

Shanghai Electric Group Co., Ltd.
Shanghai Electric Editorial Board

Honorary Director
Leng weiqing

Honorary Deputy Director
Liu Ping Zhu Zhaokai

Director
Sun meijunbo

Planner
Shen Jin

Editor-in-Chief
Tu Min

Add No.149, Middle Sichuan Road,
Huangpu District, Shanghai, China

Zip 200002

Tel 8621-23196488

Fax 8621-63216017

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Shanghai Electric

TECHNOLOGY IS OUR KILLER FEATURE IN

Technology is becoming a new weapon in COVID-19 response, where Internet-based technologies play a crucial role. For example, big data-based real-time monitoring of the pandemic situation alongside with monitoring, analysis and utilization of population movement; and Internet-based pandemic prevention and containment, online shopping, and remote working and teaching. Effectively containing the pandemic, Internet-based technologies are also reshaping how our society develops.

Based on the Internet, enterprises are constantly driven to create new value according to new needs. Today's Alibaba is different from the original Taobao, and so is Tencent from chat apps used years ago, and Huawei from a cellphone manufacturer. Their achievements are attributed to their continual efforts in developing new business models with the Internet at the core because there is no such thing as a fixed model for Internet-related companies, let alone boundaries.

The Industrial Internet that fuses next-gen information technologies and the manufacturing industry links the traditional industry with cutting-edge IT technologies, and has become a major driver to the digital transformation of manufacturers. Putting the Industrial Internet high on its agenda, China has committed to the planning and implementation of top-level strategy-making, industrial development, enhancing application and ecosystem building, and managed to forge a development situation characterized by "coordinated direction, differentiated orientation, unified action, and all-rounded cooperation".

As the replacement of old development drivers with new ones is being boosted in the new Industrial Revolution, Shanghai Electric, a leading equipment manufacturer in China, is committed to organically integrating the manufacturing sector with the Industrial Internet and accelerating seamless transfer from old development drivers and production systems to new ones. It is essential for Shanghai Electric to make the Industrial Internet a centric part in its business landscape to gain edges in competitions, which is also a must for Shanghai Electric to achieve new glories.

"Technology is our bridge, and killer feature in competitions." As Leng Weiqing, Party Secretary of the Party Committee and Chairman of Shanghai Electric Group, said, "We have talents and heritage, and undoubtedly we can create our own technological logic. An enterprise's stable and long-term development lies in fundamental and core technologies which must be results of independent invention and innovation and owned by the enterprise itself."

C O N T E N T S

P02
BRIEF NEWS

P06
NEWS

C O V E R T O P I C S



V I E W P O I N T S

P24
INTERVIEWS

Luo Wenlin: The Spirit of
Craftsmanship Leads to
Success

P28
DEPTH REPORTS

Shanghai Electric to Achieve
Carbon Goals Through
Steady Progresses

C U L T U R A L S A L O N

P32
INNOVATIVE APPROACH

Practice is the Sole
Criterion for Testing Truth

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ELECTRIC NEWS



BRIEF NEWS



Shanghai Electric Wins 6 China Machinery Industry Science and Technology Awards

Recently, Shanghai Electric received multiple 2021 China Machinery Industry Science and Technology Awards for its scientific achievements. Shanghai Electric Power Generation Equipment Co., Ltd. Turbine Plant (“Shanghai Electric Turbine Plant” for short) obtained two second awards under the sci-tech progress category by Research On and Upgrading Sub-critical 600MW High-Efficiency and High-Parameter Steam Turbines and Research on New Best Double-Reheat 1000MW Ultra-supercritical Steam Turbines, one third award by Research on High-efficiency Flexible Double-reheat Stream Turbine, alongside one third prize under the technical invention category by A CNC-Based Check Method and System for Cutter Compensation. *Shanghai Highly Electrical Appliances Co., Ltd. and Shanghai Tian An Bearing Co., Ltd. obtained one third prize under the sci-tech progress category respectively by The Horizontal Rotor Compressor for Vehicles and Its Key Technologies and Applications of Solid Lubrication and Precision Manufacturing In Bearings of Medical Devices.

Shanghai Electric Accomplishes Projects For Beijing Winter Olympics

Recently, the Power Beijing Shangyi Yanjialiang Project located in Shangyi County, Hebei Province, was connected to the grid at full load, for which Shanghai Electric was a member on the construction side. The infrastructure project plays a fundamental role in providing green power to the 2022 Beijing Olympic Winter Games, and is also seen as a landmark power project for boosting coordinated and integrated development of Beijing, Tianjin and Hebei Province. It employs forty four 4.5MW wind turbines and one 2.0MW unit manufactured by Shanghai Electric Wind Power Group Co., Ltd. , with total capacity of 200MW. What’s more, the 10kV power distribution cabinets supplied by Shanghai Dahua Electrical Equipment Co., Ltd., a subsidiary of Shanghai Electric Power Transmission & Distribution Group, have begun to deliver electricity, which are adopted in “Beijing Yanqing Mijiabao 110kV PTD Project” and “State Grid Beijing Yanqing Power Supply Company’s 110kV Yanqing Substation Capacity Increase Project”. Employees will be stationed at the two power distribution projects mentioned above during the Beijing Winter Olympic Games to ensure the projects performance soundly and stably to give the utmost support to the sports event.



CCTV Covers Shanghai Electric's Milestones in Wind Power

On January 4th, the TV show 30-Minute Finance of CCTV-2 (Finance Channel of China Central Television) explored the topic "when offshore wind power enters an era of grid parity", and elaborated on an array of early and visionary measures taken by Shanghai Electric Wind Power Group Co., Ltd. ("Shanghai Electric Wind Power" for short) to better prepare for the decreasing price of offshore wind power, and gave a general introduction about its major technological breakthroughs, inventions and innovations achieved in R&D and maintenance. This year, the second year of the "14th-Five-Year-Plan" period and the first year of a time when grid parity is implemented throughout China's wind power industry, sees unprecedented opportunities and challenges for wind power companies in China. Shanghai Electric Wind Power will embark on a new journey in the "carbon-zero" age in pursuit of becoming the largest offshore wind power player and the third largest onshore player in China.



Consulate General of China in Karachi Acknowledges Thar Project Undertook By Shanghai Electric

Recently, the Consulate General of China in Karachi, Pakistan, sent a letter of commendation on the Thar Coal Block-I Coal-electricity Integration Project, which highly appreciated the unity and commitment demonstrated by Shanghai Electric's project team against the ongoing battle with COVID-19, tightened local security and other difficulties in 2021, and fully recognized of the importance of completing a number of key tasks of the project. The consulate hoped that that efforts are made to safeguard the health and safety of employees, and they can grasp the significance of the project to the bigger picture and keep the momentum to ensure the program can proceed smoothly, making greater contributions to the development of "China-Pakistan Economic Corridor" and the opening of the 20th National Congress of the Communist Party of China.



Shanghai Electric Machinery Obtained Highest Credit Rating in National Water Sector

Recently, Shanghai Electric Machinery Co., Ltd. was rated AAA mechanical manufacturer, the highest rating, in the 2021 national credit rating of construction companies for water projects, which was released by the Ministry of Water Resources. It is reported that this rating will be a vital criterion in evaluating suppliers for water construction projects. To be more specific, China's big water projects like the second phase of South-North Water Transfer Project and that of the Yangtze River To Huaihe River Diversion Project, will all take this rating into consideration seriously. Therefore, the AAA rating granted has paved the way for the company to seize a larger market share.

Heiyazi Project by Shanghai Electric Wind Power Sets New Record of Hours Available

On December 16, 2021, the CNNC Gansu Heiyazi Project undertaken by Shanghai Electric Wind Power Group Co., Ltd. ("Shanghai Electric Wind Power" for short) set a new record of hours available, which exceeded 4000 hours, much more than the 3608 hours achieved in the same the period in 2020. The wind farm, 37 km to the southwest of Yumen City, Gansu Province, is China's first project carrying out grid parity and also a demonstration project for both China National Nuclear Corporation (CNNC) and Shanghai Electric Wind Power, which was granted 5A rating by China Electricity Council in 2020. From last year on, the project team has managed to ensure sound operation of and high-quality maintenance for the project with diligence and devotion, making formidable contributions to refreshing the record.





UK-based PV Project Implemented by Shanghai Electric Connected to the Grid

Recently, the West Holcombe PV project, one of a package of PV projects in the UK constructed by Shanghai Electric Power Generation Engineering Co., Ltd., first got connected to the grid and had its power sales contract inked. Despite the time difference, cultural barriers and COVID-19, the project team comprising Chinese, British and Italian members managed to attain the goal of grid connection. The package marks the first program independently developed, built and operated by Shanghai Electric Power Generation Engineering Co., Ltd., and also its first new energy project launched in the high-end overseas market using the model “investment and financing-construction-grid connection and power generation-operation”. The package has 8 projects in total, and the other 7 will be connected to the grid as scheduled.

Shanghai Electric Guoxuan New Energy Receives Big Order for Energy Storage From Developed Market

Recently, Shanghai Electric Guoxuan New Energy Technology Co., Ltd. (“Shanghai Electric Guoxuan New Energy” for short) inked a supply order with Pacific Green Technologies, a listed company from the US for the UK-based REP1 & REP2 energy storage project whose capacity is 100MW/100MWh, which is planned to be carried out in the second quarter of 2022. With a relatively well-developed energy storage market, UK is likely to take the lead among European countries regarding battery storage in the next 10 years. Pacific Green Technologies, an internationally-known energy storage project developer, intends to launch a number of energy storage projects in UK with a total planned capacity of 1.1 GWh. The collaboration represents a strategic move of Shanghai Electric Guoxuan New Energy in enhancing its presence in the overseas market, especially UK and the US.





