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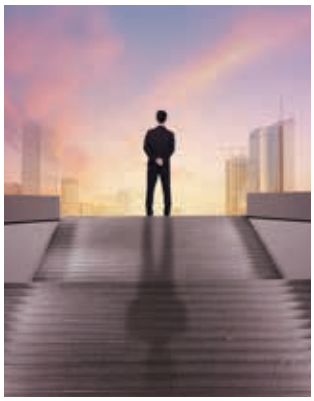
MANAGERS



MANAGEMENT IS THE "GENERAL COMMANDER" OF INNOVATION

Shanghai Electric Group's subsidiaries have made remarkable achievements in their respective fields: the Shidaowan nuclear power plant equipped with high-temperature air-cooled reactors, operated by Huaneng and constructed by companies including Shanghai Electric, successfully got connected to the gird, and the world's first 35 kilovolt superconducting power cable was put into operation. In the meantime, Shanghai Electric Group's tech teams working at the backstage have become known by more and more people.

A number of experts who achieved remarkable results in innovation expressed heartfelt gratitude in recent interviews to leaders who continued to support them even when few people were optimistic about their researches, which is quite impressive.

There are a lot of stories behind "continued to support". More often than not, people see the brilliant results of innovation rather than the tough work behind it. However, technological innovation in fact is a long journey full of risks and challenges in choosing subjects, conducting researches and applying the results. Not all innovative efforts pay off. It takes years of devotion for tech teams to catch up with leading players and even become "leaders" themselves, who started from scratch merely as "followers".

An expert at Shanghai Electric Group's Central Academe made it much clearer that once a project is likely to succeed and yield industrial and economic benefits in a short term, many would fight for the opportunity to implement it. As for projects that are in frontier areas, with an unpromising outlook or even stand a high chance of failure, are companies still willing to provide support? Furthermore, many programs require a huge investment, and are not likely to deliver until it has run stably for years and consistent researches have been conducted. What is "worse", their contributions cannot be reflected in economic gains. How many companies would like to support such programs?

Philip A.Roussel has pointed out in his book Third Generation R&D that technological innovation should not be seen as "the business of technology experts only"-- the involvement of the management team actually plays the key role. Neither Dong Mingzhu nor Ren Zhengfei is a researcher, but they have developed great innovative enterprises, which fully prove the point. In the new era of innovation, managers are the leading role for innovation, or even general commanders on site. D

ELECTRIC SHANGHAI 上海电气

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ELECTRIC NEWS

China Central Television Covered the Hunutlu Project in Turkey

On November 21, CCTV-4 covered the 2X660MW ultra super-critical units adopted by the Hunutlu coal-fired power station in Turkey. As a milestone connecting China's Belt and Road Initiative and Turkey's Middle Corridor Initiative, the Hunutlu project has been the biggest by the amount of direct investment from the Chinese enterprise since China and Turkey established diplomatic relations. Shanghai Electric Power Generation Group is the provider of steam turbines, power generators and supportive equipment which use Shanghai Electric's green and efficient 660MW ultra super-critical coal-fired power generation technology. A manager said that Shanghai Electric would do its best to build the Hunutlu project a benchmark in the world and the Belt and Road program and to expand the reach of Shanghai Electric's products and services.

Shanghai Electric Continued to Hold a Leading Position in the Annual National Electricity Reliability Evaluation

Recently, the National Energy Administration and China Electricity Council jointly held a conference in Beijing to release the 2020 electricity reliability indices for three kinds of power units. Shanghai Electric's units kept their holding position in terms of equivalent unplanned outage hours. According to the data, with an annual average of 18.23 equivalent unplanned outage hours per unit, units manufactured by Shanghai Electric by large outperformed its competitors across the three categories. To be more specific, Shanghai Electric's 1000MW and 300MW units reached 0.85 hours per unit and 6.58 hours per unit respectively and annually, and its high-pressure heater ranked first by market share and unplanned outage hours in the industry. Shanghai Electric also outnumbered its competitors in units awarded. 57% or 5.7 units out of ten 1000MW units awarded were from Shanghai Electric, and the number was 34% or 6.7 units for the twenty 600MW units. It had altogether 15 units awarded that accounted for 30% of all.

Shanghai Electric (Anhui) Energy Storage Co., Ltd. Won 2021 China Energy Storage Technology Innovation Award

On December 9, the Global Energy Storage and New Energy Influence Summit kicked off at Shenzhen and honored companies that made significant contributions in energy storage this year. Shanghai Electric (Anhui) Energy Storage Co., Ltd. obtained the 2021 China Energy Storage Technology Innovation Award thanks to its R&D competence on key materials of all-vanadium redox flow batteries, system integration, production industrialization. and cost-effective products. With over 10 years of intensive research and development, the company has mastered core technologies of flow energy-storage cells' R&D, design, manufacturing, installation, commissioning, and operation, and accumulated rich experience in engineering applications. So far, it has established a strategic partnership with State Power Investment Corporation, Stage Grid, China Energy, Anhui Chaohu Economic Development Zone, and Jiangsu Yancheng Economic and Technological Development Zone, whose aggregate capacity of generation-grid-load-storage integrated energy projects to be launched stands at 3GWh. In addition to the domestic market, its sales network includes foreign countries and regions.

Two National Chambers of Commerce Rated Shanghai Electric AAA

Recently, the China Chamber of Commerce for Import and Export of Machinery and Electronic Products (CCCME) and the China International Contractors Association (CHINCA) gave Shanghai Electric the highest rating AAA of two items in the 2021 Enterprise Credit Evaluation announced. CCCME is the only national chamber of commerce for the import and export of machinery and electronic products, and has nearly 10,000 member companies including leading players and small-and-medium enterprises in this sector. CHINCA engages in project contracting, labor service cooperation, and project investment across over 190 countries and regions, which support their social and economic growth and people's well-being.

No.2 Gas Turbine of the Pancevo Project Successful in Its First Ignition

Recently, the No.2 gas turbine of the 161MW gas turbine combined cycle power plant project in Pancevo, Serbia, undertaken by Shanghai Electric, finished its first ignition successfully, which ran stably on a no-load condition for 30 minutes with a motor speed of 3000 rpm, resulting to a good performance. As a pivot of the project, the successful ignition laid a solid foundation for the operation of the combined cycle system. Owing to the close cooperation of all departments who jointly removed problems of electric protection tripping, unstable flames of the probe and natural gas leakage inside the cover of the gas turbines during the course, the task was fulfilled smoothly.

First Wind Power Plant of Shanghai Electric in Europe Connected to Grid

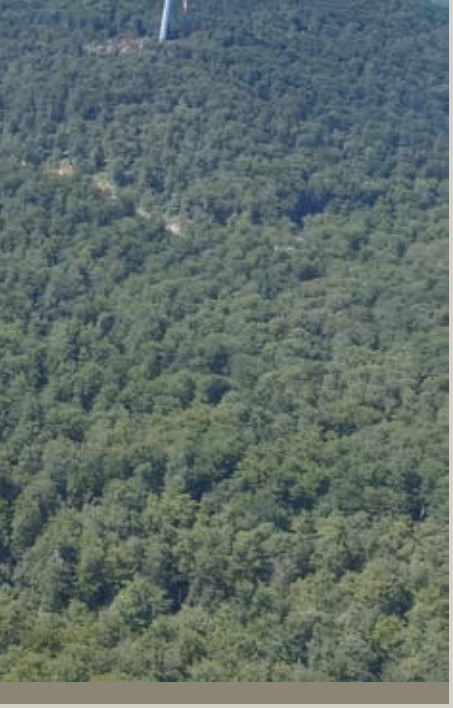
Recently, Shanghai Electric Wind Power Group Co., Ltd. ("Shanghai Electric Wind Power Group" for short) inaugurated a project in Senj, Croatia, which was its first onshore wind power project in Europe with NORINCO International as its partner. The project sits along the coast of the Adriatic Sea in the middle of Croatia, 8 kilometers away from the northeast of Senj city. With a wind farm of 44.8 km^2, it has a total commissioned capacity of 156MW including 39 sets of 4MW wind turbines, and is expected to work for 3,400 hours and generate 530 million kWh per year. With this great start, Shanghai Electric Wind Power Group embarks on the journey to increase its influence in Europe.

