

EDITOR'S LETTER

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Shanghai Electric



WARM WINTER

It is unusually cold in Shanghai this winter, with the temperature dropping to -6°C in the suburbs, while air conditioning makes it less so.

Europe is not as lucky. With €1, you can buy a loaf of bread, shower gel, and a large bottle of coke in a “1 Euro Shop”, but not 1 kW/h of electricity. In France, the price of electricity exceeded €1.1 per kW/h in August. In Germany, recently, it has jumped by 2.5 times in 4 days as the wind stopped. My friend in Sweden and her husband take home bags of dead branches and leaves from the road every day. Over the video chat, I saw the firewood she hoarded for the winter almost occupied half the house, and I asked, “Winter will be over soon. Is it really necessary?” She said, “Need to prepare for the next, right?”

As tension increases in the energy market, more European families realize that the high electricity price is likely here to stay, and saving electricity has to be a daily practice. Changes are taking place in countless European families: setting the water pressure at half the usual level, shortening the shower time, changing to energy-saving LED lights, stopping driving to work, storing firewood... Everyone is doing the calculation carefully and spontaneously without the need for a slogan, which might be the most heartening part of this serious energy crisis.

The butterfly effect will be far-reaching. For now, an energy decoupling between Europe and Russia seems inevitable, and after a temporary restarting of the coal power system, it is necessary to move back to renewable energy. Structurally speaking, energy generated by the sun, wind, water, and other natural elements are distributed evenly across the globe, unlike fossil energy, where a monopoly exists below the earth's surface.

The issue's cover story discusses the opportunities and challenges in the integrated development of traditional and new energy. The focus of future energy competition may shift from resources to energy-extracting technologies and comprehensive consideration of efficiency and costs.

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ELECTRIC NEWS



BRIEF NEWS



With World's Biggest Rotor, Shanghai Electric's Turbine Rated "Best 10 Innovations"

In September, Shanghai Electric Wind Power Group Co., Ltd. (hereinafter as "Wind Power Group") was awarded the "Best 10 Innovations" as one of China's top 50 wind power enterprises by its EW8.5-230 wind turbine based on the Poseidon platform at the China (Jiangsu) New Electric Power Development Conference and the 14th China (Jiangsu) International Wind Power Industry Development Summit Forum 2022. The first EW8.5-230 turbine was successfully hoisted in the Site B of Bozhong offshore wind power project of Shandong Energy Group in early September prior to the Conference, making it the turbine hoisted whose rotor diameter is the biggest so far in the world.

The award is evaluated by China Machinery, Metallurgy and Building Materials Workers Technical Association. Leveraging its decades of experience in developing offshore wind power, Shanghai Electric Wind Power designed the semi-direct drive EW8.5-230 turbine, a candidate for the evaluation, specifically for Chinese sea areas with medium-to-low wind speeds. With a 230-meter diameter, the turbine rotor has a swept area that equals to roughly 5.8 standard football fields. It can produce 28 million kWhs every year at an average wind speed of 7.5m/s, which is enough for 14,500 households for one year, and hence can cut coal consumption by nearly 10,000 tons and CO₂ emission by 24,000 tons.

Shanghai Electric's 3 Projects Included in List of Shanghai's Excellent Enterprises for Quality Management Digitalization

In October, the Shanghai Municipal Office of Quality Work Leading Group (hereinafter as "the Office") announced lists of "Top 10 Enterprises" and "Excellent Enterprises" for quality management digitalization in 2022. Shanghai Electric Nuclear Power Group Co., Ltd. was awarded the "Top 10 Enterprises" with its report "Digitalization of Quality Management Services for Nuclear Power Equipment", and Shanghai Electric Digital Technology Co., Ltd. and Shanghai Generator Plant "Excellent Enterprises" with "SEunicloud: High-end Industrial Internet Platform for Quality Management" and "Coordinated Digital Quality Management for Power Generation Equipment Throughout Life Cycle and Industrial Chain" respectively. The Office selects and promotes a number of leading enterprises whose experience and measures are reproducible to encourage more enterprises to enhance their quality control and to speed up Shanghai's high-quality development, which implements the Three-year Action Plan for Quality Improvement in Shanghai (2021-2023) and key tasks of Shanghai's quality development in 2022.



Shanghai Electric's 2 Solutions Included in Best Solutions for Energy Industrial Internet (2021-2022)

The 2022 Global Industrial Internet Conference held in November released the Best Solutions for Energy Industrial Internet (2021-2022). Two solutions developed by Shanghai Electric Digital Technology Co., Ltd. were included in the list, which were The Smart New Energy Management Solution Based on the Industrial Internet Platform and Demonstration Projects of 5G Industrial Internet-based Smart Wind Power Application. The latter, a joint result with Shanghai Electric Wind Power Group Co., Ltd., was rated "Excellent Solutions (2021-2022)". The project is about how Shanghai Electric formulated multi-dimensional solutions for plants and areas in new energy development with the Industrial Internet platform SEunicloud as the technological base. By realizing centralized maintenance, efficient fault handling and lean management of production performance, these solutions lead to increases in per capital work efficiency and power availability as well as the decrease in fault handling time. Moreover, the SEunicloud platform offers one-stop Industrial Internet-based solutions in terms of perception, internet, platform and application for developing "energy internet +" projects that integrate wind, solar power, energy storage and charging to better empower energy management of modern industrial zones.

Completed by Shanghai Electric, Australia's First PV Project Connected to Grid at Full Load

In late November, the 5.3MW PV project at Cod, Australia, constructed by Shanghai Electric has run for over two months after getting connected to the grid at full load, with all facilities in smooth operation. The project passed the performance test with an average generation efficiency of 0.93 during the period, much higher than 0.809, the value stipulated in the contract, and had its major construction tasks completed in November.

Shanghai Electric won the bid for the project in March, 2019, and had to postpone the construction due to COVID-19 pandemic and the power price fluctuation in Australia. After resuming it in June, 2021, Shanghai Electric broke ground in December and achieved grid connection and power generation in September this year, a month ahead of schedule.



Constructed by Shanghai Electric, Thar Power Plant's Two Units Complete First-time Reverse Power Transmission

In October, two units of the power plant at Thar, Pakistan constructed by Shanghai Electric completed reverse power transmission for the first time, with every section receiving the flow without errors and all instruments signaling correctly. Major facilities of unit 1 and unit 2, such as power systems, were charged reversely with "zero" mistake in both operation tickets and procedures through the whole process thanks to project operators' meticulous reviews and handling. To accomplish the task for the first time, the project team worked with related departments closely to make detailed and thorough plans and preparations in advance, and overcame challenges posed by persistent high temperatures, torrential rains and floods and delayed arrival of equipment, which endorsed the success of the reverse transmission.

Foshan Medical Waste Disposal Project Designed by Shanghai Electric Passes First-Time Inspection

In September, the medical waste disposal project at Foshan City designed by Shanghai Electric received the completion acceptance certificate for the first time. The design team submitted the technology blueprint and showed that results demanded by the metrological supervision department could be achieved. It also proved that data collected in the pilot run agreed with design parameters by and large after analyzing techno-economic indicators and operation data of the trial operation. The whole unit ran with all indicators meeting requirements and high stability in combustion and performance, indicating its excellent quality.

Shanghai Electric Commences to Construct Shanghai's Biggest Centralized PV Project

In August, Shanghai Electric commenced to construct the 128MW fishery-photovoltaic complementary project at Gangxi Town, Chongming District, Shanghai. Once completed, it will make Chongming's energy much more cleaner and promote the development of "beautiful villages" and world-class ecological island with an annual generation of electricity of approximately 140 million kWhs on average, which can cut the consumption of standard coal by roughly 43,400 tons and CO₂ emission 108,300 tons. Based on the effective and multi-purpose use of land, the project realizes both power generation and fishery development, making itself an ecological, smart and standardized demonstration program of modern green fishery and an education center for fish farming based on the complementary development between PV and fishery.