EMISSIONS REDUCTION AND ENERGY CONSERVATION DEMONSTRATION PROJECT PRAISED BY PRESIDENT XI JINPING USED SHANGHAI ELECTRIC'S TECHNOLOGICAL UPGRADE PLAN

On the arrival of the 2022 Chinese Spring Festival, Chinese President Xi Jinping, also general secretary of the Communist Party of China Central Committee and chairman of the Central Military Commission, inspected Shanxi Ruiguang Heat & Power Co., Ltd. ("Shanxi Ruiguang" for short) and learned in detail about the company's performance on energy conservation and emissions reduction, productivity increase and safety of heat supply during his visit to Shanxi Province where he talked with county and village officials and villagers. As a national demonstration coal-fired power plant, the plant uses electromechanical equipment and auxiliary furnaces produced by Shanghai Electric in its two 300MW cogeneration units, and took the lead in Shanxi Province to implement ultra-low emissions technologies by adopting Shanghai Electric's competitive technological upgrade solution: flexible operation of low-pressure cylinders and cylinder cutting transform plan.

President Xi Jinping inspected operation data in the central generation management room of thermal units, smart fuel management center and the automatic lab of Shanxi Ruiguang, and talked with on-site technicians about the plant's efforts to improve emissions reduction and energy conservation, productivity and production safety. He stressed that in light of China's fossil fuel structure characterized by abundant coal reserves but oil and natural shortage, we shall consolidate

basics for energy generation by securing coal supply, and coordinate low-carbon and diversified utilization, as well as comprehensive storage and transportation of the coal-based industry by speeding up green and low-carbon technological breakthroughs and industrial structure upgrades. Proactive and stable efforts must be made to achieve goals of carbon peaking and neutrality to make contributions to the fulfillment of the second "Centenary Goal" and the building of the community of a shared future for mankind.

As one of the major heat suppliers for Taiyuan City and Jinzhong City, Shanxi Ruiguang every winter provides heat to 10% of Taiyuan's total area supported by its central heating system and 40% of that of Jinzhong, totaling around 24 million m². Thanks to its excellent heat supply capability and the cost-effectiveness and safety of operation, the No.2 unit and No.1 high back-pressure unit supplement each other after being upgraded by Shanghai Electric, and ensure efficient heat supply and remarkable social benefits. So far, the renovated unit has entered its second winter, running safely and stably. The flexibility-oriented upgrade solution implemented on Shanxi Ruiguang's No.2 unit is a symbolic case of thermal plant upgrade by Shanghai Electric, which fully shows its technological strength and characteristics.

The two steam turbine units used are subcritical 300MW air-cooled turbines produced by Shanghai Electric Power Generation Equipment

SHANGHAI ELECTRIC CONTRIBUTED TO OPERATION OF WORLD'S FIRST 35KV LONGER-THAN-ONE-KILOMETER SUPERCONDUCTING CABLE

On December 22, 2021, Shanghai held an event to celebrate the operation of the world's first 35kV superconducting cable of 1.2 kilometers. Gong Zheng, Vice Secretary of the CPC Shanghai Municipal Committee and Mayor, announced the start of the operation at the celebration. Dong Yunhu, Chairman of the Shanghai Committee of the Chinese People's Political Consultative Conference (CPPCC), and Zhang Zhigang, General Manager of State Grid Corp, together inaugurated the Shanghai Innovation Center for Superconductivity for Manufacturing Industries. Zhang Wei, Vice Mayor, addressed the event, and Liu Ping, Vice Party Secretary of Shanghai Electric Group and President, participated.

The deployment of the superconducting cable tackles the problem of power transmission in the bulk through conventional cables, creating a milestone in key technologies of new-type power system construction and signaling the acceleration of industrialized application of high-temperature superconducting cable in China.

The 1.2-kilometer cable connects two 220kV substations, Changchun Substation and Caoxi Substation in Xuhui District, with a designed current capacity of 2,200 amps, which is so far the longest 35kV high-temperature superconducting cable in full commercial with the largest transmission capacity in the world. It takes Shanghai Superconducting Technology Co., Ltd. 3 years to complete the whole project after removing an array of obstacles, which is jointly established by Shanghai Electric Cable Research Institute (SECRI), Ossen Group, Shanghai Electric Power Transmission & Distribution Group Co., Ltd., State Grid Shanghai Municipal Electric Power Company and Zongjin Energy Company—a partner of SECRI superconductivity research team.

The high-temperature superconducting power cable is crucial to the development of the new-type power system, and is seen as the game-changer with highest potential for the power industry in the 21st century. Compared with conventional cables, it can be widely applied in city grid upgrading, grid interconnection, main grids for narrow corridors, AC/DC interconnected grids as well as industrial scenarios that have special requirements or difficulties which cannot be solved through common measures, due to its advantages of less loss, higher capacity, no pollution and smaller size, making it a promising tool for the future.

A couple of developed countries have speeded up researches in this area: as of today, the only demonstration project is deployed at Essen City, Germany, whose cable is one kilometer long, and other countries like the US, Japan and Korea have developed cables that are longer than 100 meters.

The transmission capacity of a 35kV superconducting cable equals to that of a conventional 220kV cable, or 4 to 6 conventional cables of 35kV, which can reduce the installation space underground by 70%. Thanks to its excellent transmission efficiency and space utilization, the superconducting cable is highly suitable to deliver bulk power to midtown areas which is enormously expensive.

Globally speaking, R&D on superconducting technologies shows an ongoing momentum. Over the past 15 years, Shanghai has continuously invested on the R&D and industrialization of high-temperature superconductivity. With pushes from departments on science and technology as well as industries, it has built up core capabilities from superconducting material to cable integration, making it a city with the longest industrial chain of superconducting cable in China.

Looking forward, Shanghai Electric will continue to enhance the innovation of manufacturers for superconductivity, broaden the range of technological application, and build Shanghai into an internationally-influential center of the superconductivity industry. **D**

Co., Ltd. Turbine Works. As the need for heat grew beyond its supply capacity, Shanxi Ruiguang cooperated with Shanghai Electric in 2020 to upgrade its facilities, and they agreed on the flexible operation of low-pressure cylinders and cylinder cutting transform plan. The plant's performance afterwards proved that the solution was easy in the implementation and safe in operation. The generation-3 turbo-generator with double internal water-cooling systems used is invented by Shanghai Electric Power Generation Equipment Co., Ltd. Turbine Generator Works. Compared with regular hydrogen-cooled or water-cooled turbines, this model features higher safety and less difficulty in repairing and maintenance. What's more, it can cut infrastructure and equipment costs by large because hydrogen is not used for cooling, making it unnecessary for the power plant to build hydrogen production facilities. The subcritical 300MW single-reheat furnace further optimized its design according to the client's strict requirements through using corner tangential firing, single intermediate reheat and dry ash extraction technologies. **D**

World's First Demonstration Project of Generation-IV Nuclear Reactor, A National Science and Technology Major Project, Made Big Breakthrough

Shidaowan nuclear power plant which uses the high-temperature gas-cooled reactor is put into operation with Shanghai Electric as one of its constructors.

The world's first industrial-scale demonstration plant of a high-temperature gas-cooled reactor with pebble-bed module, the Shidaowan nuclear power plant was connected to the grid on December 20, 2021. As the world's first nuclear reactor in operation of its kind, it makes China one of the handful countries owning Gen-IV nuclear reactor technologies and a leader in the global nuclear power market.

The Shidaowan demonstration project with high-temperature and gas-cooled nuclear reactor broke ground in 2012 as one of the 16 national science and technology major projects alongside with the Chinese Lunar Exploration Program and BeiDou Navigation Satellite System. Headed by China Huaneng Group, the project has Shanghai Electric as one of its major participants in construction that is responsible for supplying multiple key facilities of the nuclear island and conventional island. Having devoted more than a decade on the task, Shanghai Electric has independently achieved a number of technological breakthroughs that address global and industrial problems, ensuring that 93.4% of all engineering equipment are made in China.

To be particular, the pressure vessel, manufactured by Shanghai Electric Nuclear Power Equipment Co., Ltd. and with high-temperature gas-cooled reactor, features a bigger size and more complex structure than those of the pressurized water reactor, setting a new record of both height and weight. Shanghai No.1 Machine Tool Works Co., Ltd. manufactured the reactor internals with metal, which is the largest thin-wall metal internals in the world due to its amazing parameters: a height of 20.06 meters, a diameter of 5.44 meters, wall thickness of 40mm and weight of 357 tons. It took the company roughly 8 years to remove all technological obstacles one after another before finally making it, which included forging, drop-weight testing on steel panels, the manufacturing of low-alloy seamless steel pipes and large-diameter metal bellows, circular base

soldering, precision processing of the thin-walled shell for the reactor core and precision soldering, and the precision processing of bottom support plates and precision assembly, making many firsts in China.