China's First Sino-foreign Offshore Wind Power Project Connected to Full-Capacity Grid

On November 20, the intertidal-zone-situated offshore wind farm, the 5th phase of the project invested by Guohua Energy Investment in Dongtai City, Jiangsu Province, achieved grid connection when the grid was at full capacity, which is China's first Sino-foreign offshore wind power project and undertaken by Shanghai Electric Wind Power Group Co.Ltd. The successful connection symbolized another energy landmark under the Belt and Road Initiative. With an installed capacity of 200MW, the offshore wind farm, one of the handful farms located in intertidal zones in China, has 50 sets of W4000-146 wind turbines that are roughly 37 kilometers offshore. The team completed the project with all efforts despite many difficulties caused by the natural environment.

Three Shanghai Electric's Subsidiaries Rated the SRDI "Little Giants"

Recently, Shanghai Electric's three subsidiaries, Shanghai Electric Nuclear Power Equipment Co., Ltd., Shanghai United Bearing Co., Ltd. and Shanghai Zhenhua Bearing Factory Co., Ltd., were listed as the third batch of the SRDI "Little Giant" enterprises announced by the Ministry of Industry and Information Technology due to their outstanding innovative capability and excellent performances in brand influence, economic benefits, operation, and management. The SRDI ("Specialized, Refinement, Differential, Innovation") Little Giants refer to leading companies that are dedicated to niche markets and characterized by strong innovation capability, high market share, ownership of core technologies, good quality, and outstanding profitability.



BRIEF NEWS

Shanghai Electric Guoxuan New Energy Technology Provided Lithium Batteries to Baidu "Pinghu" System

On November 25, Baidu launched its "Pinghu" DC Lithium Battery System in Shanghai and announced Shanghai Electric Guoxuan New Energy Technology Co., Ltd. ("Shanghai Electric Guoxuan New Energy Technology" for short) as its "strategic partner" on the system. Shanghai Electric Guoxuan New Energy provides lithium batteries for the data center of the Pinghu System and LFP batteries for the energy storage parts, which is characterized by higher specific energy, longer cycle life, higher charging and discharging rates and environmental friendliness, and has been widely applied in areas like energy storage and HVDC. The inauguration will start stronger cooperation between the two parties in R&D and promotion of applying DC lithium batteries in data centers, and exploration of energy storage and green operation of data centers.

Stator of No.2 Power Generator for Thar Power Plant in Pakistan Lifted into Position

Recently, the stator of the No.2 power generating units of the 2x660MW coal-fired power plant was lifted to the designated position, which is in Block-1 of the Thar coal mine. It indicated the installation of No.2 steam turbine units started, laying a solid foundation for rotor installation and center location to be implemented. The project department reinforced controlling the hoisting process and all staff strictly carried out the plan, which ensured the successful installation of the stator.

SHANGHAI ELECTRIC AND ZHEJIANG UNIVERSITY JOINTLY WON THE 2nd-CLASS AWARD OF THE NATIONAL PRIZE FOR PROGRESS IN SCIENCE AND TECHNOLOGY

The project "Wide-area Collaborative High-end Large-scale Programmable Automation System and Its Application", which is an industry-university-research project of Shanghai Electric and Zhejiang University, won the 2nd-class award of the National Prize for Progress in Science and Technology. On November 3, the awards were presented to the winners by Chinese president Xi Jinping and other Party and State leaders, who attended the National Science and Technology Award Conference held by the CPC Central Committee and the State Council in Beijing.

This project addresses the urgent demand for high-end large-scale programmable automation systems in China's modern industrial production, which is increasingly large, high-speed, and refined. It makes breakthroughs in solving four major problems of the systems, namely, the overall design technology, the comprehensive security technology that integrates functional security and information security, the optimization technology for cognitive network, and the optimization technology for operation, forming a core technology system based on independent intellectual properties. The project has successfully developed the wide-area collaborative high-end large-scale programmable automation devices and system and has already launched relevant promotion and application works.


国家科学技术进步奖
证 书
为表彰国家科学技术进步奖获得者，特颁发此证书。
项目名称：广域协同的高端大规模可编程自动化系统及应用
奖励等级：二等
获 奖 者：上海电气集团股份有限公司

Chinese Premier Li Keqiang Congratulated on Croatian Wind Power Project Engaged in by Shanghai Electric

On December 7, Zagreb, capital of Croatia, witnessed an event to celebrate the grid connection of the 156MW wind power project in Senj, Croatia, in which NORINCO International serves as the investor, constructor and operator and Shanghai Electric as the provider of onshore wind turbines.

Chinese Premier Li Keqiang sent a congratulation letter on the successful grid connection. Andrej PLENKOVIĆ, Prime Minister of Croatia, and Qi Qianjin, Chinese Ambassador to Croatia, attended and addressed the celebration. In a video call, Ning Jizhe, deputy head of China's National Development and Reform Commission, read out Premier Li Keqiang's letter. Jiao Kaihe, Chairman of China North Industries Group Corporation, and Dario Mihelin, Croatian Ambassador to China also addressed the ceremony through video.

Andrej PLENKOVIĆ expressed his gratitude for the letter by Li Keqiang, highlighted that both Croatian and Chinese leaders saw the Senj wind farm as important, and applauded the inauguration of the trial production of the project that overcame earthquakes and the pandemic. The electric output of the Senj wind farm accounts for 3.5% of Croatia's total, supporting the country to realize its goal of increasing the percentage of renewable energy to 30% by 2022.

As Shanghai Electric's first wind power project in Europe, it completed the lifting and assembly of all unit components on October 30 (local time), and got connected to the grid on November 12. Despite the pandemic, Shanghai Electric finished the lifting and grid connection in a timely manner. With its wind turbines standing fast and tall on the continent, Shanghai Electric shows its muscles and becomes a stronger competitor on the international market.

SHANGHAI ELECTRIC SIGNED STRATEGIC AGREEMENT WITH SKF AT THE CIIE

The fourth China International Import Expo (CIIE) was held in Shanghai from November 5 to 10 as scheduled. The largest "global fair" was almost as busy as the "Double 11" Shopping Festival.

On November 7, the signing ceremony of the state-owned enterprise sub-group of Shanghai trade delegation for the 4th CIIE kicked off at National Exhibition and Convention Center (Shanghai), in which 9 companies including Shanghai Electric signed 11 agreements with foreign counterparts, totaling 3.95 billion yuan. Shanghai Electric inked a strategic agreement with SKF from Sweden, witnessed by Zhang Wei, Deputy Mayor of Shanghai, Hua Yuan, Deputy Secretary-General of Shanghai Municipal Government, and Bai Tinghui, Party Secretary and Head of Shanghai Municipal State-owned Assets Supervision and Administration Commission. Leng Weiqing, Party Secretary and Chairman, and Jin Xiaolong, Vice President of Shanghai Electric Group, attended the event.

Bai Tinghui briefed on deals made by the state-owned enterprise sub-group of

Shanghai trade delegation who so far had hit a new record high contract amount of 3.08 billion US dollars by signing 114 purchase letters of intent, outnumbering many other sub-groups of Shanghai.

During the fourth expo, Shanghai Electric reached more than 10 purchase orders or framework agreements with foreign companies that totaled 1.739 billion yuan. Shanghai Electric and SKF reinforced their cooperation on basis of the contract signed last year. Both can increase their brand value and overall competitiveness via mutually-beneficial technological and product interaction that was made possible by the combination of Shanghai Electric's global positioning and SKF's global supply chain and excellent engineering R&D competence.

Shanghai Electric has collaborated with foreign companies in creating new opportunities and implementing projects in areas like new energy, smart medical care* and advanced manufacturing from the inception of CIIE four years ago, becoming a platform converging world-leading technologies, products and services. Shared with domestic enterprises benefits, it gained in technological empowerment and transformation and upgrading as it promotes low-carbon, green and sustainable development, contributing to building "a new development pattern with domestic and international cycles supporting each other".

International attendees compared CIIE as a "golden gate" to the big Chinese market at the opening ceremony. Coming to its fourth session, the gate has opened wider and wider, which empowers Shanghai Electric to leverage international cooperation and seek mutually-winning cooperation via connecting with more companies and entering more markets.