No.1 Gas Turbine of Datang Haikou Project Ignited, Shanghai Electric Participated in

In the last few weeks, the No. 1 gas turbine of Datang Haikou gas-fired power plant was successfully ignited for the first time, making a significant progress towards the goal of commercial operation as Haikou City's first large clean power plant, the project sitting in the northern Hainan Province plays an important role in meeting growing need for electricity as Hainan promotes local economic development during the 14th "Five-year Plan" period. Phase I is designed to have 2 sets of 9F gas turbines which on an annual basis, can produce approximately 2.5 billion kWh and reduce the use of standard coal by about 250,000 tons and the hydroxide emission over 570 tons.

The Sylhet Project Constructed by Shanghai Electric Completes its Warranty

In the last few weeks, Shanghai Electric concluded its operation and maintenance services in the 24-month guarantee period for the power plant expansion project at Sylhet, Bangladesh. During this period, the project team led construction, operation, and maintenance employees to offer high-quality services against lack of labor, the COVID-19 pandemic, big floods and delayed spare parts. Having run for 674 days accumulatively, the power plant produced 980.2-GWh electricity, securing a constant power supply for the local people.

Shanghai Electric's New Synchronous Condenser Named High-end Breakthrough Smart Device

In October, China's first distributed 50Mvar GVPI air-cooling synchronous condenser was reviewed and rated by Shanghai Municipal Commission of Economy and Informatization as a "High-end Breakthrough Smart Device for Industrial High-quality Development (2021-2022)". The condenser is an essential project accomplished by Shanghai Electric Power Generation Equipment Co., Ltd. Generator Plant amid its strategic transformation, and also a milestone for Shanghai Electric to implement the strategy of "building new-type power system with new energy at the center". Mostly deployed at wind and solar power plants, the device can offer on-site reactive compensation and inertia support flexibly in line with characteristics of new energy power stations, grids and installations, thus enabling these grids to consume more new energy-generated electricity. Regarding technology and application, the device is one of the most advanced in peers at home and abroad, and is to be commissioned first at new energy power plants in China.



First Main Pump of First “Hualong I” Reactor in Mass Construction Delivered

In early November, the first main pump of the first “Hualong I” nuclear reactor after the model enters mass construction was delivered to the nuclear power plant at Zhangzhou City by Shanghai Electric-KSB Nuclear Pump & Valve Co., Ltd. (hereinafter as “KSB Nuclear Pump”).

Being a first-time EPC contractor for this kind of project, KSP Nuclear Pump overcame a lot of difficulties before successfully delivering coolant pumps to No.1 and No.2 reactors at the Zhangzhou plant. When Shanghai was in fight with the pandemic in April, the project team was busy preparing for the full-load test of the pump, a crucial moment. While acting strictly in line with Shanghai’s pandemic control measures to keep employees healthy, KSP Nuclear Pump also supported the team to make emergency plans through various means to get ready for the test of the main pump, which ensured the smooth implementation of this national key project. Twenty-six employees who were necessary for the test courageously volunteered for closed-loop management which meant they had to live, sleep and work in the factory. On April 12, the first pump passed its test with all parameters meeting requirements in the schedule.

Thanks to Zhangzhou’s staff who were all CPC members, the final verification commencing on October 1st was completed on the 16th with all specifications met and the vibration of the main pump in its optimal condition, paving the way for the successful delivery afterwards. **D**

Unit 1 of Datang Haikou Combined Cycle Power Plant Put into Operation

On November 9, Unit 1 of Datang Haikou Combine Cycle Power Plant with 9F Gas Turbine, constructed by Shanghai Electric and its partners, passed the 168-hour test run with smooth operation of all equipment and systems and excellent economic and technical performance indicators, receiving positive comments from the owner. Shanghai Electric provided the power island equipment for the project, including gas turbine, steam turbine, generator and condenser. The project team, which overcame all adverse effects of the COVID-19 pandemic, has completed the manufacturing and delivery of the equipment on schedule. The project is reportedly the first large clean power plant in Haikou. Its first phase with two 9F gas turbines can yield an annual power generation of 2.5 billion kWh after completion, saving 250,000 tons of standard coal and reducing CO₂ emissions by 1.92 million tons, increasing the installed capacity of clean energy in service in Hainan Province by 11.9%, effectively relieving the tight power supply in Hainan and providing a stable power supply for the Hainan Free Trade Port during the 14th Five-Year Plan period. **D**



1.2

THE 1.2 MILLIONTH ELEVATOR OF SHANGHAI MITSUBISHI ELEVATOR DELIVERED

On November 30, Shanghai Mitsubishi Elevator Co., Ltd. (Shanghai Mitsubishi Elevator) welcomed the honorable customer who purchased its 1.2 millionth elevator, the Zhongyuan Liangwan Apartment in Putuo District, Shanghai. The company held a delivery ceremony for the elevator, where a souvenir plaque was presented to the user. Leng Weiqing, Secretary of the Party Committee and Chairman of Shanghai Electric, witnessed the milestone together with the Owners' Committee of the Zhongyuan Liangwan Apartment and staff of Shanghai Mitsubishi Elevator.

The iconic elevator delivered by Shanghai Mitsubishi Elevator is LEHY-N model with 1:1 roping for renovation and remodeling. Upgraded based on the original structure and configurations, it will greatly enhance the experience of the residents. Reportedly, the residential community, built in 1999, is a model property for the Shanghai's revitalization plan for old town in line with China's national development plan. The total number of elevators in use is about 206, and Shanghai Mitsubishi Elevator is one of the suppliers. It was urgent to update the old elevators as their operating condition was becoming worrisome. Shanghai Mitsubishi Elevator tailored the renovation plan after carefully surveying the project site, which moderately preserves the components and minimizes damage to the building structure and decorations while shortening the construction period to minimize the impact on the residents' daily life. In addition, the company raised the cabin height, improved

the cabin decoration, and equipped the elevators with intelligent and disease-proof features such as an automatic recognition system for electric bicycles and antibacterial buttons, so as to provide users with a safer, cozier and smarter elevator riding experience.

In order to provide better user experience, Shanghai Mitsubishi Elevator provides 10-year warranty service for five core components, connects elevators to its remote monitoring system, and upgrades all elevators under the contract to 10-year extended warranty 2.0, so as to deliver satisfactory results to customers. **D**





PT1 of NE1-700MW CSP+250MW PV Project in Dubai

CONNECTED TO GRID

On November 29, local time, the PT1 of Noor Energy 1 700MW CSP +250MW PV Project in Dubai, built by Shanghai Electric as a general contractor, was successfully connected to the grid, marking a milestone in the transformation of the Group in the new energy industry. The PT1 has provided the first kWh of green power to the region with excellent technical parameters and stable operation of all main and auxiliary equipment.

As a demonstration project for the "Belt and Road" initiative and the global carbon neutrality goal, the PT1 adopts the world-leading parabolic trough technology to solve the drawback that conventional PV power plants cannot generate electricity at night. During the project period, there were difficulties such as price increase of raw materials, stagnation of shipping, disruption of production, serious shortage of personnel and increase of all costs due to the COVID-19. The staff overcome the adverse effects of the pandemic through careful planning and

effective coordination, conquering many technical challenges with new thinking and successfully achieving the milestone.

The project is the Phase IV of the Noor Energy 1 PSC Project developed by Dubai Electricity and Water Authority (DEWA) at the Mohammed bin Rashid Al Maktoum Solar Park. The photovoltaic part, totaling 700 MW, consists of one 100 MW tower and three 200 MW troughs; the 250 MW of PV units are distributed in the spare locations across the plant for maximum utilization of the site. Covering 44 square kilometers, the equivalent of 6,162 football fields, it is the biggest concentrated solar power project in terms of installed capacity, investment amount and heat storage of molten salt tanks in the world. After being put into operation, the energy stored in the PTs can produce power for up to 13.5 hours continuously to meet the demand for electricity at night or under adverse weather conditions, while the energy stored in the tower can generate power for up to 15 hours continuously. **D**

SHANGHAI ELECTRIC FACILITATES SMOOTH PRODUCTION OF THE FIRST AIRBUS A321 AIRCRAFT IN CHINA

Recently, Airbus announced that the first A321 aircraft has been put into production at its Asian assembly line for Airbus A320 Family in Tianjin, China, marking the successful delivery of the Tianjin Airbus project by Broetje Automation Equipment (Shanghai) Co., Ltd. (Broetje Shanghai), a subsidiary of Shanghai Electric. It is the first major upgrade of the assembly line since it was put into operation in 2008. In November last year, Broetje Shanghai won the bid for Airbus Tianjin project, responsible for the adaptation, modification and upgrade of the A321 aircraft assembly line. The project team overcame the adverse effects of the pandemic and successfully completed the adaptation and modification as planned, receiving high praise from German Airbus and Tianjin Airbus. With the commissioning of the first A321 aircraft, a new milestone has been set for the cooperation between Broetje Shanghai and China aircraft industry. **D**



THE FIRST “3060 HYBRID TOWER”

Wind Turbine Installed



in regions with a low wind speed and high wind shear value due to its high rigidity, security, stability and low raw material cost. The “3060 hybrid tower” solution designed is customized by Shanghai Electric Wind Power for the new large-capacity turbine under all circumstances with high profitability.

With properties of standardization, high accuracy and adjustable walls, the new hybrid tower adopts a modular design approach that reduces design and manufacturing time, and addresses issues that arise from different production lines, automatic and digital, by using highly accurate adjustable wall mold (the thickness of the duct piece can be either 30mm or 60mm) despite different parameters demanded by various projects, tower types and mold producers.

So far, this product has 13 patents for horizontal molds, tooling that adjusts wall thickness, tooling and tools for assembling duct pieces and others. Shanghai Electric Wind Power implements whole-process quality control by developing more than 100 documents and standardized systems in this aspect for 36 procedures including duct production, transportation and installation, mold assembly, hoisting, delivery and assembly tools. While molds are primarily used by Shanghai Electric Wind Power’s turbines, they also have ports for other turbine producers, which makes it possible to share factories and molds with multiple suppliers and build a new inclusive ecosystem.

With business units for blades, drive chain and hybrid tower formed respectively, Shanghai Electric Wind Power accelerates technological penetration of core parts, such as the hybrid tower, and their supply chain-related businesses to gain thorough control over core parts from design technologies to manufacturing procedures, and to enhance its competitiveness on the tech side. **D**

In recent weeks, the first WH6.25N-182 “3060 hybrid” wind tower, a standardized modular tower that was independently developed by Shanghai Electric Wind Power Group Co., Ltd. (hereinafter referred to as “Wind Power Group”), was successfully installed at the Chaoshuishan desert in Jinchang, Gansu, symbolizing the commercial operation of the product.

The last few years see a wide range of applications of the steel-concrete hybrid tower



230 METERS!

Shanghai Electric Sets a New Record for Grid-connected Wind Turbine Rotor Diameter

On November 16, the next-gen semi-direct drive turbine EW8.5-230 developed by Shanghai Electric Wind Power Group Co., Ltd. (hereinafter referred to as the “Wind Power Group”) was successfully connected to the grid. As an installed turbine with a revolutionary rotor diameter of 230 meters, its successful connection to the grid has set a new record worldwide.

Shanghai Electric Wind Power Group Co., Ltd. (hereinafter as “Shanghai Electric Wind Power”), a subsidiary of Shanghai Electric, develops the new EW8.5-230 turbine, a semi-direct drive product specifically made for Chinese seas with low-to-medium wind speeds, by exploiting the advanced know-how it has accumulated in decades on offshore wind power. The new turbine uses the highly-integrated semi-direct drive chain with goals of “high profitability and reliability”, making it a “leading holistic resolution employing state-of-the-art technologies”.

The Group has a wealth of experience in turbine design, production, installation, operation and maintenance gained from China’s largest offshore wind turbine library. Combining the advantages of different technologies, it has developed the next-gen Poseidon platform with a highly-integrated semi-direct drive chain technology based on grid parity of offshore wind power and the development goals for the area under China’s carbon peaking and carbon neutrality goals.

The EW8.5-230 turbine features Shanghai Electric Wind Power’s proven blade design, reliable pitch and yaw system, energy efficient cooling system, and optimal integrated electrical system, along with an innovative drive chain design.

- It adopts double TRB main bearing design to bear the rotor load more effectively, and the gearbox is directly connected to the main shaft with a more compact structure for easy transportation and installation.
- Three-stage planetary gearbox and medium-speed permanent magnet generator are adopted for better transmission efficiency and higher power revenue.
- The simple structure without wearing parts such as high-speed couplings and carbon brushes improves the

availability and reduces maintenance workload.

·It solves the difficulties in replacement of large components with comprehensive solutions for aerial replacement of gearboxes, generators, transformers and other components, reducing the cost of life-cycle operation and maintenance.

The EW8.5-230 turbine has the world’s largest rotor diameter as a grid-connected wind turbine with a blade length of 112 m. The Wind Power Group independently completed its aerodynamic and structural design, using hybrid carbon fiber and glass fiber materials to make it lighter and stronger, extending blade service life through dynamic leading edge erosion protection, and applying world-leading lightning protection technology to ensure the reliability of its operation.

Besides, the turbine adopts life-cycle digital design, manufacturing and maintenance management. With the latest version of the LeapX control system of the Group, the EW8X-230 turbine reduces its operational load and establishes an intelligent interconnection with the Wind Power Fengyun system to keep improving its availability and yield for clients.

Shanghai Electric Wind Power has pioneered the development of “large” turbines that can achieve grid parity. To address the possible technical and quality risks, the Group upholds its rigorous approach and completes testing of all important aspects during the development process, covering raw materials, components, systems, the installed turbine and the wind farm, especially the performance test of new composite materials, blade limit and fatigue test, integrated back-to-back test for shaft system, gearbox and generator, electrical system test for converter, pitch system and main control system, and rotational loading test of the installed turbine.

Once all the factory tests are completed, Shanghai Electric Wind Power checks the operation of the turbines under real conditions by testing the prototype onshore to solve all potential problems to avoid the high risks in offshore test and to improve the reliability in batch operation. **D**

A CENTURY-OLD SHIPWRECK SALVAGED

Shanghai Electric Contributes to a Major Breakthrough in China's Underwater Archaeology

A historic breakthrough in China's underwater archaeology was witnessed in the waters of Hengsha at the mouth of the Yangtze River: The semi-circular caisson made up of 22 giant curved beams, manufactured by the Shanghai Electric Nuclear Power Group Co., Ltd. (hereinafter referred to as "Nuclear Power Group"), was loaded with the largest wooden shipwreck ever found, the No. 2 ancient ship in the Yangtze River Estuary. After more than 4 hours of lifting, the ancient ship was successfully salvaged at 0:40 a.m. on November 21.

The salvage work adopts the pioneering "curved beam non-contact overall migration technology for cultural relics". After the first batch

of components arrived at the salvage site on August 17, it took only 95 days to assemble the caisson, which is about 50 meters long, 20 meters wide and 10 meters high. The assembly is smooth because the curved beams manufactured by the Nuclear Power Group successfully overcame the submarine sediment erosion and hydrological conditions. On November 20, the nearly 10,000-ton caisson loaded with the ancient ship, sediment and seawater was steadily lifted by the salvage vessel named "Fenli" at a speed of about 4 meters per hour. At 00:40 on November 21, the mast of the ancient ship resurfaced.

The Nuclear Power Group started to develop the isometric model for the salvage of the ancient wreck as early as July 2021, and successfully completed the isometric model test on January 12 this year.

On March 25, despite the force majeure events such as the COVID-19, the Nuclear Power Group organized manufacturing and processing personnel to efficiently advance the manufacturing of the final product against the clock. On July 17, the first 4 longitudinal beams were delivered; on August 17, a batch of core devices including the launcher and 4 curved beams arrived at the salvage site; and on October 18, the delivery of all curved beams was completed.

In 8 months, the Nuclear Power Group produced a total of 2,600 tons of equipment and successfully applied the large curved beam technology to the field of archaeology and heritage protection, which demonstrated not only the Group's strength in advanced assembly and manufacturing, but also its development strategy for "cross-border integration and collaborative development". 



Shanghai Electric Wins a Bid for World's First "Wind Power-Fishery" Integration Project

Recently, Shanghai Electric Wind Power Group Co., Ltd. (hereinafter referred to as "Wind Power Group") won the bid for world's first floating offshore wind power and fishery farming integration project, as the supplier of its main equipment and towers.

The project, located on the northeast of Nanri Island in Putian City, Fujian Province, with a depth of about 35 meters underwater, is developed by the Fujian Longyuan Offshore Wind Power Co., Ltd. of Longyuan Power Group. A floating wind turbine will be built based on the innovative concept of "generating power and farming fish simultaneously" to realize the shared use of "platform structure,

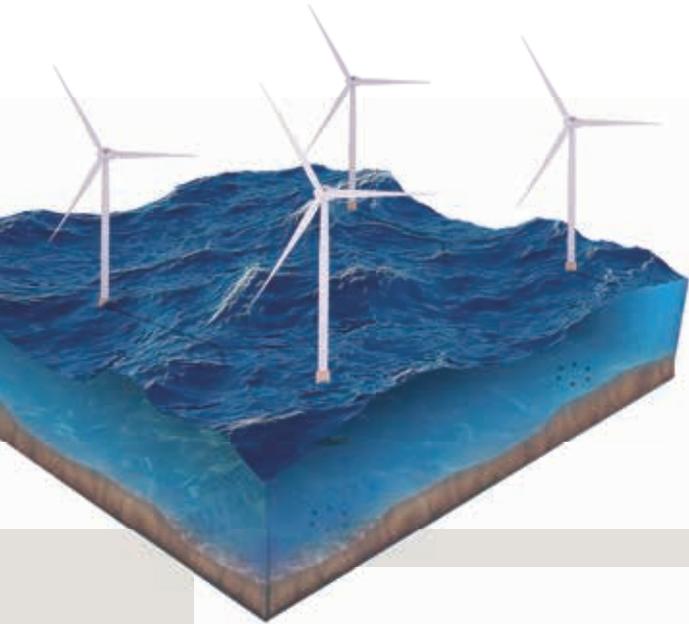
ocean space and operation capabilities".

Shanghai Electric Wind Power has fully ensured the safety and reliability of the system from three aspects: design, experimental verification, and digitally-enabled operation and maintenance, in order to ensure the stable operation of the floating wind turbine under harsh offshore conditions for better and sustained harvest of wind energy.

With the development of offshore wind power into deep sea, the Group is ready for the development and application of floating and deep sea wind farms. The group has participated in two major floating offshore wind power technology research projects.

"Floating Offshore Wind Turbine Load Calculation and Pneumatic and Torque Control Methods" and "Integrated Simulation Research of Floating Wind Turbine based on TLP", organized by Shanghai Science and Technology Commission, which have been closed after expert evaluation.

Under the trend of new energy integration, Shanghai Electric Wind Power will take the world's first floating offshore wind power and fishery integration project as an opportunity to continuously optimize models and application scenarios through technological innovation, promote the integration of multiple energy sources, facilitate the collaborative development of energy industry and other industries, and create a new ecosystem for their co-existence and co-prosperity. **D**



Two Units of Dongjiakou Project of Shanghai Electric Power Generation Group Starts Operation as Scheduled

On November 4, Unit 2 of Huaneng Qingdao Dongjiakou 2×350MW cogeneration project, constructed by Shanghai Electric Power Generation Group (hereinafter referred to as "Power Generation Group"), successfully passed the 168-hour test run. The Unit 1 was put into operation on October 13. The construction plan of the project has been fulfilled as scheduled.

The project is one of the key thermal power plants under the 13th Five-Year Plan of Shandong Province and a key provincial energy conversion project. The Power Generation Group provides the main equipment and furnace auxiliary equipment for the project. After completion, the project will satisfy the needs arising from the growth of thermal load in Dongjiakou port area, enabling a better and safer power supply system. **D**

COVER TOPICS



COVER TOPICS

A BETTER INTEGRATION OF CONVENTIONAL AND RENEWABLE ENERGY SOURCES FOR LOW-CARBON DEVELOPMENT

N

ew products and industries are always born in technological revolutions, and the energy revolution is no exception.

Shanghai Electric, a witness for and an innovator in energy equipment development, knows well the significance of conventional and renewable energy equipment for national energy security. In this issue of

Shanghai Electric, we are bringing you valuable insights from Shanghai Electric's enterprise summit forum themed by "Energy Integration for An Intelligent Future". You will see visionary plans for better integration of conventional and renewable energy sources and ambitious goals for a low-carbon, zero-carbon, smart and innovative future.







COVER TOPICS

Soaring energy prices in Europe following the energy crisis which was triggered by the Russia-Ukraine conflict have soon affected all aspects of social life in Europe, forcing European countries, who used to be the most active in carbon neutrality, to reactivate their coal-fired power plants. This seemingly unexpected energy crisis is reminding us in a special way to re-examine the relationship between conventional and renewable energy sources.

It's time for a major upgrade of our energy system. While leveraging its competitive edges on equipment for conventional energy sources including coal-fired power, gas power, nuclear power and biomass power generation, Shanghai Electric will vigorously develop new equipment and technologies to develop a multi-energy complementary system which features the wind-solar-hydro-thermal-storage integration, and the source-grid-load-storage-hydrogen integration, to optimize the combination of conventional and renewable energy sources. We will endeavor to be a primary contributor to the green energy industry in the new era by creating an integrated industrial ecosystem.

Carry on the centennial heritage to create a better future. Adhering to "openness, coordination and win-win cooperation", Shanghai Electric will join hands with partners who share the same goal of high-quality development to develop green, smart and systemic solutions for smart energy, intelligent manufacturing and smart infrastructure, with a view to contribute to a zero-carbon society and high quality development of the power sector.

“ OPPORTUNITIES AND CHALLENGES POSED BY INTEGRATED DEVELOPMENT OF CONVENTIONAL AND NEW ENERGY SOURCES ”

The Ukraine-Russia conflict and Europe's energy crisis force people to take a second look at the integration of conventional and new energy sources. Take the trend of electricity from wind and solar energy for example. There was statistical data showing that wind power and photovoltaic power accounted for 26.7% of China's power generating capacity in 2021, and the National Energy Administration's data show that the percentage is expected to reach about 50% in 2030, which means that by then they will be another major power source alongside hydroelectric and nuclear power.

However, the problem is that neither wind nor PV is able to serve as a primary source of power. Electricity from conventional coal-fired plants is under full control. As new energy like wind power and PV develops and replaces thermal power, the stability of grids is reduced because electricity from these renewable but turbulent sources is electronic. We used to use copper, iron and materials alike, but today both wind power and photovoltaic plants need to employ power electronic devices for grid connection, whose low resistance against interference gives rise to quite a few problems.

What are the challenges standing in our way now?

Firstly, the transients and voltage's flexibility of grids supported by PV and wind power plants are far lower than the requested level. Typical incidents include power outages in the UK in 2019



Vice Director of Energy Research Institute, Shanghai Jiao Tong University and Director of Wind Power Research Center

Cai Xu

and Australia in 2016. At that time, 34.7% of electricity in the UK came from wind, and so once big failures happened, the grid's frequency was damaged due to lack of inertia, an archetypal consequence caused by the shortage of flexibility and inertia.

Secondly, power electronic devices are necessary for grid connection for every renewable-energy power plant, whose high permeability and tight coupling will give rise to dramatic frequency fluctuations. This problem was first observed in California in the US, offshore wind projects in Germany's North Sea, Hami City in Xinjiang Uyghur Autonomous Region, China, and Tongyu City in Jilin Province, where the frequency spanned from less than 10 Hz to over 4,000 Hz. Such a daunting range is mainly brought about by their high permeability.

Thirdly, the support of the transient current is insufficient. The HVDC system's transmission capacity is enormously curbed. For instance, the Qinghai-Henan UHVDC Power Transmission Project has a capacity of 8 million kilowatts, but now only transmits at 3 million level, which results in crippled operation of the project, solar and wind curtailment and bigger limitations on capacities to be installed.

With more electricity from renewable sources transmitted in grids, these problems will deteriorate and need more efforts from the conventional side for better integration. In fact, the wider and deeper deployment of new energy sources and power electric devices will produce more changes in the electricity industry.

Multi-energy complementation is important for the integration of conventional and new energy sources. A higher percentage of new energy sources in the energy mix requires utilizing their varied properties while promoting complementary development. What's more, we need to keep upgrading wind and photovoltaic power generation technologies

and make good use of energy storage, an excellent support. China has underpinned energy storage projects over the past few years, which include pumped-storage hydropower programs, a traditional form but used better, and more importantly, new ways like electrochemical energy storage. At the same time, we need to take advantage of control capability on the user side through supply-need interaction to make the whole energy system stable, safe and reliable.

What are the opportunities and challenges we have now? Firstly,

coordinated and complementary development. The development of conventional energy needs innovative technologies in areas like deep control and inertia to help to expand new energy's share in the grid. Secondly, conventional energy needs to be cleaner and meet the demands of decarbonization, which is also a form of integration in the long run. Thirdly, gradually switch to the new energy industry from the conventional one.

Apart from using new energy, the switch is also about making technological innovations in the conventional sector. Deployed in new scenarios, products, such as synchronous condensers, will be added with new technologies and properties. Turbulences and even headwinds are inevitable as the transformation proceeds. Although the conventional energy sector appeared to go from bad to worse in the past couple of years, it may have the opportunity to make extremely fatty deals now and in the near future on the ground that many countries have been struck by nationwide power failures or incidents alike, and moreover, the new energy sector is not yet ready. Therefore, we ought to accelerate technological innovation in conventional energy development during the window period to make the switch smoother.



ENERGY SAFETY IN EXTREME WEATHERS

GUESTS:

Li Canbing, Professor, Vice Director and PhD tutor, Department of Electrical Engineering, School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University

Wu Huanqi, Executive Vice President, Shanghai Electric Power Generation Group

Xu Qiang, Vice President, Shanghai Electric Power Generation Group

Lu Dongqing, Vice President, Shanghai Electric Nuclear Power Group Co., Ltd.

Kang Pengju, Chief Digital Officer, Shanghai Electric Wind Power Group Co., Ltd.

MODERATOR:

Yang Yang, journalist with The Paper



The past few years has seen extreme weathers happening frequently, for example, the severe cold wave in 2020 and the radical drought in Sichuan Province and Chongqing City in this year's summer. China's energy safety is under great pressure. When extreme weathers are no longer extreme incidents but a new normal, the switch to new energy from the conventional brings a string of new challenges to power safety in a traditional sense. To ensure full control of energy development, we need to adapt to and address new scenarios and problems.

Q What are the disruptive challenges caused by a higher frequency of extreme weathers to developing new-type power systems?

A The major risk is that thunders, typhoons and other dangerous weathers will disturb equipment's operation. In addition, the power system today has to keep the power electric balance because wind and solar conditions are part of weather while more and more power in China's grids comes from renewable sources. Just imagine what would happen if the wind stops for some time. A wind power plant

with an installed capacity of over 10 million kilowatts deployed in Gansu Province once dropped from full load to zero in just approximately 10 minutes. If we want to secure the power balance, we have to either reduce the load or find additional power from other generators in the same time span, which is almost impossible. Likewise, provinces where PV installation is one of the main energy sources might suffer from a huge lack of energy when there is no clear sky for 10 days consecutively or even a month. We still have a long way to go to re-examine weather risks and figure out how to prevent them regarding the fact that the biggest risk for the new-type power system lies in weather.



ENERGY

Q Shanghai Electric plays a prominent role in the power equipment industry. What are the new challenges or changes you need to respond to? What are your most urgent problems in technological innovation?

A What we need desperately is to design a holistic weather monitoring system for our power industry. At present, weather monitoring and forecast services provided by the department of meteorology and climate are mainly socially oriented, without taking the power industry's special conditions into consideration. Today, coal-based power plants are the cornerstone to the whole power industry, and it would be nuclear power's turn in the future's new energy-centered power system. Energy storage is also important in the transition.

Q Power crises begot by extreme weathers in recent years forced people to reach a consensus that thermal power plants are still essential to the electricity system and will hold their position in the energy mix for a far longer time than we expected. How to re-evaluate their importance when we are promoting the vital transition to new energy?

A It is almost impossible to outdate all thermal power plants, which may seem insane to many, but the extreme weather this year, radical heat and drought, does push electricity consumption much higher. It is important for us to expand our generation capacity because only with enough capacity can we address such weather conditions.

Our installed capacity is big, but people may have some misunderstanding about it. To be more specific, there are the generating capacity that shows how much power can be produced, and the capacity actually needed.

In China, most thermal power plants are coal-based, and a few are coal-based, which is directly related with our natural resource reserves. So far, nuclear power accounts for around 4% of the national output. Therefore, we must prioritize the research on thermal power. Shanghai Electric needs to focus on coal-based power plants specifically, and take the following aspects into consideration.

Firstly, to make coal-based plants cleaner is to increase their production efficiency, and carbon reduction needs to be implemented from the design stage, the very start of a project, to make our plants one of the most efficient in the world. Secondly, coal-fired power plants need to help new-type power grids to realize load peaking by always ensuring that new energy power plants can produce more electricity, which means they need to perform the new task of deep peak regulation. At the same time, they need to be highly reliable with long service life to better support new-type power systems.

We have constructed new coal-based power plants in places where they were prohibited over the past few years because the country has recognized the importance of power stations and more importantly, the support from the government is a great opportunity for us. We can see promising developments in new energy. Apart from that, we also need to build more energy storage stations because they can shave the peak and fill the valley.



COVER TOPICS

Q It is notable that more coal-based and thermal power plants have been approved by local governments this year. Upgrading thermal power plants has become a new market on the ground that flexibility goals formulated in the 13th Five-Year Plan are not fully met. What's more, the grid side has a growing demand for peak regulation, and thermal power plants themselves need transformation. Therefore, what are the new trends in the market of flexibility improvement?

A We used to build a large number of thermal power plants whose installed capacity and parameters were relatively low. To make things worse, they were never asked to perform peak regulation on such a large scale, which means that they are incapable of doing so. However, Shanghai Electric is able to upgrade old generators with advanced technologies, making them more flexible and efficient. A lot of resources and efforts are invested into technological improvement to satisfy the expanding market need.

Q In the first half of this year, Shanghai Electric's energy storage business recorded a year-on-year growth of 153%. What changes in market demand does it reflect?

A Early this year, we launched Anhui Province's first 100MW program at the grid side, an energy storage station, and it has got connected to the grid. The second project is a source-side peak and frequency regulation station of Phase I of Shazhou Power

Plant, which is also commenced at the start of this year and expected to produce electricity at the end of this year. Thirdly, we have received orders for energy storage projects that are used to complement wind and solar power generation systems. Fourthly, we inked a contract with PGT from the UK on a 100MW energy storage project, a milestone achievement in exploring overseas markets. Fifthly, we have established strategic cooperation with domestic leading enterprises, ensuring a stable supply of batteries for standby generators for the long run.



Q Energy storage still has to address challenges in areas of profitability and business model. What are your opinions and suggestions on improving the status quo?

A Shanghai Electric has built up several demonstration bases, the solar energy storage project at the Minhang Site being the first one, to verify technologies and to explore business models as well. Minhang Site has yielded a good ROI. Moreover, it promotes the implementation of energy conservation plans across the entire site, including business models and getting surplus electric power connected to the grid. Another action at the initial stage is to build China's first and largest independent shared energy storage station in Qinghai for peak and frequency regulation. However, in light of the business model, its commercial performance is not satisfying when it is only meant for peak shaving and frequency regulation. Therefore, whether policies can be implemented is crucial to the development of energy storage.

ENERGY

Q Extreme weathers have a more direct impact on new energy and hydroelectric energy. As the energy transition comes to a critical period, more and more countries have shown support for nuclear power since last year. Concerning the status quo of energy security, what are the new challenges in the global nuclear power market?

A We've spotted new chances for nuclear power over the past few years. Neither media nor climate conferences attended by institutions and organizations worldwide approved the participation of nuclear power entities. In contrast, government leaders have dialogues on how to better develop nuclear power on the precondition that nuclear power safety is absolutely ensured even in private sessions of conferences at the United Nations in New York. China has been committed to nuclear power development. Nuclear power has many advantages. On one hand, it has more than 3 technical solutions whose safety and stability have been improved and verified. On the other hand, new technologies promote nuclear power to be applied in more scenarios and with other types of energy in a complementary manner, which include small-scale applications, modularized products, and the high-temperature gas-cooled reactor, a leading technology of China's 4th-Gen reactor.

Q The blue ocean market for wind power development is off the shore. Offshore wind power projects are now evaluated in every aspect, and there are higher requirements for power generating benefits and reliability of wind turbines. Apart from the large size, what other characteristics will offshore wind power projects have?

A Offshore wind power development is a market with huge potential. If China's offshore wind power, both along the coast line and in the open sea, is developed by large, the use of coal will be cut by at least 60%.

Therefore, it is possible for us to replace conventional energy with offshore and onshore wind and PV projects. The challenge that comes with potential is high cost, which is the foremost obstacle in exploring resources in the deep and open sea. To support the life of 5 billion people on Earth, the energy has to be cheap no matter what kind it is. Thus, developing any energy should focus on cost reduction. Offshore wind power is no exception. One way is to scale up by incentivizing more companies to enter the market. At the same time, we need to promote coordination across the industrial chain to make the market bigger and bigger. In addition, we can reduce costs by developing offshore wind

power in lockstep with other complementary businesses including mariculture, wave energy conversion and offshore PV farms. We, as humans, are a community, and Earth is our home. No one, a person or a country, can stand alone. Under the guidance of carbon peak and carbon neutrality goals, renewable energy will enjoy high-quality development and jump to a higher stage during the 14th Five-Year Plan period. Energy transformation is essential for China to realize long-term and stable economic development and build a modern socialist country in all respects.





COVER TOPICS

SMART ENERGY

LEADER IN THE COUPLING OF NEW AND TRADITIONAL ENERGY SOURCES

Zhang Tong, journalist with China Industry & Information Technology



SMART

While new energy has been developing fast, are thermal power plants really doomed?

Although new energy enjoys the advantage of being clean, it is inherently random and turbulent, which will severely impact the grid's safety and stability when a high proportion of electricity transmitted comes from renewable sources. What's worse, power shortages have struck many regions in China from last year on due to frequent extreme weathers and the global energy crisis, and hence thermal power plants attract more and more attention for their function as a "cornerstone". Countries have to re-evaluate the role of thermal power plants because of weather and more restrictions and power consumption. Thermal power plants are expected to serve as a security net to ensure power supply safety, and big support to facilitate new energy development.

The renewable and the conventional are complementary.

Therefore, how can we realize decarbonization on the premise of ensuring energy safety during the switch to turbulent new energy sources from stable fissile ones? The answer lies in multi-energy complementation. It takes years to realize an energy transition that requires the development of different energy sources in parallel.

The past decade sees fundamental changes in China's energy mix. While the installed capacity from photovoltaic and wind power takes up a bigger share, coal-based power drops to less than 50%. Nuclear power plants have regained momentum and proceeded stably, and energy storage has entered the fast lane. To cut carbon emissions in the power industry, it is essential to promote coordination and cooperation on source, load and energy storage sides with factors of time, area, characteristics and entities taken into consideration.



ENERGY

MULTIPLE “SOURCE-GRID-LOAD-STORAGE-HYDROGEN” APPLICATIONS

In May, the State Council released a circular on the implementation plan to promote the high-quality development of new energy in the new era, drawn up by the National Development and Reform Commission and the National Energy Administration. It will encourage the construction of industrial green microgrid and source-grid-load-storage integrated projects, and promotes complementary and efficient utilization of various kinds of energy in order to improve the grid system's regulation capability and flexibility. It will also support and direct grid companies to get connected with and consume electricity from renewable sources, and boost the development of new-type energy storage.

The synergy of “source-grid-load-storage” refers to a business model based on the solution that integrates the power source, grid, load and energy storage. With this pattern, we are able to accurately manage the load that can be cut off and energy storage resources in society, enhance the safety of grid operation, and address problems like grid frequency fluctuations amid the consumption of clean energy. As a result, it will help to increase the use of electricity produced by renewable sources, and drive the coordinated and sustainable development of both energy and ecology.

Concerning new market trends, energy enterprises leverage advanced physical and information technologies and upgrade management models to find out the know-how in areas of connecting energy users with suppliers, building new industrial ecosystems to meet clients' diverse needs efficiently and cost-effectively, and realizing high-



quality planning, operation, collaborative management, interactive response and multi-energy complement among a variety of heterogeneous energy systems.

Shanghai Electric, one of the enterprises that have the most categories of energy equipment in the world, refines and upgrades its portfolio for conventional and new energy. It has developed world-class technologies in areas of clean and efficient coal-based power generation, safe nuclear power and natural gas-fired peaker power plants with efficient and flexible regulation, and sets a new world record for coal use in power generation.

Shanghai Electric has launched many high-tech projects, either in research or to be approved, in light of complementary development of "wind-solar-hydroelectric-thermal-storage" and "source-grid-load-storage-hydrogen" hybrid solutions, for example, floating offshore wind turbines, new-type energy storage system, high-voltage power electronic conversion devices, efficient PV cells and solar power generation system and large-scale hydrogen energy equipment.

Meanwhile, Shanghai Electric develops the life-cycle "comprehensive smart energy solutions" specifically for large grid, off-grid and users' actual application scenarios by utilizing various energy sources available in the region, coal, natural gas, solar and wind power and biomass, and different energy storage methods, hydrogen production and heat storage, which not only meets diversified needs of energy consumption within the system but also increases energy efficiency.

According to Tang Yucheng, General Manager of Shanghai Electric Smart Energy Technologies Co., Ltd., Shanghai Electric's excellent capabilities in equipment manufacturing and system integration ensure that its "one-stop comprehensive smart energy system solutions" covers every link: source, grid, load and storage.

As for clean coal-based power production, Shanghai Electric, the world's top three in thermal power generation technology, develops the double reheat ultra-supercritical technology that can improve generation efficiency by large. According to the latest data, the unit consumes only 249.6 grams of coal per kWh.

As for wind power technology, Shanghai Electric customizes separate unit solutions and offshore wind power platforms, Petrel and Poseidon, for the sea with high-speed winds as well as low-to-medium speed. The EW11.0-208 direct-drive turbines based on the high speed-oriented Petrel platform can be deployed in sea areas that are in normal conditions or will be hit by typhoons. It can hugely increase generation efficiency while ensuring excellent coordination and a low failure rate. The EW8.X-230 semi-direct drive turbine targets areas with low-to-medium wind speeds, which is based on the Poseidon platform. Shanghai Electric also designs and manufactures an airfoil family which features the advantages of a high life-drag ratio, low roughness and sensitivity, and helps to optimize the turbine design as a whole by increasing the blade's generation efficiency and balancing load and output. What's more, Shanghai Electric's Windsight wind farm digital design platform can collect together all wind resource assessment work flows finished, perfectly addressing the lack of a unified management platform and accurate and standard whole-process review system in the evaluation.

As for CSP technology, Shanghai Electric is the EPC contractor and one of the main equipment suppliers to the Dubai 950MW CSP+PV solar complex that is the largest and most advanced in the world. While promoting the construction, Shanghai Electric provides excellent examples of adjustable power supply with properties of large scale, long time and low cost. The complex compasses an area of 440,000 km², the equivalent of 6,162 football fields, and has the biggest quantity of molten salt usage. When at night or weathers are not good, energy stored by PT units can support power generation for as long as 13.5 hours, and that of the CT CSP towers is 15 hours.

As for fluid storage, Shanghai Electric is able to design energy storage stations on a systemic level, and has acquired exclusive patent licenses for key technologies including 5kW-25kW container charging pile of vanadium flow batteries and the advanced 50kW pile.

As for lithium-ion battery storage, Shanghai Electric has established a high-quality and independent lithium battery industrial ecosystem that preliminarily realizes



coordination between energy-side battery products and industry-side production line equipment. Shanghai Electric's factory at Nantong has an annual production capacity of 5GWh, and its products are used in the 32MW/64Whh project at Golmud in Qinghai Province that is China's first grid-side shared energy storage station, and solar-plus-storage-side 12.5MW/20MWh solar energy storage station in Tibet.

As for hydrogen technology, on the basis of core and key equipment for the four major links, i.e. production, storage, transportation, and utilization, Shanghai Electric focuses on large-scale and low-cost hydrogen production equipment and large-capacity facilities that produce methanol through "green hydrogen + carbon capture" and ammonia with hydrogen. In this way, it empowers the large-capacity and low-cost hydrogen industrial loop of "hydrogen produced from renewable energy + green chemistry based on carbon capture".

As for carbon capture and utilization (CCU), Shanghai Electric is constructing a CCU project at Jiahua City in Zhejiang Province with an annual capture capacity of 200,000 tons. Shanghai Electric also builds a demonstration factory to produce methanol with hydrogen whose annual capacity is 130,000 tons, offering a feasible solution to green utilization of raw materials and energy and "deep

decarbonization".

As for nuclear power, Shanghai Electric directly benefits from the faster development in this area because it is the world's sole integrated supplier that can offer the nuclear island, main equipment of conventional islands, key instruments, instrument control and instrumentation and large casting and forging parts. As China's need for energy and power continues to surge, nuclear power is important to ensure both an independent energy supply and a low-carbon transformation. According to the energy development strategy for the medium to longer term, nuclear power plants' installed capacity and output are expected to reach 10% in the national aggregation respectively by 2035, which means the current market still has much potential. Alongside power generation, the comprehensive utilization of nuclear power is another blue ocean market.

According to Tang Yucheng, Shanghai Electric's smart energy system solutions have devices connected in a digital and intelligent way through digitization's base feature and smart grid technology, and realizes inter-device coordinated operation through AI and big data capabilities and automatic control technologies. What's more, scenario-based solutions can be produced based on clients' different characteristics and needs.



NEW DEMONSTRATION OF SMART ENERGY APPLICATION

When you drive on the Shugang Bridge in Shantou City, you will see a white “windmill”, gigantic and towering, that is the Petrel platform-based EW11.0-208 wind turbine with a height of 115 meters from its hub’s center to the ground. Its rotor’s diameter is 208 meters long, and the length of the blade 102 meters, creating a swept area that is 4.7 times of a standard football field. With an annual generation capacity of 40.4 million kWh, it can support about 20,000 households for a year and cut carbon dioxide emissions by 34,000 tons. The turbine got connected to the grid and started to produce power on August 10, 2022, setting a new Asian record for the largest capacity of a single wind turbine connected to the grid.

It is part of the Shanghai Electric Shantou Smart Energy Demonstration Project launched in Shantou, Guangdong Province by Shanghai Electric Wind Power Group Co., Ltd.

As of present, it is the largest “loE +” demonstration project integrating wind and solar power and energy storage in Guangdong, and the first industrial park of its kind for Shanghai Electric. In the future, it will develop into a zero-carbon park and an exemplary program for smart city construction.

The project is composed of one 8MW wind turbine, one 4 MW turbine, 2.42MW PV panels placed on rooftops, 1MW/1MWh lithium battery energy storage station, 1MW/1MWh vanadium flow battery energy storage container, charging piles, smart building monitoring systems, IoT system of “5G+” factory, microgrid management system and smart energy control platform. With dynamic “source-grid-load-storage” management technologies, the project ensures highly reliable power supply and high-quality power, and realizes automatic coordination, balancing and maximization of energy by utilizing Shantou’s rich wind and solar resources.

The Shantou site incorporating distributed wind power and PV installations, new-type energy storage facilities and other integral energy complies with the standards and processes of “Industry 4.0” and adopts world-leading lean production management systems,

making it an advanced large-capacity smart offshore wind power production base featuring cutting-edge technologies, good quality, efficient equipment and smart production lines in the global market.

Empowered by the cyber-physical system (CPS), the project formulates an intelligent manufacturing system enabling digital collection, application and decision-making, and establishes smart microgrids integrating wind and PV power, energy storage and charging piles, getting ready for future trends in China’s offshore wind power development.

In addition, this project empowers modern energy management in industrial parks by providing one-stop Industrial Internet solutions for sides of sensors, networks, platforms and applications. As one of China’s first green and smart energy projects and a signature application of 5G Industrial Internet smart wind power technologies, it explores how to ensure high-quality energy supply when a big proportion of electricity is from renewable sources, and proves that this model is commercially feasible.

The announcement of the dual-carbon policy accelerates wind and PV power companies to make technological innovations and explore new application scenarios. Combinations, of renewable and digital technologies alongside with new energy applications and scenarios, lead to many inventions.

Shanghai Electric Wind Power Shantou Smart Energy Demonstration Project is a perfect example in this regard. It builds up an open experimentation platform where new ideas, methods and products will be collected and enhanced with new technologies, such as 5G, IoT, big data, cloud computing and AI. Therefore, it develops into a complex that integrates smart new energy, digital wind farms, factories and interaction, smart energy storage, smart distribution network, smart factories, industrial parks and transportation, revitalizing the relatively traditional power equipment and products.

Shanghai Electric finishes the design, manufacturing and integration of over 70% of equipment deployed at the project on its own. It uses about 36% of electricity generated by itself, which can cut carbon dioxide emissions by 6,500 tons every year and make its utilization ratio of renewable energy almost 100%.



The smart energy management system also supports self-production and self-consumption of electricity and connects surplus power to the grid in addition to ensuring high reliability and quality in power supply. It is estimated that on a yearly basis, EW11.0-208 turbine's output plus the 3.1 million kWh from PV facilities are able to support the operation of the whole industrial park with a surplus of 35.4 million kWh available for direct grid connection. The surplus alone will directly bring in economic benefits of approximately 16 million yuan every year, calculated at 0.453 yuan/kWh, the current

benchmark price for electricity generated by coal-fired power plants in Guangdong.

Tang Yucheng concluded: "Shantou project offers low-carbon or even zero-carbon solutions for industrial parks, which can be reproduced by our peers. So far, there is a huge market for energy consumption decarbonization in Chinese industry because clean energy only takes up a small fraction of its energy landscape. Concerning the status quo, the Shantou project acts as an effective technological solution to the achievement of the "dual carbon goals." 



VIEWPOINTS



INTERVIEWS

HOU ZHAO QIN

WIN CUSTOMERS
WITH ADVANCED
TECHNOLOGY
AND RELIABLE
QUALITY



HOU ZHAOQIN:

Director of Product Engineering Department, Riyong-Jea Gate Electric, responsible for product development, technological innovation, and other technological work, winner of Shanghai May 1st Labor Medal and Shanghai March 8th Red Banner Bearer.



According to the Three Character Classic, "Diligence has merit; play yields no advantage. Guard against it; exert your strength." Hou Zhaoqin's name suggests it. "Diligence leads to good life" is the simple expectation her parents have for her.

Elegant short hair, confident and competent in whatever she does - you know she is a cultured woman the first time you meet her. In a conversation, at once quick-witted and prudent, she speaks neither too slow nor too fast, telling the history of Riyong-Jea Gate Electric right before you.



Ten years ago, Hou Zhaoqin led the team to develop the radiator fan for Volkswagen Passat and made a breakthrough in the drawings of the German brand. Since then, the Riyong designs and drawings have provided initial prototypes for product outsourcing of multiple world-famous automobile manufacturers, including General Motors and Volkswagen.

In face of the rapid development of the new energy vehicle market and the implementation of China VI Vehicle Emission Standards, Hou Zhaoqin and her team went beyond the 20-year radiator fan business and developed new lines which are currently under industrialization, including the OPF regenerative air pump, electronic water pump, and integrated thermal management system (ITMS). Groundbreaking developments in these new areas create sustained drivers for future growth of Riyong-Jea Gate Electric.

"Our goal is to grow into the best automotive parts manufacturer in the world," said Hou Zhaoqin, with confidence all over her face. Vigorous (Zhao) and diligent (Qin) as her name suggests, Hou Zhaoqin is leading the Riyong-Jea Gate Electric technological

team to gain the first-mover advantage with speed, adapt to the rise of new forces with self-changes, win the respect of demanding customers with excellent quality, strengthen the development momentum of the company with innovation, and maintain customers' trust with integrity.

Through down-to-earth efforts, she proved true her parents' vision when they gave her the name. After 30 years in the industry, Hou Zhaoqin has accumulated rich work experience and life wisdom and now it is time for her to harvest what she sowed.

"I majored in motor design in college and joined the Shanghai Riyong Electric Machinery Plant after graduation. It changed the name to Riyong-Jea Gate Electric after it became a joint venture in 1998. Back then, the plant was on Guangzhong Road, Hongkou District, not in Malu. In a sense, I grew together with the company." Recalling the past, Hou Zhaoqin smiled with her eyes.

In the early 1990s, college students were cream of the crop. Girls majoring in science were even rarer. In the summer of 1992, 6 young college girls came, like a refreshing breeze, to Shanghai Riyong Electric Machinery

Plant. But now, only Hou Zhaoqin is still with the company.

"It's not surprising when you think about it. Great changes have taken place in the country, the society, and businesses in the past three decades. This generation of people have lots of options. They say knowledge changes your life, but to be exact, I think knowledge gives you a better chance to direct your life. I'm the only one who stay in the industry, the others went abroad, or changed career, or became a full-time wife and mother. We six are all living a good life," said Hou Zhaoqin.

For Hou Zhaoqin, her first job at the technological department of Shanghai Riyong was a choice driven by interest as much as a matching major. She enjoys the unparalleled satisfaction from drawing, designing, and seeing the product she designed being produced. From a technician to a manager, and then to the director of the product engineering department, her love and respect for technology has never changed.

In the past three decades, she has been through market ups and downs with Riyong-Jea Gate Electric, which transformed from a little-known small company into a renowned



INTERVIEWS

manufacturer of automobile engine radiator fans. "Our customers are from all over the world, covering major household names in the automobile industry." We could hear the pride she takes in the company's achievements: "We're here today because of the strategic vision of our senior management, constant product development, and consistent product quality." Through the glass window of the meeting room, she gazed at the picturesque factory, recalling the vivid hot summer days thirty years ago. "I kept to my choice and never regretted."

SETTING THE EXAMPLE

"Thanks to technological development, mental labor is gradually taking the place of physical labor, and the gender difference at work is increasingly diminished." Hou Zhaoqin encourages more young women to become an engineer, "scientific research requires resilience and that's women's strength. We don't have to set limits for ourselves, or think that girls are not fit for science majors. Just follow your heart."

On the homepage of Riyong-Jea Gate Electric official website, you would find a slogan "Cool air from Shunda for automobiles in a ten-thousand-mile run." The simple slogan perfectly describes the type of the company, its brand and products. Located in Malu Town, Jiading District, with 400-plus employees, the joint venture provides professional solutions for more than 200 automobile manufacturers and automotive parts suppliers at home and abroad. The product development and production capabilities continue to lead the industry. The Shunda (automobile) passenger car radiator fan assembly has won the title of Shanghai Well-known Brand for more than ten years in a row, and the Shunda trademark is named a Shanghai Well-known Trademark.

The automobile industry upgrades frequently. A platform-based model has a lifecycle of five to seven years, while its development takes at least two years. Nearly 80% of Riyong-Jea Gate Electric's annual sales is attributed to new products in the last five years. In other words, only by constantly innovating technologies and developing reliable products can the company satisfy customers' increasingly higher

demand for technological quality.

"Data show that sales of new energy vehicles in China is expected to reach five to six million this year, and exceed 10 million by 2025." At present, more than half of our existing projects are in the new energy vehicle industry. It is in line with the national dual-carbon policy, as well as the general trend. New energy vehicles need higher-standard radiator fans and it's now the critical period to grab market share. Therefore, we need to provide the latest, optimal, and comprehensive solutions for customers and meet different needs with diversified and differentiated products. Only then can we keep our existing customers and explore new markets." Hou Zhaoqin had a lot to say about R&D.

In spite of various customers, numerous projects and staff shortage, Hou Zhaoqin and her team never stop technological innovation, undertaking one project after another and developing one new product after another. For major projects, she takes charge of the main design and analyzes and verifies every size and trial results. She actively introduces new technologies, such as electronic simulation and NVH simulation analysis,



and applies advanced technologies such as CAE electromagnetic field simulation, airflow simulation, and modal analysis to improve product quality, in order to ensure that the products can withstand the test of the trials, the road, and the market. The product engineering department that she leads diligently pursues breakthroughs and innovations, delivering high performance in the corporate development. In 2021, the department had 98 new product development projects, of which 29 were completed and put into mass production. 12 new products had a sales revenue of more than 10 million yuan, and 5 generated over 20 million yuan in the first year of their launch.

Every employee at the product development department is familiar with the "Three Objectives": 1 new product every month on average, 1 new product with sales of over 10 million yuan every year, 1 to 2 high-tech products every year listed in the national or Shanghai new product trial production plan. "These objectives are not empty talk. We deliver them by uniting the whole factory and investing efforts." She emphasized on the last word.

LEADING THE TEAM WHOLEHEARTEDLY

The automobile industry is undergoing transformative changes. The fast-track development of the industry not only brings better experience and enjoyment to consumers, but also raises higher requirements for manufacturers. How to win out in a new round of industrial revolution? How to maintain a 30% market share? How to compete with time-honored overseas brands on technology? How to compete for market with emerging private enterprises in China? These questions confront R&D staff at Riyong-Jea Gate Electric. The urgency and sense of mission prevents Hou Zhaoqin from loosening efforts. She always stands at the frontier of technological development and leads the team to ride the waves.

The product engineering department of Riyong-Jea Gate Electric is responsible for product development and technological innovation. 64 of the 68 employees have a bachelor's degree, and 24 are medium- or high-level engineers, specializing in motors, electronics, machinery, internal combustion engines, hydromechanics, mechanics of materials, mechatronics, etc. Talent abounds, and each



one excels in their own domain. But Hou Zhaoqin, who started out as a technician, finds leading a team much harder than doing pure technical work.

"Everyone's personality and temperament are different. I need to understand them before getting them passionate about working. The level of capabilities may vary but everyone has his/her advantages which should be used in the right place and given full play. And that's the job of a leader. I hope to propel, support, supervise, and guide the team properly." As a female leader in a research team dominated by men, Hou Zhaoqin is known for being generous and kind. This is her life philosophy.

"When young people join us, I regard them as my own kids. I always encourage them to be bold and not afraid of making mistakes, because you can always start over. I involve newcomers in projects and take them to meetings with clients so that they can listen to the needs and comments of the clients which they can absorb into product design. Gradually, they're no longer timid or shy. Through communication, they accumulate experience, understand the industry and the market, and know how to prepare themselves for the future,

realize their own value, and improve their skills. With a satisfactory look, Hou Zhaoqin noted that Riyong-Jea Gate Electric values human resources, actively expands the pipeline of technicians, and spares no effort to retain the existing employees, enhance their sense of belonging, improve the performance evaluation system, and strengthen the incentive mechanism. An ideal product development department, to her, should be a magnet for talents, as well as harmonious enough to retain employees.

"Thanks to technological development, mental labor is gradually taking the place of physical labor, and the gender difference at work is increasingly diminished." Hou Zhaoqin encourages more young women to become an engineer, "scientific research requires resilience and that's women's strength. We don't have to set limits for ourselves, or think that girls are not fit for science majors. Just follow your heart."

Riyong-Jea Gate Electric welcomes all creative young people to bring infinite possibilities to reality. It is where Hou Zhaoqin's dream came true and where more people's dreams continue today. At Riyong-Jea Gate Electric, the future starts with you! **D**

HOU ZHAO QIN





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