The major helium circulator is seen as the "heart" of the Gen-IV high-temperature gas-cooled nuclear reactor, which is equal to the major pump of the Gen-III pressurized water reactor. *Shanghai Electric Blowers Works Co., Ltd. was committed to produce the circulator in 2009, and stood up to a number of major technological challenges including the design and manufacturing of 3D high-efficiency impeller, adiabatic cooling of bearings inside the shell under a high temperature, large-caliber valves and drive components, axial thrust balancing of the vertical unit, and the delivery, hoisting and assembly of the whole vertical unit. What was more, they built a closed testbed with high-temperature and high-pressure resistance to fulfill the pre-delivery test.

When it came to the steam turbine of the conventional island, more complicated difficulties lay in wait for Shanghai Electric's designers because steam parameters of a Gen-IV reactor outnumbered those of conventional reactors. Regarding Gen-IV high-temperature gas-cooled reactor's special steam parameters and way of operation, Shanghai Electric Power Generation Equipment Co., Ltd. Turbine Works developed a new type of steam turbine fully on its own whose performances like high-temperature components' strength, service life, comprehensive security, dehumidification, resistance to water erosion and special processing and manufacturing techniques fit into strict requirements of the reactor. Therefore, the debut of the new-type steam turbine is the Gen-IV reactor.

At present, the parameters of the demonstration project have been running within a healthy range with the reactor, steam turbine and other system operating stably. No. 1 reactor is approaching full-load operation and No.2 is on the way of completing tests before grid connection. It is planned that both operators start commercial operation in the middle of 2022. **D**





Shanghai Electric Have 14 “Shanghai Masters” With 2 More Recognized

Recently, the list of 2021 “Shanghai Masters” was announced with Shanghai Electric’s Wang Yong and Luo Wenlin acknowledged alongside with other 101 talents. As of now, Shanghai Electric has had 14 “Shanghai Masters”. Since Shanghai General Labour Union promoted the “Shanghai Master” Program to honor 1000 top talents, there have been fourteen technicians from Shanghai Electric awarded, the other 12 of whom are the late Li Bin, a “Chinese Master”, Chen Yong (Shanghai Electric Hydraulics Pneumatics Co., Ltd.), Yu Jianmin (Shanghai Mitsubishi Elevator Co., Ltd.), Hua Jianguo (Shanghai Electric Nuclear Power Equipment Co., Ltd.), Yuan Jinjiang and Zhuang Qiufeng (Shanghai Electric Power Generation Equipment Co., Ltd. Turbine Plant), Zhao Liming and Jin Dehua (Shanghai Boiler Works Co., Ltd.), Xu Zhiping (Shanghai Power Plant Auxiliary Machine Factory Co., Ltd.), Li Yunlong (Shanghai Machine Tool Works Co., Ltd.), Zhou Zujian (Shanghai No.1 Machine Tool Works Co., Ltd.) and Kan Baochun (Shanghai Heavy Machinery Plant Co., Ltd.). 

Phase II of Zhejiang Petroleum & Chemical Thermal Desalination Project Participated by Shanghai Electric Put Into Operation

Recently, the No.8 unit of Phase II of Zhejiang Petroleum & Chemical Thermal Desalination Project has finished the commissioning process, meaning that all eight units of the project have been fully commissioned with a total per-day processing capacity of 200,000 tons. It marks the largest thermal desalination project in China undertaken by Shanghai Electric after the Phase I whose capacity reaches 105,000 tons per day. As of today, Shanghai Electric has built up the largest thermal desalination system in China jointly with Zhejiang Petroleum & Chemical, which has been put into operation with a capacity of 305,000 tons per day. **D**





Shanghai Electric Contributes To Operation of Metro Lines In Cities

On December 30, 2021, Shanghai Metro Line 14 and Phase I (North) of Line 18 begun early operation, in whose construction Shanghai Electric participated. Equipped with the signal system produced by Thales SEC Transportation System Co., Ltd., the Line 14 is China's the first high-density large-capacity rail transit line which employs the type-A train with 8 compartments and the unmanned driving system. The signal system uses the TSTCBTC@2.0 system independently developed by the company, which enables the line to fulfill its maximum run-through and turn-back capacity due to its mean time between failures (MTBF) of 1 million hours. The control room of Line 18 is installed with the BIM-based smart operation and maintenance system developed by Shanghai Electric Automation D&R Institute Co., Ltd., making the line Shanghai's first fully-automatic rail with this system. Based on Bluetooth + UWB positioning technology and data asset library, the system avails the staff of real-time information of the train, allowing them to identify and respond to emergencies timely.

As of December 26, 2021, the Line 4 (36.9 kilometers) in Nanchang City and Line 4 (41.37 kilometers) in Hefei City had been put into operation, whose signal systems were also provided by Thales SEC Transportation System Co., Ltd. Concerning the fact that both lines were the longest local rail, Shanghai Electric's project team worked closely with local authorities to ensure all work was orchestrated and practiced in a detailed and scientific way in order to deliver better and more efficient experiences for local passengers through high-quality construction and operation. **D**

Chinese Consulate General in Pakistan Acknowledges Thar Project Undertook by Shanghai Electric

On January 12, local time, the Chinese Consulate General in Karachi, Pakistan, sent a letter of commendation on the Thar Block-I Integrated Coal Mine and Power Project, which highly appreciated the unity and commitment demonstrated by Shanghai Electric's project team against the COVID-19 pandemic, tightened local security and other difficulties in 2021, and fully recognized the successful completion of several key tasks of the project.

To ensure the smooth and orderly progress of the project, the leadership of the Thar Block-I Integrated Coal Mine and Power Project has formulated and implemented strict pandemic prevention and control measures, and actively proceeded with the vaccination and booster shots against COVID-19 for employees to ensure that pandemic prevention and control and construction can be carried out properly at the same time. At the same time, the project department of Shanghai Electric Power Generation Engineering actively fulfills its social responsibility by donating funds, pandemic prevention materials and living materials to the local government and community, properly implementing land acquisition and relocation of residents and providing vocational skills training for the Pakistani employees, thus vigorously contributing to the development of local economy and citizens' livelihood, receiving unanimous recognition from the local government and mainstream media alike. In addition, the project strictly followed the Safe Construction Rules and was awarded the 11th Outstanding Fire Fighting Practice Award by the Pakistan National Environment and Health Forum.

It is known that in 2021, all employees of the project endured heavy pressure to complete several important tasks due to the continued spread of the COVID-19 pandemic in Pakistan. The Thar Power Station project has successfully completed important tasks such as the roofing of No.1 cooling tower, successful box up of steam turbine, the completion of No.2 cooling tower's structure, the installation of generator stator, and the successful hydraulic test of boilers No.1 and No.2. The coal mining project finished over 75% of the earth stripping construction; all heavy oil power stations were connected to the grid, and all 50 draining wells were put into operation. **D**

FOCUS FIRST-HAND INFORMATION ON PUDONG AND GLOBALLY-INFLUENTIAL MAJOR EQUIPMENT MANUFACTURED AT LIN-GANG

At the beginning of 2022, media agencies-Yicai and Oriental Financial Pudong Channel-visited 16 enterprises in Lin-gang Special Area to unveil first-hand information of state-of-the-art technologies, which is the first to see sunrise among all districts of Shanghai, and plays an important role in the two national strategies of building Pudong into a leading area for socialist modernization construction and of building Lin-gang Special Area of China (Shanghai) Pilot Free Trade Zone. In the section "First-Hand Information On Pudong - Lin-gang Chapter", reporters came to Shanghai Electric's plants at Lin-gang area to tell a story of "globally-influential major equipment".

The plant symbolizes Chinese industrial manufacturers' commitment to excellence because it has the most direct and vital impact on the major equipment manufacturing. The reporter interviewed the National Model Worker Liu Xia and Shanghai Municipal Model Worker Chen Yong, both of whom have devoted more than two decades to their career, in other words, spent the best years of their life with Shanghai Electric.

According to Liu Xia, gigantic and tiny parts are extremely difficult to make in the industry. The welded rotor of Hualong One reactor is an example of the gigantic. It is too big to be processed into a stick by any manufacturers in the world, and we had to weld it up.

Chen Yong specializes on the most tiny and accurate components. For example, the ring-shaped plunger ring of a hydraulic pump that is nicknamed "the lord of ring" is easily to get deformed or broken, which would suspend the operation of the hydraulic system. Chen Yong and his mentor Li Bin headed the team to solve the problem after over 200 experiments, paving the way for the success of the project.

High-end equipment is indispensable to national stability, functional to prosperity, and fundamental to rejuvenation. Lin-gang Special Area is progressing the first in China and the world while competing against other edged manufacturers in the international arena. The Chinese intelligent manufacturing industry is gaining more influence on the world. **D**





Major Media Agencies Report Shanghai Electric's Environmental Protection

Recently, the news channel of Shanghai TV covered the agricultural waste recycling utilization project on Chongming Island in the section "New Exploration Into Green Agriculture". The project is invested into, built and operated by Shanghai Ouhai Energy Technologies Co., Ltd., a subsidiary of Shanghai Electric Environmental Protection Group, and is able to generate electricity of 5.06 million kwh and organic fertilizers of roughly 30,000 tons per year, which is equivalent to a reduction of 30,122 tons of greenhouse emissions.

In addition, China Environment News specially covered the Nantong Thermal Power Plant's upgrading and expansion project for No.1, No.2 and No.3 boilers, in which Shanghai Electric Environmental Protection Group participated. The feature briefly reviewed the project from areas of construction, awards and profits, and gave an in-depth introduction of the seven major technologies including reducing the amount of flying ashes, recycling thermal power and 3D design. **D**

SEunicloud Wins the Golden Purple Bamboo Award for Industrial Internet and Several Other Honors

On December 29, 2021, the Communications Industry Conference 2021 and the first "Golden Purple Bamboo" Industrial Internet Summit were held online, where the "2021 Golden Purple Bamboo Award for Industrial Internet" and many other awards were presented. Shanghai Electric's SEunicloud industrial Internet platform was selected as one of the best industrial Internet solutions of 2021.

The Golden Purple Bamboo Award for Best Industrial Internet Solutions in 2021 focuses on the outstanding industrial Internet platforms, industrial software, network and identification solutions, and security solutions released or innovatively active in the field of industrial Internet during the year, which contribute to industrial technology advancement, application implementation and industrial empowerment, and are innovative and have substantial capability for application implementation in different scenarios.

The evaluation of the award candidates took into account three primary indicators and six secondary indicators in terms of technical capability, innovation level, application implementation, market impact, application effect and the empowerment degree for digital transformation. Accordingly, nine annual best solutions were selected from the candidate companies.

In addition, SEunicloud's new energy solution was successfully selected as the 10th place in the 2021 Top 50 list of energy Internet solution providers. As a service provider of industrial Internet platform, Shuke has built a replicable and applicable industrial Internet platform around the demand of equipment data networking and intelligent operation and maintenance of Highly Group, for which it was successfully selected as an innovative and pilot application case of industrial Internet platform in 2021 by the Ministry of Industry and Information Technology. With Shanghai Electric's SEunicloud industrial Internet platform as the carrier, Shuke was awarded the Golden i Award of the 19th i-China Forum for 2021 Industrial Internet Innovation Practice Leaders. **D**

COVER TOPICS



COVER TOPICS



PROMOTE THE

INTEGRATION OF
MANUFACTURING
AND INDUSTRIAL
INTERNET



ACCELERATE THE

REPLACEMENT
OF OLD GROWTH
DRIVERS AND
PRODUCTION
SYSTEMS WITH NEW
ONES

This platform is home to an open mindset and unlimited imagination. The all-rounded collaboration gives rise to a beam of light that resonates with your heart. It is the light of "carbon peaking and neutrality", of "intelligent manufacturing" and "digitalization". There are always admirable pioneers blazing a trail against all hurdles. On this platform, business elites with Siemens, Electricite De France, and Midea share their observations and insights. By listening, our horizons are broadened, and by exchanging ideas, our minds are inspired. In the backdrop of "speed up digitalization to build a digital China", we are fully aware that with the fast development of society, only by following the trend and embracing the future, can we stay ahead of the game. As a leading equipment manufacturer in China, Shanghai Electric has forged a consensus on speeding up the corporate digital transformation via unwavering commitment towards value-based orientation, enhancing top-level design, supporting demonstration applications, and building open ecosystems, which enables it to enter the new arena of digital economy via smooth replacement of old growth drivers and production systems with new ones.



DECODE THE DIGITALIZATION AND INNOVATION OF SHANGHAI ELECTRIC DIGITAL TECHNOLOGY



nnovation drives the advancement of a country and the progress of an enterprise. Leng Weiqing, Secretary of the Party Committee and Chairman of Shanghai Electric Group, proposed at the first

cadre conference this year that we should continue to pay close attention to scientific and technological innovation and digital transformation, improve the effectiveness of scientific and technological investment, improve the scientific and technological innovation system, stimulate innovation vitality, accelerate digital transformation and improve the level of intelligent manufacturing.

Shanghai Electric Group rides the tide of digital transformation towards the goal of becoming an Industrial Internet-based company that excels in energy equipment by helping traditional industries to go digital and guiding emerging industries to embrace Industrial Internet.

MUTUAL SUPPORT BETWEEN DIGITALIZATION AND "A CENTENARY MANUFACTURER"

Shanghai Electric inaugurated its Industrial Internet platform SEunicloud at the China International Industry Fair held in September 2019, which refreshed professional clients' perception of Shanghai Electric, a company founded a century ago. In its debut, SEunicloud rewrote professional visitors' understanding of Shanghai Electric, a company with a century-long history. The audience couldn't help taking photos with their cellphones.

Shanghai Electric Group and Shanghai Electric Digital Technology Co., Ltd. (SEDT) jointly implemented the project of SEunicloud Industrial Internet platform, which is part of Shanghai Electric's strategy "building and operation of digital platforms".

In the sector of traditional equipment manufacturing, SEunicloud serves as an Internet-based infrastructure that is responsible for building digitalization capability, incubating digital industry, building and operating digital platforms, developing industrial software and hardware, and providing solutions and technological support for Shanghai Electric.

As of the end of January 2022, the SEunicloud platform has had 127,000 devices connected, 113,000 pieces of which are online, managed equipment assets with a total worth of 150.26 billion yuan (not including Shanghai Mitsubishi Elevator), and presented over 109 APPs and APIs, 23 industrial solutions and 13 cases. Platform management is performed on application groups, operations, data services,





OVER TOPICS

APIs, and microservice components. It has developed AI platforms together with Shanghai Electric Group Co., Ltd. Central Academe and deployed nearly 100 basic algorithm components. It independently develops the Cloud Ring and a couple of smart gateways that support fast connection with other devices, two dozen industrial assembly lines, and over a hundred industrial communication protocols.

Brilliant as the SEunicloud is, it only reveals a facet of SEDT.

From its inception, Shanghai Electric Digital Technology has fulfilled multiple roles: "supporter for digital businesses, navigator for digital technologies and co-creator of digital products." As a supporter, it supports the information and digital businesses of Shanghai Electric Group by implementing information-based enterprise management, building digital infrastructure and providing related services. As a navigator, it is responsible for leading the technological development of the group and promoting Industrial Internet and smart supply chain platforms. As a co-creator, it develops new digital products and business modes with the whole industry and related companies.

In fact, digitalization capacity has grown into core competitiveness of Shanghai Electric as it evolves from a traditional manufacturing company into a modern enterprise on high-end equipment manufacturing and intelligent manufacturing, which shows that digitalization is a must-have tool for making a company stronger, more efficient and advanced.

The Internet sees the fastest iteration and upgrading ever in all sectors. From the very first day of its establishment, Shanghai Electric has to seize every moment to dash forward boldly.



SPECIALISTS FOR PROFESSIONAL TASKS

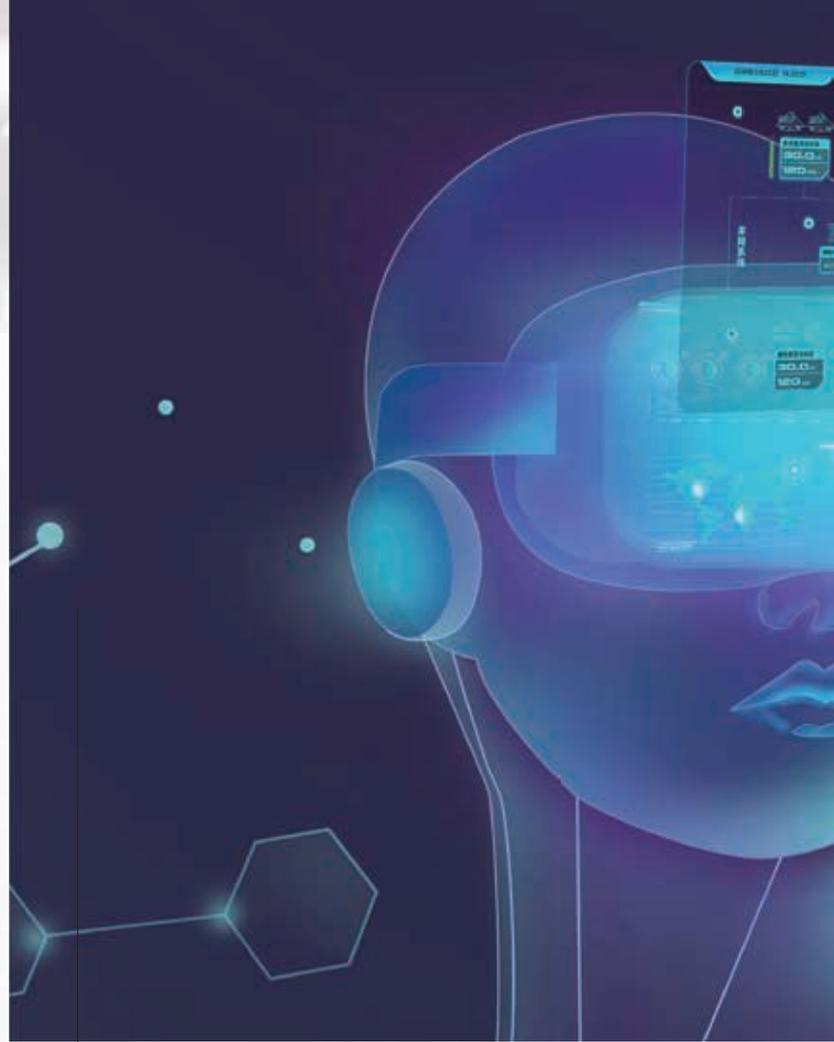
With COVID-19 savagely intruding on human communities, our life is forced to pause in many ways, causing a lot of difficulties. However, the advantages of cloud-based procurement shine through the chaotic situation. The smart supply chain platform Shanghe built by Shanghai Electric integrates "business, logistics, capital and commercial paper".

With the digital infrastructure in place, effective measures are needed as well. Shanghai Electric Digital Technology strives to make breakthroughs in pivotal steps and in-depth exploration of application scenarios, empowering the industry with digital tools.

The Iwind System is a typical example of in-depth explorations of application scenarios. It is a foundational Industrial Internet-based maintenance platform independently developed by Shanghai Electric, and the first product connected to the SEunicloud. With just a few clicks, employees at the headquarter of Shanghai Electric Wind Power Group can check real-time operation data of wind turbines far away. The Iwind System is the first smart operation and service platform for wind power certified by national authorities.

What's more, SEDT designs an array of products for industrial applications, such as "smart maintenance for energy storage" software and medical rehabilitation devices, for Shanghai Electric Power Generation Group. Recently, SEDT has formulated the "14th Five-Year Plan" of Digitalization of Shanghai Electric Machinery Co., Ltd. and the Digitalization Plan of Shanghai Electric Nuclear Power Group Co., Ltd. (2021-2023) with related companies. With recognitions like "professional tasks ought to be fulfilled by specialists" from partners, Shanghai Electric Digital Technology is better fueled to proceed.

The smart supply chain platform "Shanghe" represents Shanghai Electric's big achievement made in pivotal steps, which integrates procurement and sales. Based on in-house incubation and application, the Shanghe system has basically taken its shape as a group-level smart supply platform that incorporates three software products



on supplier life-cycle management, source identification and competitive pricing and collaborative procurement, and two smart solutions on e-commerce and supply chain coordination.

According to the statistics, in the past year, the supply life cycle module has been adopted by 93 companies, managing more than 21,000 suppliers; the source identification and competitive pricing system by 37 Shanghai Electric Group's companies, managing over 23,000 competitive pricing projects whose total sourcing and bidding amount exceeds 52.5 billion yuan; the collaborative order module allows automatic procurement throughout the whole process via online operation; and the e-commerce platform sees more and more products available, company users, and registered suppliers, making the procurement more transparent, traceable and cost-effective. Meanwhile, SEDT provides technological support to the E-Service platform and meets companies' e-commercial needs on parts and components, making substantial contributions to E-service's total transaction amount of more than 100 million yuan.



The Shanghe platform is advancing towards the goal of “linking the upstream with downstream players, procurement with sales, and clients with merchants, converging supply chain resources, increasing trade volumes, building business ecosystems, and inventing new commercial models”.

Leveraging Shanghai Electric’s internal resources and industrial influence, SEDT collaborates with relevant industry groups and companies on research into specific application scenarios to facilitate the transformation of various internal business sectors, and to offer digital transformation services to external companies. By developing solutions with Shanghai Electric’s characteristics for niche markets, it will amplify its influence and accumulate more edges while empowering Shanghai Electric’s major businesses.

REINFORCE CORE COMPETITIVENESS IN THE “NEW TRACK” OF DIGITAL ECONOMY

Efforts have been made on national and municipal levels to propel digital transformation, to encourage top players to build influential industrial platforms, to promote the transformation of key industries, and to explore the formation of a more capable Industrial-Internet ecology.

Capturing opportunities created by the booming digital economy and the group’s digital transformation, Shanghai Electric Digital Technology continues to exercise innovation-driven development to reinforce the group’s core competitiveness in the “new track” of digital economy and high-quality development of the whole industry through “digital empowerment”.

In 2021, Shanghai Electric Digital Technology had 284 new orders totaling 267 million yuan, of which 32 were from external companies with a total worth of over 43.12 million yuan. It also saw increases in ROE.

As for the next steps, Shanghai Electric

COVERED TOPICS



COVER TOPICS

Digital Technology will keep supporting the strategy of integrating "smart energy and intelligent manufacturing", unleashing the potential of "industrial smartization and service industrialization" and coupling "energy Internet with Industrial Internet", and centers on empowering in-house development via digital tools to increase both quality and efficiency. As for Industrial Internet, it will make Chinese "intelligent manufacturing" more competitive and boost the capacity building of local high-end equipment manufacturers. At the end of last year, it announced the 3.0 version of SEunicloud, trying to formulate an expansion plan for industrial clusters.

What's more, Shanghai Electric Digital Technology will sum up informationization and digitalization practices and experiences of model subsidiaries in line with the digital transformation and high-quality development on the group, industry and company levels, and satisfy needs varying with the industry type and company development stage by circulating such practices and experiences. It will collect the group's data assets accumulated in the past 10 years and process them into digital products that can be deployed on the cloud and help digital empowerment to enhance a company's competence in trend perception, fast decision-making, simulation and prediction, and risk management. Shanghai Electric Digital Technology will continue to increase the SLA service quality and reduce the service cost. According to statistics, Shanghai Electric Digital Technology provides services to roughly 200 subsidiaries, reaching nearly 20,000 users and over 150 systems and platforms, and reduces the service cost by nearly 5% on a yearly basis.

As for enhancing internal risk management and system security, Shanghai Electric Digital Technology will continue to standardize the project management system by formulating project management regulations, improving evaluation models for project managers' performance, and promoting timely and effective project management. We will also strengthen project risk management by improving the project risk preparation system and identifying risk level and process control plan reasonably based on the pre-sale risk evaluation model. Shanghai Electric Digital Technology will also promote accreditation, enhance internal control and implement risk management.

Looking ahead, following the general principle of "seek progress while maintaining stable development, carry out inheritance and innovation, and unwaveringly follow the road of high-quality development", and adhering to the core concept of "high-end, green, digital and service-oriented", Shanghai Electric will seize the major opportunities brought by the national strategy and strive to become a seed player and excellent player in new segments with a scale of 100-trillion-yuan, such as green, low-carbon and digital economy. **D**

星云智汇[®]
SEunicloud

ELECTRICITE DE FRANCE'S DIGITAL PRACTICE FOR LOW CARBON ENERGY

Du Wenhui, General Manager, China R&D Center of Electricite de France



After over 20 years' reform of the European power market, Electricite De France (EDF) has transformed from a pure power

enterprise to a comprehensive energy enterprise with a focus on electricity, with business presence across 23 countries and 9 R&D centers located in countries and regions with the strongest technology innovation power around the world. With 90% of our electricity generated from clean energy in 2020, EDF is now committed to the development of low-carbon and clean energy.

For over 40 years, EDF has been developing in China. Our power generation segment covers nuclear power, thermal power, wind power, offshore wind power, and biomass power generation; and our energy service segment provides services and manages projects of centralized heating, water heating, urban lighting, etc. in various cities. With the reform and opening-up of China's electricity market, EDF also actively participates in the electricity sales and power trading business, providing energy-saving and emission reduction services for a wide range of customers.

Our business basically covers the entire chain of power energy, from upstream power generation, power transmission and distribution to downstream electricity sales and energy services. Our corporate value is to build a net zero energy future with electricity and innovative solutions and services, to help save the planet and drive wellbeing and economic development.

The EU has reached carbon peak in 1990 and aims to achieve carbon neutrality by 2050. Today, electricity in Europe comes from hybrid sources, with nuclear power currently leading, followed by natural gas, and a growing share of renewables.

In the context of Europe's carbon neutrality target, the French government has also set up a corresponding target for its zero-carbon energy strategy. Specifically, the strategy has two major aspects. On the downstream side, it advocates energy conservation, reducing the energy consumption of the entire society, improving energy efficiency, guiding people to form green energy habits, and establishing policies such as a fair carbon trading mechanism and expanding the coverage of energy-saving certificates. On the upstream side, concerning the energy structure, it encourages diversified allocation, the vigorous development of renewable energy, and the further reduction of fossil energy.

Taking into account France's domestic energy resources, energy demand, and the complementarity, confluence and collaboration of energy resources among European countries, as well as the challenges on existing power systems and the overall economic feasibility, we believe that a balanced combination of 50% nuclear power and 50% renewable energy can provide strong support for the economy and stability of the energy system. As an energy company, our mission is to provide all customers with low-carbon energy through technological innovation and

to help the French government achieve the goal of zero carbon emissions.

We pay special attention to manufacturing technologies, especially in the operation and maintenance phase. We focus on new manufacturing technologies and application scenarios, including the repair of parts and components, which can be quickly replicated by 3D scanning and new manufacturing technologies based on digital technologies and digital simulation.

Both Shanghai Electric and EDF are leaders in the world's energy and power industry. We have obvious complementary advantages in terms of resources and technologies, leading to a wide range of cooperation fields in the upper and lower streams of the energy industry chain, such as digital twin, smart operation and maintenance of power plants, digital simulation, industrial software, manufacturing, integrated energy planning and construction services, energy storage technologies, and renewable energy technologies. We are confident about and looking forward to future cooperation and joint innovation, and wish to deepen our collaboration in the context of energy digitalization and carbon neutrality. By combining our respective advantages and complementary vision and capabilities, we look forward to promoting a new chapter of Sino-French energy cooperation and contributing to the global energy transformation towards carbon neutrality. **D**

As the full text is too long to quote, here are some excerpts of it



ALL ROADS LEAD TO ROME – SIEMENS' DIGITAL TRANSFORMATION TO THE ZERO CARBON FUTURE

Liu Ruofeng, Vice President for Siemens Industry Software Inc. Greater China



A

s a century-old manufacturer, Siemens has gone through three industrial revolutions. Except for the steam

engine invention, Siemens had been at the forefront of each industrial revolution, from the popularization of electricity to later automation and digitalization. We have always been an advanced innovator and technology pioneer in this industry.

2022 marks the 150th anniversary of Siemens' entry into the Chinese market. We share a long history with Shanghai, where Siemens established its first office 150 years ago. The past 2021 also marked a very special year for Siemens, when we built our world's first fully digitized factory in Nanjing. After the inauguration, it will serve a broad spectrum of users, just like our Chengdu factory. It will not only undertake the largest part of our global electronics manufacturing business but also serve as a benchmark for Siemens to the Chinese customers.

Siemens has just launched our Pioneer of Zero Carbon initiative, being the first among global major industrial groups to commit to achieving Carbon Neutrality by 2030. In China, Siemens factories are expected not only to reach the carbon peak by 2030 but also to achieve carbon neutrality by 2025. We aim to promote the collaboration of our industrial chain and the ecological chain to achieve the goal of carbon peak and carbon neutrality, so as to promote the sustainable development of both the community and the enterprises. Zero carbon, digital economy, and digital twin are great concepts

leading to the same ultimate goal of sustainability. Just like the saying goes, "All roads lead to Rome".

So, how did Siemens manage to implement various strategic changes and digital transformation in the past 10 years, transforming itself from an established industrial company to a technology company? Over the past 10 years, we have gone through four rounds of major business organization restructuring. By 2021, with the arrival of our new CEO, Siemens has completely reorganized its structure, with the Digital Industry becoming the core of our real business, supplemented by Smart Infrastructure, Siemens Mobility, and Siemens Healthcare. Our core strategy has switched to Digitalization, Automation, and Sustainability, further emphasizing the sustainability of the company in today's digital transformation.

The "D" in the latest Siemens sustainability framework "DEGREE" stands for the future trend of digital and low-carbon development of this industry. We are committed to social responsibilities, and the sustainability of our community, our customers, our shareholders, and our employees. This is the new DNA of Siemens today.

We also have similar adjustments in building up our digital capabilities, and even made investments ahead of our business layout. Siemens has published a large number of whitepapers focusing on enterprise digitization and the low-carbon digital economy, sharing our own experience with the industry to co-create business transformation. Through this process of digitizing Siemens, we have a deeper understanding of how to build a digital enterprise and

sum up experience concerning four major aspects. First and foremost is the lifeline ranging from order to delivery. A company relies on orders to survive. Second, products. As an enterprise, you must have products and be able to cover their lifecycle from production to retirement. The other two aspects are IT and OT, which should be integrated with the two aspects above to create a true digital enterprise.

For the Pioneer of Zero Carbon initiative, what will Siemens do to achieve it? We are going to fully adopt digital twin technologies in the execution phase of product manufacturing, while adopting the Internet, edge computing, and big data to make real-time improvements in optimization processes. With the application of the Industrial Internet, we will continue to pursue the goal of reducing emissions.

And how will we adopt the digital twin technologies across the entire enterprise process? We will apply them in the development, supply, manufacturing execution, and operation stages of a product.

Siemens' business is highly compatible with that of Shanghai Electric. By leveraging Siemens' best practices to align with Shanghai Electric's digital strategy, we can work together to upgrade the capabilities of both sides and empower the Chinese market. At the same time, we look forward to further cooperation to make Shanghai Electric a benchmark for high-end electrical equipment in China. Together, we aim to build an ecology to serve the market of smart energy and low-carbon economy. **D**

As the full text is too long to quote, here are some excerpts of it



EFFECTIVE DIGITALIZATION FORMS POSITIVE CYCLE GRADUALLY

Li Liang, General Manger, Department of Consultation, Midea Cloud Co., LTD

I

n order to meet the general listing requirements of Midea, we launched the strategy of "One Midea, One

System and One Standard". At that time, Midea carried out a radical reform: the "632 reform", involving 6 operating systems, 3 management platforms and 2 technology platforms.

Three years of digitalization unified the process systems. Based on that, we launched Internet +, which mainly focuses on data analysis and mobilization of all the systems. In 2016, Midea started a new round of digital construction, namely, C2M (Customer-to-Manufacturer), representing a forward-looking business model for the future. In 2018, Midea used 5G to connect devices within the internet. In 2020, Midea put forward the idea of comprehensive digitization and intelligentization. Since 2012, Midea has invested more than 10 billion yuan in digitalization, and has also benefited from digitalization. Digitalization is a magic weapon. The more you use it, the more effective it will become, and vice versa. That will then lead to a positive cycle of digitalization.

Why is digitalization launched

at Midea? In 2011, Midea was faced with great challenges. First, large-scale and low-cost manufacturing was no longer possible; Second, consumption patterns had undergone great changes. We must embrace the internet to switch from a traditional enterprise to a tech company; Third, years of development revealed many problems, towards which we made some strategic adjustments.

At that time, Midea adopted a divisional mechanism and there were large differences between these divisions. In this situation, we proposed the strategic transformation with an emphasis on "leading product, efficiency driven and global operation". From 2012 to 2019, we had followed this core strategy. All the actions of the whole group were taken around it.

In terms of IT, Midea made an overall plan. By 2012, there were three major sections, and the entire system consisted of more than 100 sub-systems. Under such framework, data between systems were not interconnected, especially between industrial groups and enterprises. All data, including basic data, was different and fragmented as well.

How can we unify the management of so many systems? Midea made a plan and started

all over again. We replaced all the original systems and rebuilt them into 6 major systems: PLM for user end to R&D; APS for R&D to planning; SRM for planning to purchasing; ERP for purchasing to manufacturing; MES for manufacturing to sales; and CRM for sales to services. On the basis of these 6 systems, three management platforms were built, including data analysis platform, financial management system and human resource platform for the group. Then two technology platforms were established to unify the portals and integrate these systems.

In this "632 reform", we emphasized end-to-end connectivity. At that time, there were only concepts without actual practice. After this, we found that the unified system set rules and standards for our business and data, with complete process recorded. If problems occurred, the source would become very clear.

Digitalization has also changed the innovation of business model. First, it's about the way of work; Second, it's about the relationship with business partners; and finally, it's about the business model itself. There are also many innovations based on digitalization itself. **D**

As the full text is too long to quote, here are some excerpts of it

VIEWPOINTS



INTERVIEWS



**HOLDER
OF THE
NATIONAL
MAY 1ST
LABOR
MEDAL
AND THE
TITLE OF
SHANGHAI
STANDOUT**

LUO WENLIN!

**THE SPIRIT OF CRAFTSMANSHIP
LEADS TO SUCCESS**

“

W

**HATEVER YOU DO,
DEVOTE YOUR HEART
AND SOUL TO IT. SEE
THE PRODUCT AS AN
ART PIECE, AND NEVER STOP AT
99.99% WHEN 100% IS POSSIBLE.”**

“Whatever you do, devote your heart and soul to it. See the product as an art piece, and never stop at 99.99% when 100% is possible. It is Luo Wenlin's interpretation of the craftsmanship spirits, and the ultimate goal he pursues. The past 15 years have witnessed how he develops from a common worker coming to Shanghai from his hometown to a “Shanghai Standout” (a title conferred on top workers in the city). He has made great achievements in the precision machining of thinner and longer shafts, and has made outstanding contributions to a number of national key engineering construction projects. What drives him to grow up into a model mechanic? Let's review his career path.

THE YOUNGEST TECHNICIAN

At 19, Luo Wenlin graduated from the Shanghai Electric Machinery Vocational School, majoring in the lathe. In 2007, he hopefully started to operate the lathe machine at the former gold processing sub-plant of Shanghai Electric Machinery Co., Ltd. (Shanghai Electric Machinery for short) with high hopes from his parents who lived in rural areas.

Senior technicians usually called the sub-plant the “big gold processing workshop” because most machine tools here were big with high precision and rarely seen in China, making it the place where crucial processing procedures of many extremely big and heavy equipment used in national projects



INTERVIEWS

were performed. Luo Wenlin can still recall the astonishing moment when he entered the spacious and bright workshop for the first time. With gigantic rotors moving swiftly between them, running machine tools were making low roars, manifesting their fundamental difference from horizontal lathes he learned about at school.

He thought that he had mastered all technical know-how, but suddenly found what he had learned was far from enough, and there was much for him to discover. From this very moment, he made up his mind that he shall try his best to become an excellent specialist via learning from others and polishing practical skills in order to build his future in Shanghai.

Proactively-prepared strivers are always favored and rewarded by life. Luo Wenlin accredited his fast progress to two aspects. One is the support of Shanghai Electric which offers a level, open and fair platform for migrant workers to show their talents and forges a corporate culture of learning. The other is his tutor whose unyielding pursuit of perfection has rooted in his heart, detailed instruction helped him to grasp highly complex processing skills in a short time and unselfish sharing of expertise become his most valuable legacy.

Even with the help of the tutor, individual devotion is indispensable. Although he was just an assistant operator of an 8-meter heavy-weight high-precision horizontal lathe, he could not hold back his excitement. After coming to the workshop early in the morning, he helped his tutor to prepare tools by the side of the machine tool, and then carefully checked product drawings and procedure cards while keeping key structures and processing difficulties in mind. He paid special attention to how his tutor operated the lathe, and regarding skills that he

failed to fully understand, he would ask for advice while explaining his own opinions. On occasions like this, his tutor willingly and openly shared his own experiences and secrets of success.

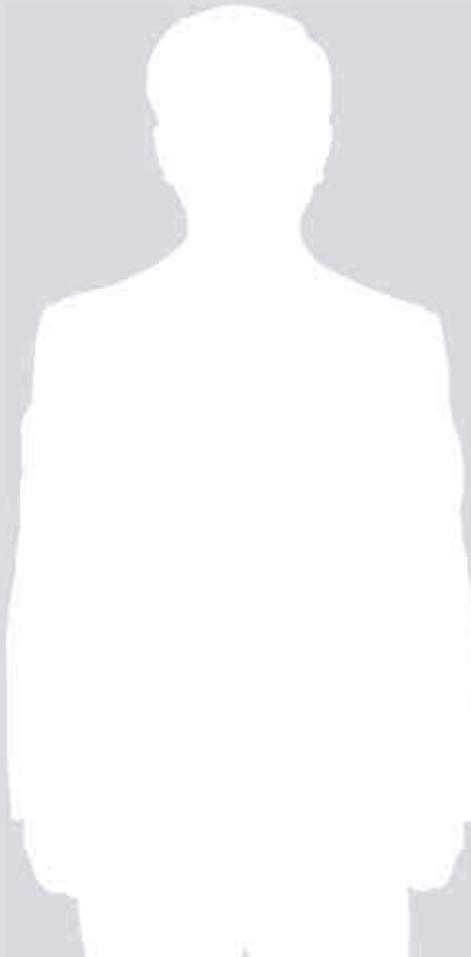
In 2008, Luo Wenlin was recommended by the manager of the sub-plant as a candidate for the Li-Bin Cup Vocation Skill Competition held by Shanghai Electric, who thought of him as a promising young man due to his passion for learning and humble attitude. Luo Wenlin won the first prize under the category of senior workers in the competition by his excellent performance, and in December, he obtained his technician certificate, becoming the youngest technician ever at Shanghai Electric Machinery.

SOLVE TOUGH PROBLEMS

The success at the competition reinforced Luo Wenlin's initial goal. He continued to modestly consult with his tutor and refine his skills while taking part in further education to improve his expertise and academic performance. Step by step, Luo Wenlin grew into the main operator of the 8-meter horizontal lathe and began to process rotors used in national major projects on his own.

Here is an example. One day, a rotor to be processed was delivered to his workshop: it was longer than 5 meters, and its diameter of the smallest outer rings on both ends was 180mm, and that of the biggest outer ring in the middle 990mm. To make it worse, the tolerance range for critical sizes on each level mustn't exceed 0.02mm according to the drawing. Before it came here, the rotor had toured around other companies and workshops, all of which believed that it was too complex to be processed based on their current capability.

What on earth made it so tough to process the rotor? Just think of the part as a steel ring with a rope through the hole, which was a little bit of exaggeration. As soon as the machine tool starts working, the middle part would swing together with it, creating an eccentric distance. Therefore, the deflection made prior to processing is already



beyond the tolerance range, making it impossible to complete the task as per the requirements.

Workers actively shared their opinions, standing around the component. Some said that unless the drawing was modified, or the technical requirement definitely couldn't be implemented, and others proposed a try, but were uncertain of the result. Luo Wenlin believed that as long as they could fix problems related to deflection and straightness by optimizing procedures or introducing auxiliary tooling, the difficulty can be solved easily.

After exchanging ideas with other technicians and managers, he gained their support and they set up a team dedicated to the task. Following Luo Wenlin's way, the team made utmost efforts to make breakthroughs in processing procedures. To put it simply, first, they tried to straighten the rotor's axle centerline, and then support the middle part with a couple of brackets, and finally align the centerline with the generatrix of the machine tool by using "a fixture and a bracket". Easy as the solution sounded, the actual processing was totally another thing. After working for 48 hours around the clock and passing all tests, they managed to keep all tolerances within the specified range.

From then on, Luo Wenlin was admired by colleagues, but instead of getting drowned in self-content, he made a record of all original data and stepped further in improving the processing work in this aspect, developing a solution for processing thinner and longer shafts. Consequently, Luo Wenlin and his teammates received more tasks of processing high-precision rotors that were very long or thin after this success, applying the solution to more products of a similar shape, removing bottleneck problems for many major projects like motors used in the West-East Gas Pipeline Project and the reactor coolant pump.

THE HERITAGE OF CRAFTSMANSHIP

"Shanghai Electric Machinery has seen each and every watershed moment in my life, and without Shanghai Electric Machinery or Shanghai Electric, I will not succeed." Looking back on the past years, Luo Wenlin becomes emotional and grateful.

His career entered the fast lane after he championed the 2008 vocational skill competition: in 2010, he was one of the first dispatched workers who managed to sign contracts with Shanghai Electric Machinery, the ultimate employer; in 2013, he was awarded the title "Excellent Rural Migrant Worker of Shanghai"; in 2014, he obtained the National May 1st Labor Medal; in 2015, he became a registered resident of Shanghai; in 2016, he was rated as one of the first excellent craftsmen of Minhang District; and in 2021, he was awarded the title "Shanghai Standout".

"The National May 1st Labor Medal undoubtedly outweighs all the other awards, but what I am most proud of is being esteemed as a craftsman because I am from a team putting the spirit of craftsmanship at the core." As early as 2013, Luo Wenlin was enlisted in the chief mechanic's workshop established by the former gold processing plant. Therefore, in addition to fully performing his duties, he was assigned an array of tasks on technical improvement, process innovation and unblocking bottlenecks, making contributions to the R&D of many new products and the progression of crucial programs.

With the deep reform of the corporate business landscape executed in the next few years, after-sale services rose as a new growth driver, craving for skilled technicians who were prepared to support on-site project teams in person whenever required. Both



his manager and tutor encouraged Luo Wenlin to join the service team in the hope that he could assume bigger responsibilities and leverage his talents in areas where the company needed most.

Shortly afterward, he became a specialist to solve crucial and difficult problems which must be addressed on the jobsite because relevant parts couldn't be delivered back to the factory, so he has supported clients in different regions. While working in this team, he developed unique repair methods by leveraging his expertise and limited resources available regarding various on-site conditions. His signature operation is to repair a vessel's motor inside the narrow cabin, which is highly acknowledged by clients. With a toolkit designed and made by himself, he managed to grind the commutator in the cabin, which enormously cut both the repair time and cost by making it unnecessary to disassemble the ship and then to have the problem addressed.

Today, Luo Wenlin has succeeded his tutor as the leader of the chief mechanic workshop, and carried on the spirit and style of his tutor, trying to impact colleagues through his own actions and the sharing of his know-how and experience. He said that he hopes to see another master nurtured in his team. It is a legacy, and more importantly, a responsibility. **D**



SHANGHAI ELECTRIC TO ACHIEVE CARBON GOALS THROUGH STEADY PROGRESSES



On December 16, 2021, Zhang Jianhua, Member of the Leading Party Members' Group of the National Development and Reform Commission and Secretary of the Leading Party Members'

Group and Director of the National Energy Administration, investigated how Shanghai Electric implemented goals of peaking carbon dioxide emission and realizing carbon neutrality as the delegation leader. He visited the exhibition center of Shanghai Electric Power Generation Equipment Co., Ltd. Generator Plant and learnt about detailed manufacturing procedures after listening to Shanghai Electric's report on how the company fully implemented the national decarbonization strategy and fulfilled responsibilities as a state-owned enterprise in order to boost transformation and the achievement of goals of carbon peaking and neutrality.

Zhang Jianhua fully recognized Shanghai Electric's development path which is to stick to equipment manufacturing, its major business, and ground all the work in this new stage of development, apply the new development philosophy, foster a new pattern of development, and promote high-quality development. He spoke highly of Shanghai Electric's integrated services, such as customized upgrading solutions for coal-fired power plants in service based on their transformation needs for energy conservation, heating and flexibility, transformation solutions for coal-fired power plants on comprehensive energy utilization as well as smart power plant upgrading plans. He concluded that as coal remains the major energy source for China, the country is on the way to strengthening the clean and efficient use of coal, increasing the integration capacity of new energy, while optimizing the use of coal and new energy, which creates a lot of opportunities for Shanghai Electric. The company shall align itself with national strategies and boost green and low-carbon transformation and development to



contribute its part to attaining decarbonization goals.

At present, it is crucial for the energy industry to practice low-carbon transformation. Since goals of carbon peaking and neutrality were announced in September 2020, the energy sector and its-upper stream and lower-stream entities have seen changes in many fields like new policies, technologies and orientations. Leading enterprises represented by Shanghai Electric have leveraged their advantages and carried out an array of projects and plans.

IMPLEMENT RESPONSIBILITIES AND BOOST HIGH-QUALITY DEVELOPMENT

The manager responsible for enterprise strategy planning with Shanghai Electric Group Co., Ltd. said that the decarbonization goals are vital to the whole society and require systematic efforts from the energy sector. For the present, we shall keep economic growth and social development while decreasing the consumption of fossil energy; and in the long run, it leads to a fundamental revolution that replaces fossil energy with new energy. As an important state-owned enterprise, Shanghai Electric closely follows the national



strategy and sticks to the green and low-carbon development principle in its strategic transformation, around which forms a general thought and gives full play to its leading and exemplary role.

Under the guiding principles of “keeping stability while pursuing progress and innovating on what has worked”, Shanghai Electric has pressed ahead towards goals of carbon peaking and neutrality, and driven high-quality development through technological innovations in areas of “energy replacement, energy efficiency increase and resource utilization”, yielding remarkable results.

As for energy replacement, Shanghai Electric places equal importance on “decreasing carbon dioxide emissions safely” and “maximizing decarbonization”. Main equipment systems provided by Shanghai Electric for coal-fired power plants have repeatedly refreshed the world record of lowest coal consumption, supporting “decreasing carbon dioxide emission safely” with actual efforts. Recently, the Huaneng Ruijin No.4 2X1000MW coal-fired units set a new world record of 249.7g/kWh after completing the 168-hour trial operation.

As for energy efficiency increase, Shanghai Electric has introduced various types of innovative products on energy conservation to different industrial scenarios. In regard to driving business performance, Shanghai Electric offers services of increasing energy efficiency to industries including power, metal

metallurgy, petrochemical engineering and construction materials based on its core advantages on equipment; regarding rail transit, it helps to enhance the use efficiency of rail transportation; as for smart building, Shanghai Mitsubishi Elevator Co., Ltd., a subsidiary of Shanghai Electric, develops an innovative energy feedback device that can reduce “carbon footprints” while the elevator goes up and down; and concerning new energy vehicle (NEV), Shanghai Electric provides services throughout the industrial chain from low-carbon factory design, smart assembly lines for lithium battery and whole vehicle, and NEV thermal management system, facilitating “low-carbon transportation”.

As for resource utilization, Shanghai Electric provides systematic solutions for industrial parks’ circle development based on its capabilities in key technologies, equipment and systems for treating fume, waste water and solid wastes. What’s more, Shanghai Electric combines carbon dioxide capture with green hydrogen energy and promotes demonstration projects like producing methanol from carbon dioxide and green hydrogen, offering a practical path to make energy sources greener and maximize decarbonization.



INNOVATIVE APPROACH

SET A GOOD EXAMPLE OF GREEN DEVELOPMENT

Over the past few years, Shanghai Electric has been exploring new areas while implementing transformation in order to contribute to the fulfillment of national goals of carbon peaking and neutrality and to gain more competitive edges. Under the guidance of the Party Committee and Board of Shanghai Electric Group, Shanghai Electric prioritizes innovation and formulates the competitive strategy of pursuing state-of-the-art technologies first and lower costs second based on equipment manufacturing, its main business, sparing no efforts to make the company stronger.

As an important state-owned enterprise, Shanghai Electric is committed to a number of missions: to promote efficient and clean use of coal and to remove obstacles in developing low-carbon and green technologies; to develop the nuclear power and gas turbine industries safely and efficiently and to overcome technical difficulties; to speed up the development of new energy including wind, solar and hydrogen power as well as energy storage; to make power transportation and distribution products smarter and more digitalized and to devise systematic solutions for integrating more renewable energy generated from the electricity of the grid; to develop “wind-solar-water-thermal-storage” and “source-grid-load-storage-charging” hybrid energy services. With these actions, it strives to practice, promote and set landmarks in new-type smart power system construction.

The manager responsible for enterprise strategy planning said that as the energy revolution proceeds, Shanghai Electric will seize every moment and opportunity with a strong sense of responsibility to present globally-competitive products and services in line with the guidance of “product smartization and service industrialization”. As China strongly supports “wind-solar-water-thermal-storage” and “source-grid-load-storage-charging” hybrid projects, Shanghai Electric will maximize its equipment manufacturing industrial cluster to lead the construction of a new-type power system that is mainly based on new energy.

Shanghai Electric has been advocating “wind-solar-storage-hydrogen-grid” technological innovations in the new energy sector and making new achievements in the

construction of the new-type power system mainly based on new energy. As the EPC and major equipment supplier of the Dubai 950 MW solar hybrid project (700MW CSP & 250MW PV) that is the world’s largest solar project featuring the latest technologies, Shanghai Electric is coordinating resources from over 40 countries to construct a demonstration project that can produce electricity stably purely out of solar energy all the time under the Belt and Road Initiative. As a leader of “carbon-zero park” solutions, Shanghai Electric is building a “wind-solar-storage” hybrid industrial manufacturing park in Shantou, Guangdong, which is the first certified “carbon-zero park” in China, providing valuable practices for using a high percentage of renewable energy.

ADHERING TO TECHNOLOGY-DRIVEN INNOVATION AND PROMOTING ENGINEERING CULTURE

The manager in charge of strategic planning of the group pointed out that, with the current accelerated energy transition, Shanghai Electric is facing huge pressure and challenges in the transformation of traditional industries, and ushering in a number of important opportunities for the development of emerging industries. With the rapid development of the marketization of the



economy and the accelerated evolution of the competitive landscape, Shanghai Electric needs to respond to the drastically changing market environment through a series of institutional reforms and innovations within the group. The group insists on taking “innovation in science and technology” as the primary driving force and “key talents” as the most important resource, and vigorously promotes the “engineering culture”, so as to create a path of “open, cooperative, win-win” development, seize the momentum and embrace the low-carbon future.

In the traditional thermal power sector, Shanghai Electric will continue to leverage its technological leadership to make greater contributions in power plant renovation and upgrading and flexibility retrofitting services; in new energy sector, Shanghai Electric will actively strengthen the “wind-solar-storage-hydrogen-grid” industry chain to further consolidate and expand the group’s competitive advantage in hybrid energy systems; for energy conservation and carbon emission reduction, Shanghai Electric will intensify the construction of industrial cluster to provide equipment and services for energy saving in high energy-consuming industries; for energy recycling, Shanghai Electric will give full play to its design, process and equipment advantages in fields such as power, petrochemical and metallurgy, and promote energy recycling based on the system solutions covering CO₂ capture and green methanol and ammonia from hydrogen, so as to contribute to the achievement of carbon peaking and carbon neutrality goals in the energy and industrial fields.

At the opening ceremony of 2021 Science and Technology Month of Shanghai Electric on November 22, 2021, the group held a high-end forum on “low-carbon and innovative development”, which featured a summit dialogue on low-carbon technologies in the energy industry. According to the manager in charge of strategic planning of the group, in the same month, Shanghai Electric participated in the annual seminar entitled the “2060 Strategy for Carbon Neutrality” held by the Institute of 2060, ShanghaiTech University, which was attended by many well-known enterprises and organizations from home and abroad. A series of forums and salons on the theme of low-carbon development were held on an ongoing basis.

The manager in charge of strategic planning of the group introduced that the Science and Technology Month aims to empower industrial development with science and technology innovation. In terms of approach, the focus will be on the establishment of an open, innovative and collaborative platform. Through the open competition mechanism, talent recruitment, industry-academia collaboration, “bringing in” and “going out”, Shanghai Electric will work together with universities and institutes, important clients, investment banks and funds, international advanced innovative enterprises and high-level talents and experts that are closely related to the innovation activities of the group, to build the platform, complete the application scenarios, gather the strength of talents and promote the high-quality development of the group. **D**





INNOVATIVE APPROACH

PRACTICE IS THE SOLE CRITERION FOR TESTING TRUTH



The IT industry's booming development over the past few years has many Internet companies idolized by self-media accounts due to their corporate culture characterized by much fewer regulations, for which the term "engineering culture" is coined. As it

goes viral, "engineering culture" is seen as an equal of the Garage culture of the US and the craftsmanship of Japan, and consequently the key to corporate technological innovation and growth. However, when the tide falls, few people would search for the real meaning of the engineering culture.

Handling engineering tasks in person, I see the engineering culture as a bigger framework covering work guidelines, methods, and attitudes of all employees, to rephrase it, a solution-oriented corporate culture. It's not just engineers who have the engineering culture. Traditionally speaking, there is a definite line between operators and engineers or technicians in terms of job responsibilities: the former for hands-on tasks and the latter for making plans, which often leads to the result that the product design and procedures don't match with actual production process at all, making manufacturing problems difficult to be fixed timely. Despite clearly-defined responsibilities, engineers and operators are two sides of one coin.

Practice is the sole criterion for testing truth. Just like the quote "talk is cheap, show me the code" by Linus Torvalds indicates, academic research itself is far from enough for designing a truly workable solution, especially in professional fields that enormously rely on pragmatic performance and experience like nondestructive testing, and hence engineers shall pay more attention to practical operation and application rather than simply focusing on standards and regulations.

When I participated in a national competition for nuclear system nondestructive testing last October, I

found that first prize-winning teams and individuals were unexceptionally engineers who have performed testing tasks for years. Frontline employees play a crucial role in solving engineering problems, and the way in which the engineering culture keeps driving the corporate development is to solve problems with the plan-do-check-act (PDCA) approach, and to test results, make continual improvements and target innovations by identifying, analyzing and addressing problems.

However, the engineering culture is not formed in one day. Good engineers and a good engineering culture form a virtuous circle. Take the nondestructive testing for example, it takes a graduate at least 2 or 3 years to obtain certificates to do testing, and at least 8 years to become an experienced expert in a certain field. It is impossible for an engineer to improve his/her personal development by fulfilling repeated tasks only. Computers will handle simple and repetitive work with increasingly powerful AI technologies, while engineers will be much more closely associated with strong capability and excellent skills who are needed by companies to remove bottlenecks, make optimizations and drive technological revolutions. As an engineer develops, the engineering culture takes form.

Tens of thousands of STEM graduates enter the labor market every year because of the expanded admission of colleges and universities. The dividend caused by abundant engineers is regarded as a critical role to support China's stable development in the next phase after the demographic dividend is exploited, but engineers themselves can hardly benefit from it. Except those recruited by a handful of Internet giants, many STEM graduates work in computer and financing companies because traditional manufacturers have offered non-competitive salaries for technical positions for decades. A positive engineering culture may start from a reasonable understanding of and respect for frontline engineers. **D**



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