It is learned that during the 4th China International Import Expo, Shanghai Electric Wind Power Group Co., Ltd. (hereinafter referred to as the "Wind Power Group") and Danfoss (Shanghai) Investment Co., Ltd. signed a strategic framework agreement to carry out in-depth cooperation in technologies for zero carbon, green growth and integrated smart energy. The two parties will work together to build a "zero-carbon" demonstration industrial park in Haiyan, Zhejiang. Shanghai Electric Power Transmission & Distribution Group, Wind Power Group, and Siemens Energy signed a letter of intent for cooperation in the introduction, localization, application, and promotion of technologies for environmentally friendly high-voltage electrical equipment. These three parties will further deepen their partnership and carry out extensive cooperation in the field of renewable energy and the new generation of environmentally friendly power equipment. In addition, Shanghai Mitsubishi Elevator Co., Ltd. also signed a strategic agreement on elevator procurement with the Third Construction Engineering Co., Ltd. of China Construction Second Engineering Bureau.

The Qingpu New Energy Bus, provided with the power battery system by the Shanghai Electric Guoxuan New Energy Technology Co., Ltd. (hereinafter referred to as Shanghai Electric Guoxuan New Energy), is also in operation to provide visitor transportation service for the CIIE. This power battery system is the company's fourth generation of the standard battery box, featuring the high energy density lithium iron phosphate square aluminum shell cells mass-produced by the Nantong manufacturing base of Shanghai Electric Guoxuan New Energy, as well as multi-level safety assurance, lightweight structure and temperature management system. Having passed the comprehensive and severe rigorous test of China National Accreditation Service for Conformity Assessment, the product has the advantages of high safety performance, excellent cycle life, and long run time. It can withstand severe cold and heat and can operate efficiently in a wide temperature range. D

2021

Shanghai Electric Science and Technology Month & Summit for Innovation and Zero Carbon Driven Development Kicked off

On November 22, the 2021 Shanghai Electric Science and Technology Month & Summit for Innovation and Zero Carbon Driven Development with the theme of "Intelligent Manufacturing Upgrade, Innovation Empowerment" was held in the Shanghai Science Hall.

Jiang Mianheng, President of ShanghaiTech University; Cao Yuanfeng, Deputy Secretary of the Organization Department of Shanghai Municipal CPC Committee; Leng Weiqing, Secretary of the Party Committee and Chairman of Shanghai Electric; Li Ruxin, Academician of the Chinese Academy of Sciences and Secretary of the Party Committee and Vice President of ShanghaiTech University; Chu Junhao, Academician of the Chinese Academy of Sciences, Researcher of Shanghai Institute of Technical Physics and President of the Institute of Optoelectronics of Fudan University; Wang Weiming, Deputy Secretary of the Party Committee and Vice President of Shanghai Jiao Tong University; Qin Jian, Secretary of the Party Committee and Chairman of Shanghai Alliance Investment Co., Ltd.; He Qing, Secretary of the Party Committee and Chairman of Guotai Junan Securities Co., Ltd.; Wu Jianyong, Secretary of the Party Committee of University of Shanghai for Science and Technology; Liu Ping, Deputy Secretary of the Party Committee and President of Shanghai Electric; Ding Xiaodong, Deputy Secretary of the Party Committee and President of University of Shanghai for Science and Technology; Wei Juliang, Deputy Secretary of the Party Committee and General Manager of the Shanghai Electric Power Co., Ltd., SPIC; Li Ping, Vice Chairman of Contemporary Amperex Technology Co.,Ltd.; Guo Yiyu, General Manager of Huawei Shanghai Representative Office, and other leaders and guests jointly announced the launch of the Science & Technology Month.

Focusing on the two themes of "low-carbon development" and " integration of digital technology and manufacturing", this year's Science and Technology Month will carry out a series of activities including an opening ceremony, two summit forums and five thematic activities. Under the guidance of innovation-driven high-quality development strategy, the Science and Technology Month aims to invite experts, universities, institutes, companies, investment banks and funds, and internationally advanced innovation enterprises to jointly launch an industry dialogue with internal-external interactions and upward-downward linkages, so as to broaden horizons and gather forces and talents to build an open platform for China and the world. During the Science and Technology Month, Shanghai Electric will hold a summit forum on "Digital and Manufacturing Integration Development", a symposium for young scientific and technological talents, a salon on the theme of new technology development, a series of exchange activities entitled "Bringing in and Going out", talent recruitment activities, and cultural activities to promote engineering culture and craftsmen's spirit.

Leng Weiqing said in his welcome speech that, at present, Shanghai Electric is in a critical period of transformation and development. Its energy supply structure will be further adjusted, energy utilization will be changed, and energy technology and equipment will be upgraded rapidly. As the integration between the digital economy and the real economy is gaining speed and depth, Shanghai Electric will face unprecedented opportunities and pressure for change.

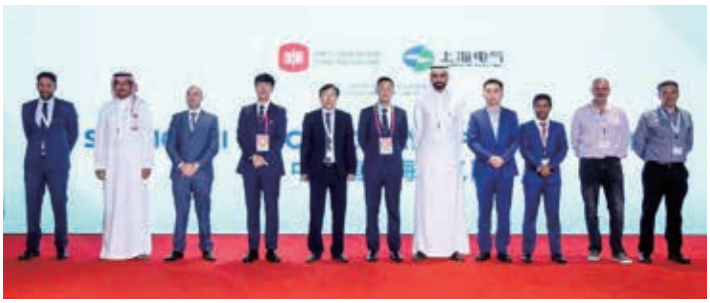
BREAKTHROUGH!

Shanghai Electric Ranked No.4 Among Chinese Wind Turbine Manufacturers in 2020

Recently, the Chinese Wind Energy Association (CWEA) officially released the Statistical Briefing on China's Wind Power Installed Capacity in 2020. The Shanghai Electric Wind Power Group (hereinafter referred to as the "Wind Power Group"), increased its installed capacity by 4.61 million kilowatts and reached a market share of 8.5% with its advanced production capacity plan and high-quality and secure equipment supply, ranking No.4 in China's wind turbine manufacturers in 2020, up by two from 2019.

In 2020, the Chinese wind power market has a total of 20 wind turbine manufacturers with new installations, adding 54.43 million kilowatts of installed capacity. The Wind Power Group's achievements in the wind power sector in 2020 have been continuing in 2021. Entering the Q4, all the staff of the Wind Power Group is working hard in the last phase of the offshore installation. They will always put the customers at the center, take the project as their responsibility, and march towards the goal of being "the first at sea and among the top three on land". D

"SHANGHAI ELECTRIC DAY" AT THE CHINA PAVILION, EXPO 2020 DUBAI



On December 1, local time, the "Shanghai Electric Day" event with the theme of "Low-Carbon Development for a Smart Future" was held at the China Pavilion of the Expo 2020 Dubai. Wang Rui, Deputy Director of the Exhibition Department of China Chamber of International Commerce and Director-General of the China Pavilion at Dubai Expo, Zhou Guangyao, Chief Representative of CCPIT Gulf Area Office and Deputy Director of the China Pavilion at Dubai Expo, and Abdulhameed Al Muhaidib, CEO of Noor Energy 1 and the owner of the Dubai Solar Thermal Power Project, attended the event.

The event focused on the theme of "Connecting Minds, Creating the Future" of Expo 2020 Dubai and "Building of a Community with a Shared Future for Mankind Innovation & Opportunity" of China Pavilion. Through the five dimensions of Innovation, Coordination, Green, Open and Share, the event fully reflected the contribution of Shanghai Electric to the "Belt and Road" initiative and the Carbon Peaking and Carbon Neutrality goals, and let the world know more about the group. The guests visited the Shanghai Electric exhibition area in the China Pavilion at the Dubai Expo to gain a comprehensive understanding of the technical strength and development achievements of Shanghai Electric in new energy, integrated energy, environmental protection, intelligent infrastructure and industrial automation. They also visited the construction site of Shanghai Electric's Concentrated Solar Power project in Dubai to learn more about the progress and innovative achievements of the project.

Wang Rui said that as a leading enterprise in China's equipment manufacturing industry, Shanghai Electric is currently participating in the construction of Phase IV CSP plant and Phase V PV project in Dubai, which can not only provide high-quality smart energy system solutions for the local community but also contribute to local environmental protection and humanities and social sciences. It is hoped that through the "Shanghai Electric Day" event, the group can share its experience and strengthen cooperation with the UAE and other countries and regions in the world. On the new journey of building a modern socialist country, Shanghai Electric will learn from history, integrate modernity and look to the tomorrow to create a more brilliant and splendid future.

It is reported that according to the "Dubai Energy Strategy 2050", Dubai's clean energy aims to increase from 7% in 2020 to 35% in 2030 to 75% in 2050, gradually becoming one of the cities with the lowest carbon emission in the world. As a general contractor, Shanghai Electric is involved in the construction of 700 MW Concentrated Solar Power (CSP) and 250 MW Phase IV photovoltaic solar power project and 900 MW Phase V photovoltaic project in Dubai, which are important parts of the strategy. The Concentrated Solar Power Project in Dubai will reduce CO_2 emissions by 1.6 million tons per year and bring green energy to more than 320,000 households; the Phase V PV project in Dubai will reduce CO_2 emissions by 1.1 million tons per year and provide clean electricity to 270,000 households.

The leaders of Shanghai Electric Power Generation Engineering Co., Ltd., the owners of Dubai Phase IV and Phase V projects, representatives of the International Company for Water and Power Projects (ACWA Power), and other representatives of participating organizations and banking institutions attended the event.

Dubai Project PV Zone 1 Connected to the Grid

Recently, the Zone 1 of 700 MW Concentrated Solar Power (CSP) and 250 MW Phase IV photovoltaic solar power project in Dubai was successfully connected to the grid. The grid-connected capacity is 70 MW, with all parameters showing properly and all receiving equipment running well. It is reported that the photovoltaic unit of Concentrated Solar Power in Dubai is divided into two phases, Zone 1 and Zone 2. The design capacity of PV Zone 1 is 217 MW; the design capacity of PV Zone 2 is 33 MW. The project department said that it will make every effort to promote the construction of subsequent important tasks with the cooperation and support of all parties.

CCTV-4 Reports on Phase V of the PV Project in Dubai

Recently, CCTV-4 featured the achievements of the 900 MW Phase V PV project in Dubai. Located in Mohammed Bin Rashid Al Maktoum Solar Park, the project is seen as a milestone for the application of advanced solar PV technology in the Middle East. Block A of the project was granted a temporary handover certificate on November 9 local time and officially entered the warranty period, while Block B is currently undergoing equipment installation and Block C has not yet started construction. In addition, the project achieved its target of 4 million safe man-hours on November 21, local time.

COVER TOPICS

EMBRACING THE CARBON PEAKING AND CARBON NEUTRALITY GOALS WITH GREEN TRANSFORMATION AS THE DRIVER

FORUM ENTITLED "INTELLIGENT UPGRADING, INNOVATIVE EMPOWERMENT" AT SHANGHAI ELECTRIC SCIENCE AND TECHNOLOGY MONTH 2021

Recently, the State Council issued an opinion on the complete and accurate implementation of the new development concepts and the achievement of carbon peaking and carbon neutrality goals, which incorporates the two goals into the overall economic and social development from the top. Since then, China has entered a new phase of high-quality development focusing on ecology priority with comprehensive green transformation as the driver, and green energy and low-carbon development as the key.

As the largest and most versatile corporation in China's energy sector, Shanghai Electric is facing the historic opportunity to reach the carbon peaking and carbon neutrality goals. How to win the battle with technology-driven transformation and upgrade to achieve high-quality development? The forum entitled "Intelligent Upgrading, Innovative Empowerment" at Shanghai Electric Science and Technology Month 2021 has made a fruitful exploration.

CREATING STRATEGIES FOR CARBON PEAKING AND CARBON NEUTRALITY AND LOOKING INTO THE LOW-CARBON FUTURE OF SHANGHAI ELECTRIC

Jin Xiaolong
Vice President of Shanghai Electric Group, President of Shanghai Electric Power Generation Group, Secretary of the CPC Committee and Chairman of Shanghai Electric Wind Power Group

He Haifeng
Chief Economist of Guotai Junan Securities and Director of Institute of Policy

The achievement of the carbon peaking and carbon neutrality goals requires the joint efforts of all sectors. We would like to invite leaders and experts to discuss how to implement the new development concepts, build a new development paradigm, promote high-quality development, and achieve carbon peaking and carbon neutrality on schedule, from the aspects of carbon emission trading, carbon finance, new technologies, new ideas and new industries combined with the situation of their own enterprises.

1 PROMOTING THE IMPLEMENTATION OF NATIONAL STRATEGY FOR CARBON PEAKING AND CARBON NEUTRALITY GOALS WITH CARBON TRADING MARKET

CHU JUNHAO Carbon is at the core of the carbon peaking and carbon neutrality goals. Director Peng Feng, would you please share with us your understanding of carbon and the role of carbon emission trading in achieving the goals?

PENG FENG A carbon trading market is a policy tool that can help achieve the carbon peaking and carbon neutrality targets. It brings companies with high carbon emissions into the management first. In simple terms, it follows the Pareto's law and focuses on the industries and enterprises with higher carbon emissions as the first step. The number of these enterprises is relatively small, so it is possible to achieve carbon emission targets faster with fewer management costs. This is the first goal of the carbon trading market. On the other hand, the carbon trading market should also promote carbon emission reduction, and guide the enterprises that are not included in the management, so that the related projects and enterprises can benefit from it, thus giving them a greater incentive to reduce carbon emissions actively.

By issuing carbon credits, we will be able to limit the carbon emissions of enterprises through policy. We can also generate economic returns through China Certified Emission Reductions (CCER), which are based on scientific quantification and allow for a trading market for emission reduction projects and environmental interests as well.

China used to promote carbon emission reduction through subsidies, but the pressure of subsidies on finance is persistent, while guiding emission-reduction projects and enterprises through the market is more conducive to development than subsidies.

Peng Feng
Head of Carbon Neutral Operation Center and Business Director of Shanghai Environment and Energy Exchange and Secretary General of China Carbon Neutral Action Alliance

Xu Yang
President of Danfoss China

Sun Yuhan
Chief Scientist of Institute of 2060 of ShanghaiTech University (STU), Director of Key Laboratory of Low-Carbon Conversion Science and Engineering, Shanghai Advanced Research Institute, Chinese Academy of Sciences (CAS), and Chairman of Shanghai Institute of Cleantech Innovation

Chu Junhao
Academician Chu Junhao Academician of the Chinese Academy of Sciences, Researcher of the Shanghai Institute of Technical Physics, CAS, President of the Institute of Optoelectronics of Fudan University

P

CHU JUNHAO Market transactions need to be digitalized, can carbon emission trading be digitalized now?

PENG FENG Green and digitized development are both very important for the future. The two directions need to be combined in carbon trading markets. Emission quotas and emission reductions need to be quantified.

CHU JUNHAO If I have a seedling nursery, can I sell it to Shanghai Electric to offset the group's carbon emissions?

PENG FENG Your example can be seen as an emission-reduction project in the field of carbon sink. So why should Shanghai Electric buy this nursery? Under future policies, Shanghai Electric may have responsibilities for carbon emissions. If there is a shortage of the group's emission quotas, it may need to buy quotas or projects with emission reduction benefits like the seedling nursery, so as to achieve its emission reduction target and fulfill its duty through carbon trading.

2 THE ROLE OF CARBON FINANCE IN ACHIEVING THE CARBON PEAKING AND CARBON NEUTRALITY GOALS

CHU JUNHAO Carbon trading is inseparable from financial support. President He Haifeng, would you please introduce the role of carbon finance in achieving the carbon peaking and carbon neutrality goals?

HE HAIFENG Carbon finance has no strict, accepted and uniform rules until now. Currently, it is mainly focused on trading. Carbon trading is initiated by the Kyoto Protocol through the introduction of the flexible Clean Development Mechanism (CDM). The withdrawal of the U.S. from the Paris Agreement has led to significant changes in the relevant global processes. While Europe has been relatively ahead of the curve, China has taken the initiative to shoulder more responsibilities by listing the eight industries that will be covered by the carbon trading system.

The financial sector is very glamorous, but in the end, it belongs to the service industry. According to Li Qiang, the secretary of the CPC Shanghai Municipal Committee, the function of the financial sector is to be a "waiter". We probably still focus more on financial tools and products, but the sector also includes the securities industry. China's financial sector can not be considered "modern" until now. The 13th Five-Year Plan for national finance also calls for "accelerating the construction of a modern financial system". Other domestic industries, such as Shanghai Electric's intelligent manufacturing, are already in the high end, and many are leading in the international arena, while finance is one step behind. China's financial sector has to shift to direct financing by securities companies and capital markets, which is what modern finance is about. Therefore, services provided by securities companies, securities funds and capital markets are more modern and direct financial support.

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Apart from green credit and fiscal taxation, securities companies and capital markets can engage in all eight industries. The specific ways can be divided into investment and financing. The investment will create enterprises and industries, and promote technological upgrades; financing allows the demand side to have direct access to relevant products, including certain tools.

For the carbon peaking and carbon neutrality goals, I suggest the financial sector: first, to implement low-carbon operations from individuals to the company as a whole. For example: go paperless at the office, print as little as possible, walk as much as possible, and choose public transportation more often. Second, in business, cooperate with more low-carbon and sustainable industries. Third, efficiently promote digital transformation and sustainable development. Like Shanghai Electric's efforts in innovative empowerment, we are also keeping up with the cutting-edge developments in the industry.

CHU JUNHAO Is it possible to set up dedicated funds to support low-carbon technologies in the financial sector?

HE HAIFENG There are a lot. For example, Guotai Junan has become a long-term partner in the development and construction of the financial services system in Zhangjiang Hi-Tech Park, securitizing the liquid assets. We need to measure the risks. We will combine development financing, policy-based finance, commercial finance and cooperative finance. The funds will be launched with guidance or initial investment from the government or relevant departments, and later more commercial capital will be brought in through leverage or multipliers. Through the master-feeder and other structures, the funds will be allocated to different industries and sub-sectors related to the carbon peaking and carbon neutrality goals. In the future, the financial sector may even support the development of low-carbon technologies.

FACILITATING GREEN DEVELOPMENT BY COUPLING TECHNOLOGY

CHU JUNHAO In terms of innovative technologies, Professor Sun Yuhan of ShanghaiTech University has been engaged in low-carbon technology research for many years in one of the leading centers for low-carbon technology in Shanghai. Now he has become the chief scientist of the Shanghai Advanced Research Institute in the area. Professor Sun, could you please give us an update on low-carbon technologies?

SUN YUHAN First of all, we need to change our mindset. When it comes to carbon dioxide, everyone thinks it is harmful, but in fact, there is no way for human beings to survive without it. It is originally good. It is because of the excessive emission of carbon dioxide by human beings that it has caused a series of problems. Our goal is to bring it back to its original balanced state.

Now, the earth already has tens of billions of tons of carbon dioxide emissions, which is a very large amount. The carbon sink function of the ocean and land can solve most of the carbon dioxide. The problem may be solved, if carbon emissions are brought down at the current stage when they are already over the limits, and such a reducing process is continued steadily over a period of time.

I have proposed a low-carbon development path for coal power coupled with renewable energy, which is a call for people to not just care about carbon dioxide, but to care about how to create low-carbon production and lifestyles. For example, we can use renewable energy in electricity production and replace coal with new non-carbon energy to produce electricity, while decarbonizing

A LOW-CARBON DEVELOPMENT PATH FOR COAL POWER COUPLED WITH RENEWABLE ENERGY

Since the Industrial Revolution over 100 years ago, fast development has led to the result that the amount of coal supplied enormously outnumbered that cycled, which naturally gives rise to a number of carbon dioxide-related problems, making it a must to achieve goals of carbon peaking and neutrality. Coal-fired power plays a vital role as we pursue decarbonization. I think that green power or carbon-free energy must be developed to reduce and neutralize carbon emissions. At the same time, optimize practices and processes we have established, and use, explore and develop game-changing technologies and low-carbon energy. At present, coupling coal with renewable energy may be a new path for the low-carbon transition of the coal power industry in China. STU and Shanghai Electric Group are jointly working on how to mobilize upstream and downstream participants to integrate "CO_2+ hydrogen", other CO_2-related products and wind-power-based hydrogen production on the upstream together, which will develop into pilot projects addressing

Sun Yuhan

Distinguished Professor of ShanghaiTech University (STU) and Chief Scientist of Institute of 2060, STU

coal power production.

Hydrogen metallurgy has been getting a lot of attention lately, but the effect is not ideal and a circular economy is needed. We are in a high-speed development and now we have reached the balance stage. In the future, China can adopt green and low-carbon electricity and new processes to electrically reduce CO_2 through a circular economy. Besides, building materials, petrochemicals, and coal chemicals can all be changed from high carbon emission areas to low carbon emission areas through technical progress.

In addition, we need to achieve low carbon emissions in our processes with the help of Carbon Capture, Utilization and Storage (CCUS). We can make use of CO_2, for example, by combining CO_2 from power generation with green hydrogen and new energy; then the CO_2 can become a recycled resource. We are cooperating with Shanghai Electric in carbon dioxide capture and recycling. At present, the proportion of related research results is not too large, about 10% or less, mainly about the significant restructuring of industries through natural recycling and technological innovation. In this way, CO_2 emissions will be significantly reduced and the CO_2 growth rate can be gradually slowed down by incorporating natural recycling into the CO_2 emission process.

China's energy resource endowment is dominated by coal, and carbon emissions have risen rapidly following economic development in the past few years. If we adjust the industrial structure, improve energy efficiency, reduce carbon emissions, and change the use of carbon, we may get coupled rather than a single industrial structure. For example, metallurgy may be combined with the chemical industry, while coal and new energy are combined.

Coupling technology is being discussed at several high-level international forums that I have attended. It could solve many problems related to carbon dioxide. Personally, I am relatively optimistic about the issue, because our government attaches great importance to the issue of carbon emissions, and enterprises are also engaged in innovative development. Combining the two forces, we will be able to achieve the carbon peaking and carbon neutrality goals and realize high-quality green development.

DANFOSS PROVIDES GREEN SOLUTIONS FOR THE ACHIEVEMENT OF CARBON PEAKING AND CARBON NEUTRALITY GOALS

CHU JUNHAO Recently, Shanghai Electric has made a remarkable achievement in communicating with foreign companies, collaborating with Danfoss in many ways. President Xu Yang, can you share with us Danfoss' solutions to promoting carbon neutrality? What valuable experience can you share as Danfoss is a leading global energy efficiency solution provider?

XU YANG The Danfoss Group announced in 2018 that it would peak its carbon dioxide emissions in 2030, not relying on policies, but relying on economic laws and market operations. Denmark, a typical Nordic country, has made several attempts to achieve carbon peaking and carbon neutrality, and there are three points to share with you.

First, accessibility. We are not pursuing carbon peaking and carbon neutrality at all costs. We want to develop the real economy, shipping centers, modern agriculture, and poverty eradication in rural areas. Let me cite a few figures about Denmark. Though Denmark is a small country with a population of 5 million, in the industrial sector, there is the wind power giant Vestas, the world's leading engineering group Grundfos, and the international shipping leader Maersk; in the modern agriculture sector, Denmark has only 200,000 people working in agriculture, but the output feeds 50 million people worldwide. The country's green

development approach does not sacrifice the real economy, agriculture or support by tourism alone. It is a model that China can learn from.

Second, innovation. For example, motors usually consume a lot of energy, including air conditioning motors. Danfoss' magnetic levitation technology can achieve energy savings of 40% while enabling intelligent operation. In fact, most CO_2 is not emitted under standard laboratory conditions, so only intelligent technology can achieve a balance between supply and demand.

Third, cooperation. Recently, Danfoss and Harvard, together with some research institutions and financial institutions, have conducted an urban carbon peaking study for Helsinki. The mayor proposed to achieve carbon neutrality in the city by 2028. Danfoss' smart heating technology and the related overall plans, designs and financial solutions were recognized by Helsinki.

CHU JUNHAO At the 4th CIIE, Danfoss and Shanghai Electric Wind Power Group signed a strategic cooperation agreement on zero carbon technology, low carbon technology and green development. In your opinion, what attracted Danfoss to cooperate with Shanghai Electric?

XU YANG The cooperation between Danfoss and Shanghai Electric Wind Power Group is due to our complementary strengths and common interests.

What are our complementary strengths? Shanghai Electric is a leader in terms of systems and power supply, especially with respect to new energy. On the energy demand side, Danfoss has many breakthroughs and even world-class technologies. World-class technology inevitably brings a good return on investment. In addition, in the distributed local area network (LAN), Danfoss still owns unique innovative solutions in terms of stability and efficiency of LAN DC micro-grid in marine applications. Shanghai Electric's overall design and operational capability and Danfoss' innovative technology will definitely bring a return on investment in zero-carbon or low-carbon projects; this is also a cooperation with advantages and distinctive features in terms of project reliability.

Why did I say the two groups have common interests? In the cooperation with Shanghai Electric Wind Power Group, Danfoss has seen that Shanghai Electric is also focusing on creating the next generation of energy. In

RESEARCHES ON TECHNOLOGICAL PROBLEMS OF ENERGY INDUSTRY IN PURSUIT OF CARBON PEAKING AND NEUTRALITY

Attain carbon peaking and neutrality with high-tech Explore feasibility of minimizing carbon emissions in every sector from perspectives of technological services, plans and upgrading implementation and strive to enhance the generation efficiency of wind power and solar power generation efficiency and promote energy storage efficiency by building more pumped storage projects. With these efforts, all coal-fired plants in China can implement peak-load shifting more swiftly. What's more, breakthroughs shall be made in areas of carbon-free technology and power as we pursue carbon peaking and neutrality, and to reduce more carbon emissions than that of the set goal.

Zhang Zhongxiao

Vice Dean of Research Institute of Carbon Neutrality, Shanghai Jiao Tong University

2011, Danfoss organized Chinese authors to visit Northern Europe to write the book Tales of Danish Zero Carbon Life. Danfoss is not a speculative company, which is completely compatible with the core business and direction that Shanghai Electric Wind Power Group has been focusing on since its establishment, so the cooperation between the two companies is an immediate match.

Regarding the cooperation between Danfoss and Shanghai Electric, I would like to express our expectations by the words "pragmatic", "extensive" and "in-depth".

"Pragmatic" means that we look forward to working with Shanghai Electric Wind Power Group in the areas of low-carbon and zero-carbon industrial parks and multi-energy complementary and integrated energy use. Through the cooperation on Danfoss Haiyan "Zero Carbon Park" and other demonstration projects, the two sides will explore in depth the optimal combination of "energy supply" and "load" and efficient and comprehensive energy utilization technology to realize a good return on investment to enhance marketability and project profitability.

"Extensive" means that we expand our cooperation scope by enhancing mutual understanding. Danfoss is a company with craftsman's spirit and world-class technologies and products. For example, the energy efficiency and technology level of Danfoss' high-pressure plunger pumps and energy recovery devices are first-class in the world. The fresh water plant on Huangyan Island is powered by Danfoss' technology. So, it's possible for us to explore with Shanghai Electric in areas such as water treatment, water production and zero-liquid discharge industrial parks. Besides, Danfoss also has leading technology in regional heating and cooling, and Shanghai Electric is a leading enterprise in energy equipment and energy management, so it is possible for us to collaborate in the area of regional energy and comprehensive utilization of waste heat.

"In-depth" means that the two groups will enhance mutual understanding and trust through cooperation based on projects and technical solutions, and further promote communication, understanding and mutual trust between the top management of Danfoss and the leadership of Shanghai Electric when the pandemic is over and regular international travel resumes. I believe that if we make each cooperative project high-quality, continuously expand the scope of cooperation, and build mutual understanding and trust between the groups, especially between the senior management of the groups, the cooperation between Danfoss and Shanghai Electric will create better and more synergistic effects.

SHANGHAI ELECTRIC'S MEASURES FOR CARBON PEAKING AND CARBON NEUTRALITY

CHU JUNHAO President Jin Xiaolong, would you please tell us how the power assembly business of Shanghai Electric contributes to the realization of carbon neutrality?

JIN XIAOLONG In my personal view, there are certain ways to achieve carbon emission reduction and carbon neutrality.

First, to achieve re-electrification. Energy consumption has to be mainly supported by electricity, and green electricity has to be used within the power system. Our goal is clear, by 2025 new energy accounts for 25% of the energy supply, and eventually to occupy 78% of the energy supply. In the field of green power, Shanghai Electric's former coal-based power is now shifting to new energy sources such as wind, light, nuclear and hydrogen, and we have the conditions for transformation in the whole power market. We have technology reserves for all kinds of nuclear power, including generation 1, generation 2, generation 3, high-temperature gas-cooled reactors (HTGR), and fast breeder reactors. Shanghai Electric's wind power business has been running for 15 years, and our offshore wind power business is in the leading position in China, and we are also planning the development of PV. The Power T&D Group has deep cooperation with Shanghai Electric in the construction of the new power market based on new energy and has great advantages in terms of equipment and solutions. In terms of electrification, Shanghai Electric also has a great advantage for building a new energy-

based power system.

Second, the decarbonization of fuels. Besides the electric power system, fossil fuels, including oil, are still used in transportation and some other areas. Hydrogen energy and some other research areas will be the solutions leading the decarbonization and zero carbon fuel substitution for fossil fuels. In the future, for the new power system and fuel decarbonization, wind energy, photovoltaic energy, hydrogen energy and energy storage as balancing elements are an essential part of building a new and safe power system. In terms of energy storage, Shanghai Electric has been deeply engaged in the field for 5 years, and has built several energy storage projects.

For high energy-consuming enterprises, including metallurgy, chemical industry, building materials, there is still a big gap between China and advanced countries on energy consumption through CO_2 hydrogenation per unit of GDP, and high efficiency means energy saving and carbon emission reduction. In the above-mentioned fields, Shanghai Electric has factories of electric motors, industrial gas turbines, blowers, and Shanghai Mitsubishi Elevator and Highly Air Conditioner. Shanghai Electric also has great advantages in these fields in terms of equipment manufacturing.

Faced with the goal of reducing carbon emissions, digitalization and intelligence are indispensable for the development of more efficient and energy-saving products through technological innovation and the ability to provide holistic and integrated solutions in different fields, be it the construction of new power systems or the utilization of efficient industrial drives. Shanghai Electric has set up the Digital Technology Company and the Automation Group. Under the leadership of the two groups, there are also several development plans in digitalization and intelligence.

In the process of achieving carbon peaking and carbon neutrality, Shanghai Electric also needs to promote its transfer from traditional manufacturing to intelligent manufacturing and advanced manufacturing via intelligent technology. In the face of the carbon peaking and carbon neutrality goals, I personally believe that the group should be driven by innovation. For several new areas mentioned earlier, scientists are responsible for studying the implementation path, i.e. what technologies can be used to reduce carbon; however, enterprises should also consider the implementation cost when choosing the technology path. Can we achieve the lowest

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ACCELERATE THE BUILDING OF POLICY FRAMEWORK FOR CHINESE CARBON FINANCE

With an urgent need for decarbonization worldwide, financial services are required by sustainable, green and low-carbon development. China has announced the "1+N" policy framework for achieving carbon peaking and neutrality, which incorporates financial support tools. The realization of decarbonization depends on concerted commitments from all stakeholders, which can forge the financial policy framework and related financial systems for China to seek decarbonization. Guotai Junan will enhance its capacity of providing green and low-carbon services to boost green finance and Shanghai's building of a green finance hub, and collaborate with Shanghai Electric to

He Haifeng

Chief Economist of Guotai Junan Securities and Director of Institute of Policy

cost in the implementation of the technology we choose? Can we generate social benefits while bringing revenue to the company? In terms of hydrogen production, storage, transportation and use, there are many technical routes now; and the routes involving ethanol, methanol or ammonia still need to be carefully studied in the future.

Shanghai Electric, led by the carbon peaking and carbon neutrality goals, is in a critical period of transformation and development. It is also an opportunity, Shanghai Electric must achieve high-quality development with technological innovation as the driver.

CHU JUNHAO Shanghai Electric has made a lot of efforts in promoting carbon neutrality. It has made strategic arrangements in wind energy, photovoltaic energy, hydrogen energy, nuclear energy, energy storage, power transmission and transformation, all kinds of equipment, intelligence and digitalization. In the process of achieving carbon neutrality, realistic and scientific planning is very important to obtain an economically viable technical route. Achieving carbon neutrality is not contradictory to science and economic development. The goal cannot be achieved if we deviate from science and business development.

6 OPPORTUNITIES AND CHALLENGES FOR SHANGHAI ELECTRIC'S LOW CARBON DEVELOPMENT

CHU JUNHAO Although Shanghai Electric has made great achievements in carbon neutrality, the task is still very demanding. Next, please feel free to express your opinions and give suggestions on the new development opportunities of Shanghai Electric.

PENG FENG The first thing that Shanghai Electric or other enterprises should know is what their specific goals are for carbon emission reduction. The EU has corresponding requirements for this. There are strict standards for the carbon footprint of products after entering the market, and there are also requirements for the industrial chain and supply chain, and even some requirements for the products of downstream enterprises. Different targets may result in different demands at the strategic level.

Shanghai Electric will probably have carbon emission quotas in the future and generate emission reduction benefits by serving customers. Environmental benefits may be transformed into emission quotas, and the quotas are very typical carbon assets. How to manage carbon assets and even add value to them, valorize and securitize them, is related to asset management. Although the definition of carbon finance is not clear, there are already many innovative practices, and we can securitize it to provide it with better liquidity. For this reason, companies need to be equipped with the appropriate talent, data, and organizational structure. At the same time, the enterprise has to match its strategic positioning, and the organizational structure is not the more advanced the better, but needs to be appropriate.

CHU JUNHAO Shanghai Electric is a very large group, and it is recommended that the group set up a medium-sized enterprise to prepare for carbon emission trading. After the enterprise acquires enough experience, it can spread its experience throughout the group. Mr. Sun has just introduced some new technologies, which of them can be introduced to Shanghai Electric?

SUN YUHAN Taking into account the recent discussions, I have a few suggestions.

First, can the existing strengths of Shanghai Electric meet the development requirements? Can its gas turbines, including heavy gas turbines, medium gas turbines and small gas turbines, play a leading role in the future energy distribution network? Coal-fired boilers are very promising, but peak shaving is not so easy, and there may be new requirements on boilers, and on related manufacturing.

Second, transfer the existing technologies of traditional energy equipment to new energy resources. For example, partial power generation by hydrogen fuel cells does not necessarily rely entirely on hydrogen combustion, but may also rely on other fuels supply, such as methanol. The future opportunities in the field of new nuclear energy may be very large, and Shanghai Electric has already engaged in it.

Third, coupling, to decarbonize. It is not enough to rely only on business. There is a great opportunity for the development of traditional coal power coupled with renewable and non-carbon energy. Assuming that renewable energy is stored in silos, how can we connect the upstream and downstream to utilize it? If it can be effectively coupled with jet fuel and certain needs, an eternal reservoir of oil is created.

CARBON MARKET AND CARBON NEUTRALITY

Carbon trading is a tool that drives carbon emission reduction from the enterprise side, and can be combined with the capital market to channel more funds to emission reduction, boosting work in this regard. Having operated for nearly half a year, the Chinese carbon market has traded over 30 million tons of carbon dioxide with a transaction amount of roughly 1.3 billion yuan as of November 19. In the future, the carbon market needs to cover more industries and offer more transaction services in order to avail more companies and institutes of trading rules, and more importantly, to establish and improve carbon financial vehicles to make the policy-driven market better. We hope that large-scale carbon offset programs will encourage more companies and individuals to make individual contributions to carbon emission reduction.

Peng Feng

Business Director and Head of Operation Center of Shanghai Environment and Energy Exchange and Secretary General of China Carbon Neutral Action Alliance

There is also energy storage. The coupling of energy storage with the combined hydrogen, heat, and power system is very important. Energy storage and peak shaving are equally important as they relate to the future energy network and the large-scale involvement of renewable energy sources. What are the solutions for energy storage based on the combined hydrogen, heat, and power system? It needs to be studied thoroughly, and there are many ways.

There is also Shanghai Electric's main strength from existing to intelligent energy management. Coupling or energy storage can not be separated from energy management. In terms of different application scenarios and combinations of energy management, Shanghai still has so many schools and a lot of energy. It is not difficult to draw a few pictures for creating solutions, but it requires technology and efficient energy management. That's one thing that needs hard work.

CHU JUNHAO Finally, I would like to ask President Jin Xiaolong, what do you think are the advantages and characteristics of Shanghai Electric in the face of the carbon peaking and carbon neutrality development strategy, and what strategic arrangements have been made by the Group for lower carbon emission? What are the opportunities and challenges that Shanghai Electric faces in low carbon development?

JIN XIAOLONG The first aspect is that Shanghai Electric has two integrations: the integration of generation, grid, load, and storage and the integration of wind power, photovoltaic, energy storage and hydrogen energy. We need to build energy systems around these two integrations and look for opportunities. We are the best in China, and we have completed a lot of demonstration projects in flexibility retrofitting. We undertook a major order for flexibility retrofitting and coal power unit retrofitting for a Taiwanese power plant, worth about 390 million. We have sorted out a list of solutions, including sub-critical and super-critical technologies, and we are working closely on the strategic arrangement.

Shanghai Electric has thermal power, gas turbines, nuclear power, wind power, photovoltaic, energy storage including hydrogen, and virtual power plants in terms of coupling. The whole system has the ability to build a large base to provide a total solution from the balance point of view. We have a lot of new energy bases of 10 million kilowatts, which could be equipped with part of the thermal power with peak shaving and other new energy. We are also planning to combine the source and back-end of new energy. There are several ideas: one of them is to transform electricity into other products, such as highly intensive agriculture, agricultural tourism destinations, etc. Also, new materials can be included in the development of the industry chain. Shanghai Electric has the ability to provide a package solution.

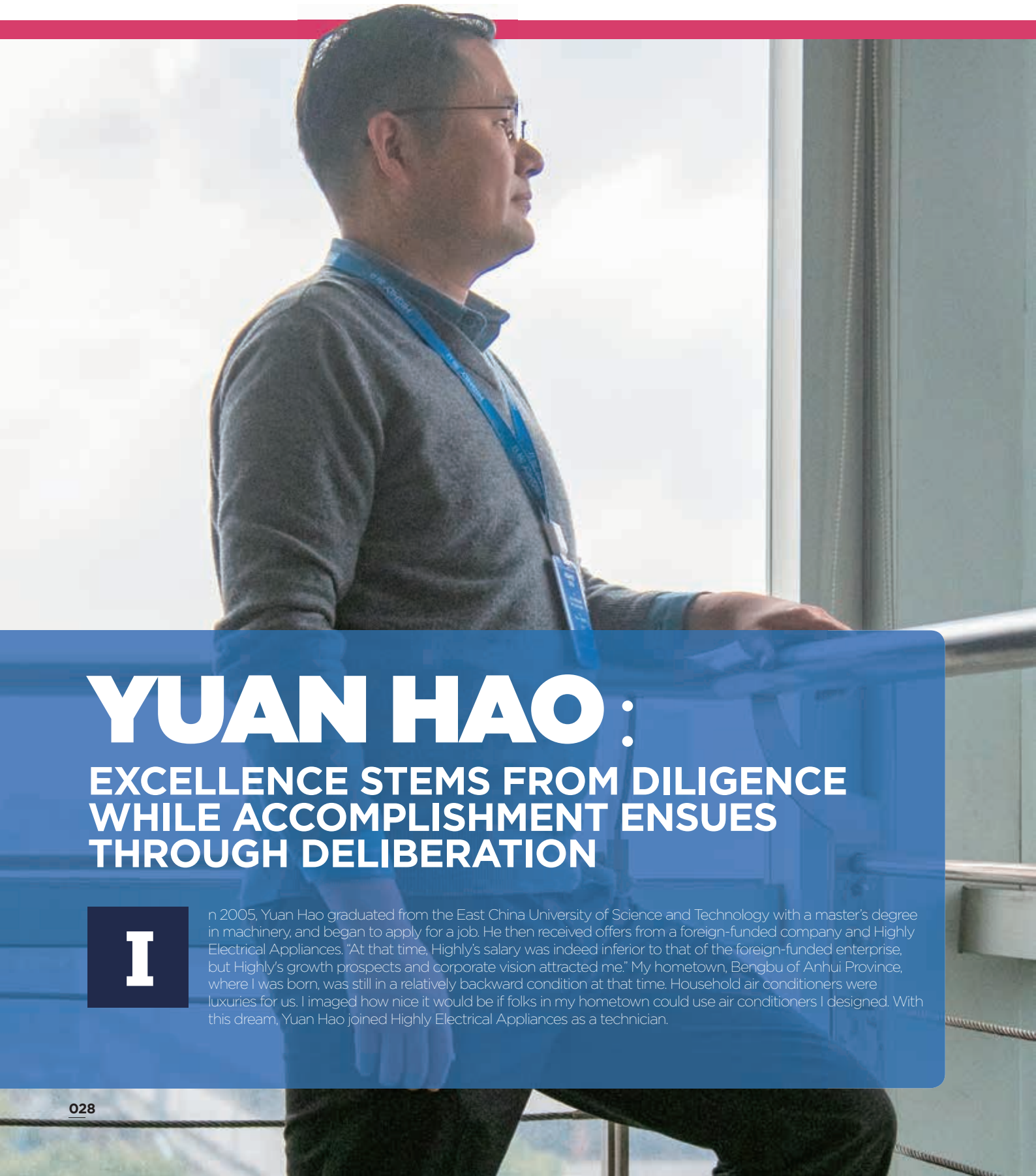
The second aspect is, what are the future challenges for carbon peaking and carbon neutrality? Technology and equipment are our basis. As an equipment manufacturing enterprise, how can Shanghai Electric's products adapt to the market demand under the carbon peaking and carbon neutrality goals? First of all, our technology should be upgraded. Technology for products and equipment should adapt to market development. Shanghai Electric has strengths in motors and shortcomings in electrification,

and electrification and automation will become intelligence and digitalization in the future. Under the premise of integrated and digital development of products, we also need to have the ability to develop integrated digital solutions. It extends to another issue: to meet the development direction proposed by the carbon peaking and carbon neutrality goals, talent is the most important resource. How can the traditional manufacturing-based talent pool respond to the needs of energy transformation, enterprise transformation and market development? Personally, I think it is an urgent problem to be solved and one of the main aspects for talent and investments attraction.

In addition, the technology update frequency in the field of new energy is very high. Previously, a generation of technology could be effective for 3 years, 5 years, or even 10 years, while new energy technologies, whether in wind power, photovoltaic, or energy storage, are updated very quickly. Even within 1 year, 6 months, or 3 months, new technologies are generated continuously. During the development of the traditional market to the fast evolving market, our organizational structure and marketing and sales model have posed a great challenge to us.

Shanghai Electric has set many industry records from zero in the past, so there should be no problem for it to keep pace with the market development in terms of talents and technology in an era of highly developed digital technology and high integration of industry, academia and research. Although facing tough challenges, Shanghai Electric is mentally ready to move forward.

The carbon peaking and carbon neutrality goals represent a major strategic decision made by the CPC and the State, which is crucial to the sustainable development of the Chinese nation and the construction of a Community of Shared Future for Mankind. As a leader in the new energy industry, Shanghai Electric will conscientiously implement the "Four Reforms and One Cooperation" national energy security strategy and the carbon peaking and carbon neutrality goals proposed by President Xi Jinping, focus on our major businesses, shoulder the responsibilities proactively, seek progress in a balanced manner, inherit the tradition while insisting on innovation, gather top-tier talents, achieve high-level cooperation, build a comprehensive and open platform for science and technology innovation, create a new dimension of open, cooperative and win-win development, and unswervingly promote the high-quality development of the Group.



YUAN HAO :

EXCELLENCE STEMS FROM DILIGENCE WHILE ACCOMPLISHMENT ENSUES THROUGH DELIBERATION

In 2005, Yuan Hao graduated from the East China University of Science and Technology with a master's degree in machinery, and began to apply for a job. He then received offers from a foreign-funded company and Highly Electrical Appliances. "At that time, Highly's salary was indeed inferior to that of the foreign-funded enterprise, but Highly's growth prospects and corporate vision attracted me." My hometown, Bengbu of Anhui Province, where I was born, was still in a relatively backward condition at that time. Household air conditioners were luxuries for us. I imaged how nice it would be if folks in my hometown could use air conditioners I designed. With this dream, Yuan Hao joined Highly Electrical Appliances as a technician.

HARD WORK PAYS OFF. INITIAL SUCCESS BODES WELL FOR THE FUTURE.

YUAN HAO

Deputy General Manager of Customer and Product Center, Shanghai Highly Electrical Appliances Co., Ltd.

At the start of the 21st century, the DC inverter air conditioner had become a new direction for the development of air conditioning technology in the field of new environment-friendly refrigerants. In the spring of 2008, in order to quickly occupy the global air conditioning compressor market, Highly Electrical Appliances decided to develop a new type of inverter compressor. Soon, the company established a project team for the "High APF Performance R410A DC Inverter Air Conditioning Compressor" and appointed Yuan Hao, merely 28 years of age, to take the post of design director for the project.

The project involved a lot of interdisciplinary knowledge concerning control, motors, refrigeration, and noise. So, the kind of pressure Yuan Hao had was conceivable. As the project's design chief, Yuan Hao found that his existing knowledge amounted to only a "drop in the ocean". Fortunately, the company had a complete process system and a design document database, as well as a literature retrieval platform open to the public. Since then, Yuan Hao seemed to have returned to the life as a student, reading around the clock all relevant design materials, historical documents, university textbooks, academic papers...from which he gathered information and organized them into different types of notes meanwhile, endlessly consulting department leaders and experts in various fields within the company. Thus, he quickly expanded his knowledge.

Because of the tight project schedule, the development plan was extremely detailed. Sometimes, the plan is detailed in hours or even minutes. Every morning, Yuan Hao gathered colleagues from the project team to analyze problems and discuss technical solutions. Every evening, they summarized the day's work, collecting technical problems encountered, and assigning tasks for the next day.

In project development, things were complicated. All stages of work, from simulation analysis, theoretical calculation, structural design, to parts processing, and then to prefabrication and performance establishment, needed to be confirmed and coordinated by Yuan Hao. What's even trickier was that as the project progressed, more problems kept arising. In order to clarify the design process and reduce the time to solve various problems, Yuan Hao kept a detailed record of all problems encountered in the design, having them well documented for future reference. In addition, before commencing any work, Yuan Hao would go to the worksite to track and check the preparation of each specific task step to ensure that everything was in good order. Sometimes, a situation might occur where "a new wave flows in before the current one ebbs away." Whenever in such a situation, Yuan Hao would always tell himself: Don't worry. As a road is taken step by step, so problems need to be solved one by one."

PERSISTENT DILIGENCE LEADS TO BOTTLENECK BREAKTHROUGHS

In 2013, Highly Electrical Appliances set forth the BP400 Action Task, challenging the targets of production and sales of 4 million inverter compressors. At that time, the domestic inverter market had just begun to develop. The two leading enterprises in the industry occupied most of the inverter market share with their own supporting products. Yuan Hao, as the product manager of the main inverter products at that time, was faced with huge pressure for breakthroughs in creating a more superior product able to overcome market and technical barriers. Together with his team, they constantly sought to apply pressure on themselves, without being conservative as technology innovators. Since then, Yuan Hao led his team members towards daring breakthroughs, through joint research, and careful verification. After undergoing 2 years of technical research endeavors, and experiencing numerous failures and doubts, they finally reduced the shaft diameter of the main product by 20% and the overall weight by 15%, while raising performance by 2%. For the structure of breakthrough innovation, an invention patent for major regions of the world has been applied for.

Never underestimate this 2% increase in performance. As you know, an air conditioner is used for about 5 months a year on average. With 30 days in a month, running for 10 hours a day, the annual power consumption of a single air conditioner is 1200 degrees, when calculated on the basis of an average power of 800watts. If calculated according to a sales volume of 10 million units, with a 2% performance efficiency improvement, then approximately 240 million kwh of electricity consumption can be saved for the country every year.

From the end of 2016, when the new inverter compressor began to be introduced into mass production, ushering in the era of rapid development of Highly Electrical inverter products, to 2017 in which 5 million inverter units were sold, and to 2019 and 2020, in which 9 million and 16 million units were sold respectively, it has kept achieving substantial increases in production and sales year after year.

ABUNDANT ACCUMULATION BUT PRUDENT UTILIZATION. EXTENSIVE ABSORPTION BUT INCREMENTAL WITHDRAWAL.

Looking at Yuan Hao's career development path, it looks like an enviable smooth road. But perhaps only Yuan Hao himself is aware of the fact that only through total immersion of oneself in one's course, abundant accumulation and prudent utilization, and painstaking endeavors, can one reap fruitful harvests.

He assumed the position of product manager of Compressor Design Department in 2011, large product manager of Customer and Product Center in 2014, deputy technical director of Customer and Product Center in 2016, technical director of Customer and Product Center in 2018, and deputy general manager of Customer and Product Center in 2019....

Starting from a grassroots technical developer, Yuan Hao has gradually grown to be a team leader and manager, through years of personal development. