of the turbine to the server. The server algorithm analyzes the above data and issues the yaw offset command of the turbine to optimize the optimal condition under different working conditions. The yaw offset angle increase the production efficiency.

主控解决方案 (智能控制)

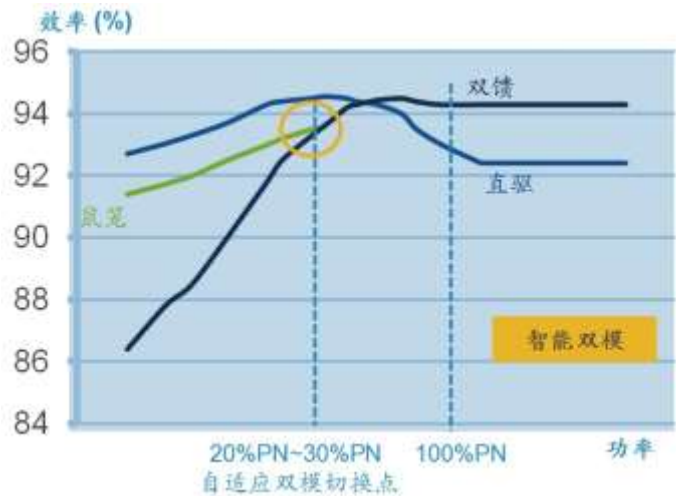
Main Control System Solution (Intelligence control)

智能双模控制

Intelligent Dual Mode Control

自适应双模传动链控制技术结合了低转速下感应电机和高转速下双馈电机的优点，改善在小风速下风机的性能，从而提升发电量。

The adaptive dual-mode drive chain control combines the advantages of induction motors at low speeds and double-fed motors at high speeds to improve the performance of the turbine at low wind speeds, increasing production.



最优风轮能量捕获

Optimal Wheel Energy Capture

基于风机模型并结合PI控制，通过实时地微调桨叶角度追踪最佳风能利用率 (Cp值) 来提高低风速下风机的效果。同时在线自动搜索和辨识最优变桨参数，补偿桨叶安装偏差。与传统控制算法相比，新增风速作为控制因子调节桨叶角度的功能，可快速跟踪风况变化并最大化风能捕捉效率，增加发电量。

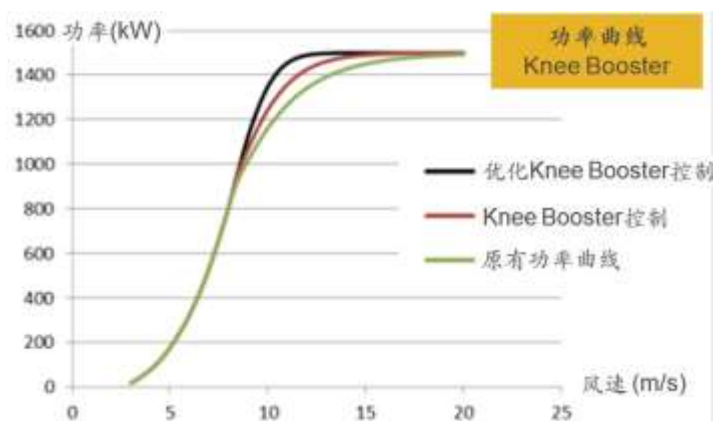
Based on the turbine model combined with PI control, improves the effect of the turbine at low wind speed by fine-tuning the blade angle to track the optimal wind energy utilization (Cp value) in real time. At the same time, the optimal pitch parameters are automatically searched and identified online to compensate for the pitch installation deviation. Compared with the traditional control algorithm, the new wind speed as a control factor adjusts the blade angle, which can quickly track wind changes and maximize wind energy capture efficiency and increase production.

功率曲线Knee Booster拐点优化

Power Curve Knee Booster inflection point optimization

应用动态控制算法优化变速段和恒速段的切换控制，使风机尽可能运行在最优转速上，提升风机在功率曲线拐角处的功率输出。

The dynamic control algorithm is applied to optimize the switching control of the shifting section and the constant speed section, so that the Turbine can run at the optimal speed as much as possible, and the power output of the turbine at the corner of the power curve is improved.



→ 主控解决方案 (智能控制) Main Control System Solution (Intelligence control)

智能额定功率提升

老风机机组设计余量较大，通过分析风场实际风况和风机设计载荷，利用实际载荷余量，增加风机额定输出功率，从而提升年发电量。

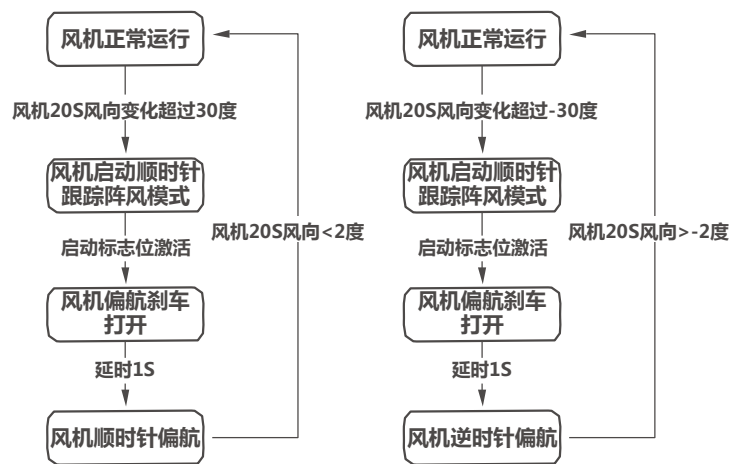
Intelligent Increasing Rated Boost

Old turbine usually have a large design margin ratio. By analyzing the actual wind conditions of the wind park and the design load of the turbine, the actual load margin is used to increase the output power of the wind turbine, thereby increasing the annual power production.

阵风控制 Gust Control

风机在阵风风况下，因风向的大范围变化，导致风轮机舱方向不能正对风向，因此在阵风风况下，风机不能有效捕获风能导致风机损失电量。

In the gusty wind condition, the turbine can't face the wind direction due to the wide range of wind direction. Therefore, in the gust wind condition, the turbine can't effectively capture the wind energy and lose power.



功率提升—涡流发生器

Increase power production —Vortex Generator

风机在额定功率工况以及较高湍流风况下，风流过叶片背时气流攻角过大，使得气流分离，降低升力，增加阻力。涡流发生器是一种特殊的结构设计组件，用以延缓气流分离，提高升力并降低阻力，从而避免气动损失，改善风机的风能捕获能力。

The wind turbine at rated power condition and high turbulent wind condition, airflow Angle of attack is too large when wind flows through blade backside, which makes airflow separation, reduces lift and increases resistance. Vortex generator is a special structural design component, which is used to delay airflow separation, increase lift and reduce drag, thus avoiding aerodynamic loss and improving wind energy capture ability of turbine.



变桨控制解决方案（大功率小型化） Pitch Control System Solution (Larger Power Smaller size)

新机型变桨方案—陆上3.x-5.xMW Pitch solution of new turbine model —Onshore 3.x-5.xMW

● 4.XMW KEB 变桨方案 4.X MW KEB pitch solution

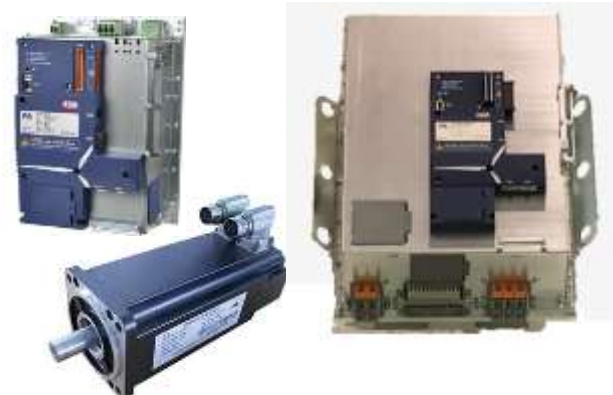
- 驱动方案：KEB 19P6、永磁同步电机
- 性能特点：22KW驱动器，13KW电机
- 柜体：304不锈钢（C3等级）
- 电机：IP65，24V低压刹车（160NM），旋变
- 环境适应性：-40°C-65°C
- Drive solution: KEB 19P6 / permanent magnet synchronous motor
- Performance characteristics: 22KW driver, 13KW motor
- Cabinet: 304 stainless steel
- Motor: IP65, 24V brake (160NM), Rotary encoder
- Environmental adaptability: -40 °C -65 °C



新机型变桨方案—海上7.x-15.xMW Pitch solution of new turbine model —Offshore 7.x-15.x MW

● 海上15MW方案 Offshore 15MW solution

- 驱动方案：KEB 23P6、永磁同步电机
- 性能特点：42KW驱动器，30KW以上电机
- 柜体：316不锈钢（C4等级，可用于海上防腐蚀）
- 电机：IP65，230V高压刹车（刹车扭矩450NM），旋变
- 环境适应性：-40°C-65°C
- Drive solution: KEB 23P6 / permanent magnet synchronous motor
- Performance characteristics: 42KW drive, 30KW motor
- Cabinet: 316 stainless steel (can be used for offshore anti-corrosion)
- Motor: IP65, 230V high pressure brake (brake torque 450nm), Rotary encoder
- Environmental adaptability: -40°C -65°C



主控改造 Main Control Retrofit



主控改造解决方案——改造机型 Main Control Retrofit Solution - Turbine Model

华创1.5MW、2MW、3MW机型

惠德2.0MW机型

恩德1.5MW机型

东方风电 1.5MW、2MW、2.5MW机型

CCWE 1.5MW/2MW/3MW model

HD 2.0MW model

Nordex 1.5MW model

DFWP 1.5MW, 2MW, 2.5MW model



- 提高单台风机年均发电效率2%~4%
- 低电压穿越功能
- 高电压穿越功能
- 风场侧和风机侧一次调频
- 优化偏航控制策略
- 降低风机载荷
- 风场有功功率管理-AGC
- 风场无功功率管理-AVC
- 风场环网通讯
- Improve the average annual production efficiency of a single turbine by 2%~4%
- Low Voltage Ride Through function
- High Voltage Ride Through function
- Wind park side and turbine side primary frequency modulation
- Optimized yaw control strategy
- Reduce turbine load
- Wind park active power management - AGC
- Wind park reactive power management - AVC
- Wind park ring-network communication

主控系统改造——主控平台 Retrofit of Main Control System ——Main Control Platform

- Bachmann 平台升级
- Beckhoff 平台升级
- Mita、自控 (Reta) 平台整体替换
- DEIF平台整体替换
- 西门子平台整体
- 横河平台整体替换

Bachmann platform upgrade

Beckhoff platform upgrade

Mita, DEA (Reta) platform overall replacement

DEIF platform overall replacement

Siemens platform replacement Yokogawa platform overall replacement

改造优势 Retrofit Advantages

- 提供全面的风机改造以延长风机生命周期配备
- 采用最新的转速和功率控制核心算法
- 采用偏航自适应控制
- 提高功率曲线高穿和一次调频功能

Provide comprehensive wind turbine retrofit to extend the life cycle of the turbine

Adopt the latest speed and power control core algorithm

Yaw adaptive control

Increasing power curve

HVRT and primary frequency modulation function



主控改造案例介绍 Main Control Retrofit Case

以内蒙古张北某风场1.5MW风机二期（Mita主控）与一期（非Mita主控）同类机型的实际发电量统计为例。综合分析改造前、后被改造风机和对比风机的发电量情况，被改造的二期56#和35#风机，对比一期20#、28#风机有较大幅度的提升。

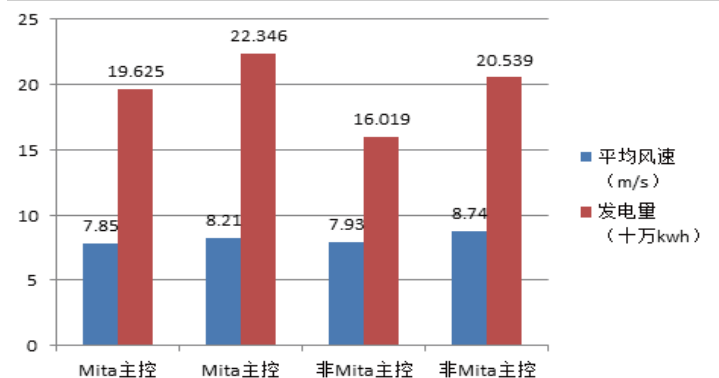
Taking the actual power production statistics of the 1.5MW wind turbine phase II (Mita main control) and the phase I (non-Mita main control) of a wind park in Zhangbei, Inner Mongolia as an example.

Comprehensive analysis of the power production of the modified wind turbines and the comparative wind turbines before and after the retrofit of the 56# and 35# wind turbines in phase II that were transformed, compared with the 20# and 28# wind turbines in phase I.



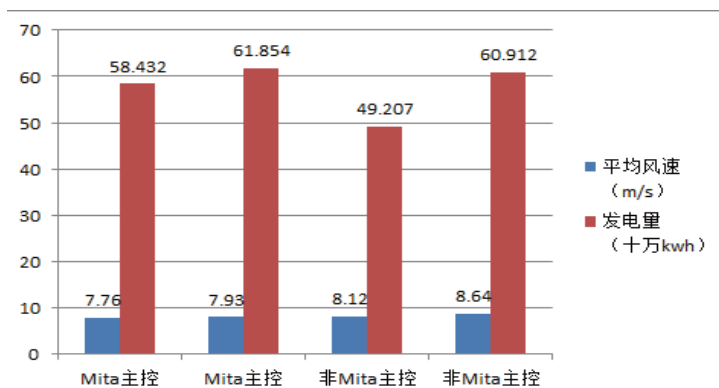
统计发现：Mita主控的2台风机比非Mita主控的2台风机多发了近54.13万千瓦时的发电量，帮助企业增加经济效益近30万元。（统计时间：2018/5/30日至2019/1/30日，数据来源为两期风机的样板机（不限电）。

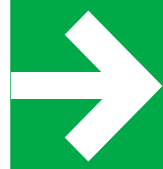
Statistics show that the two wind turbines controlled by Mita have produced nearly 541,300 kwh of power production than the two wind turbines that are not controlled by Mita, helping company to increase economic benefits by nearly 300,000 RMB.(Statistics time: 2018/5/30 to 2019/1/30, the data source is the model of the turbine (no power limit).



整一年统计时间内，两种风机的发电量统计发现：Mita主控的2台风机比非Mita主控的2台风机多发了近101万千瓦时的发电量，帮助企业增加经济效益近60万元。（统计时间：2018/5/30日至2019/5/30日，数据来源为两期风机的样板机（不限电）。

During the statistical time of the whole year, the statistics of the power generation of the two types of wind turbines found that the two wind turbines controlled by Mita issued nearly 1.01 million kwh than the two wind turbines not controlled by Mita, helping company to increase economic benefits 600,000 RMB.(Statistics time: 2018/5/30 to 2019/5/30, the data source is the model of turbine (no electricity).





变桨改造 Pitch Control Retrofit



变桨部件改造：

- 变桨改造方案
 - 能健、LUST、SSB 1.5MW变桨系统控制器改造
 - 能健、LUST、SSB 1.5MW电池改电容
 - 华创1.5MW电池改电容
 - 能健、LUST、SSB 1.5MW直流改交流
 - 使用倍福控制器对原有L+B控制器改造
- 变桨改造机型
 - 明阳智能2.0MW、2.5MW MITA变桨改造
 - 华创2MW、3MW的AB、Mita、REE变桨改造
 - 运达1.5MW变桨改造
 - 国电联合动力1.5MW 变桨改造
 - 中车变桨改造
 - 东方风电1.5MW、2.0MW、2.5MW 变桨改造

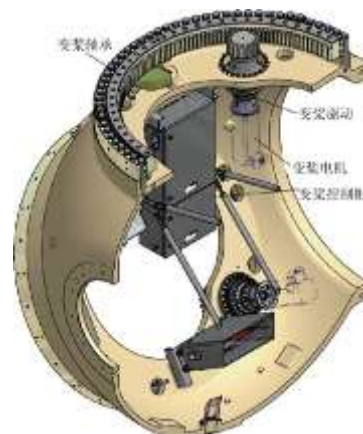
Pitch components retrofit:

- Pitch retrofit solution
 - REE, LUST, SSB 1.5MW pitch system controller retrofit
 - REE, LUST, SSB 1.5MW battery change to the capacitor
 - CCWE 1.5MW battery change to the capacitor
 - REE, LUST, SSB 1.5MW DC change to AC
 - Retrofitting the old L+B controller with Beckhoff controller
- Pitch retrofit turbine
 - MYSE 2.0MW, 2.5MW mita pitch retrofit
 - CCWE 2MW, 3MW AB, Mita, REE pitch retrofit
 - Windy 1.5MW pitch retrofit
 - GUP 1.5MW pitch retrofit
 - CRRC pitch retrofit
 - DFWP 1.5MW, 2.0MW, 2.5MW pitch retrofit

变桨部件改造优势：

Advantage of Pitch components retrofit:

- 直流改造为交流系统，提升系统性能
- 通过交流改造，增加低穿和高穿功能
- 通过改造解决备件不足问题
- 通过改造优化人机交互界面
- 通过改造增加故障和日志记录功能
- 通过电容改造大大延长设备运行时间
- Retrofitting DC into AC system to improve system performance
- Add the LVRT and HVRT function
- Solve the problem of insufficient spare parts
- Optimize human-computer interaction interface
- Add fault and log functions
- Extend equipment running time through capacitor retrofit



变桨改造 Pitch Control Retrofit



变桨整柜改造

Pitch cabinet retrofit



KEB P6 驱动器改造解决方案
KEB P6 Retrofit solution

变桨整柜改造优势：

Advantages of the pitch cabinet retrofit:

- 使用KEB P6集成式方案成熟、可靠
- 直驱风机通过整柜改造可完全消除早期柜体设计的缺陷
- 通过这种改造，相当于直接使用的新的变桨系统
- 经过型式和功能测试，可靠性得到保证
- 通过整柜体改造，重新设计安全链，系统更为安全
- 增加了高穿和低穿等各项必须功能
- Using the mature and reliable KEB P6 integrated solution
- For the direct drive turbine, this retrofit completely avoids the problems of the old cabinet design
- Through retrofit, it is equivalent to the new pitch system
- Reliability is guaranteed after the type and function test
- Redesign the safety chain through the whole cabinet retrofit, the system is safer
- Add the necessary functions such as HVRT and LVRT

风机配套系统 Turbine Auxiliary System

液压站

Hydraulic Station

吸收消化伊顿 (EATON) 先进的液压系统技术, 成功研发出拥有自主知识产权的、性能稳定的全新整套液压系统解决方案。

Absorb the advanced hydraulic system technology of EATON, and successfully develop a whole new hydraulic system solution with independent intellectual property rights and stable performance.



叶片状态在线监测系统

Blade Condition Monitoring System

引进瑞士IntelligenceEC光纤传感技术, 推出叶片在线监测系统, 监测内容包括: 覆冰监测/应力和振动监测/形变监测/评估静态、动态载荷/快速监测由雷击造成的损害, 保障风机运行安全, 对叶片进行预防性维护。

Introducing IntelligenceEC (Switzerland) optical fiber sensing technology, launching blade condition monitoring system, including: Ice cover monitoring, Stress and vibration monitoring, Deformation monitoring, Evaluate static or dramatic load, lightning damage monitoring. For protecting turbine and preventing maintenance of blade.



大数据管理平台

Big Data Management Platform

与清华大学计算机学院共同合作开发, 克服了数据延迟的缺陷, 达到风机数据传输、数据分析、数据管理等一整套完整的大数据解决方案。

Jointly developed with Computer School of the Tsinghua university, overcome the defect of data delay and achieves a complete big data solutions including turbine data transmission, data analysis and data management, etc.



免爬器

Turbine Lift

自主研发最新风机免爬器系统, 安全稳定, 适用于国内外各类风场。

Independently developed the latest turbine lift, stable and safety, suit for all wind parks at home and abroad.

振动传感器

Vibration sensor

引进国外先进技术, 自主研发出风机专用震动传感器, 提升可靠性, 保障风机安全稳定运行。

Introduction of foreign advanced technology, independent research and development of turbine special vibration sensor, improve reliability, ensure the safe and stable operation of the turbine.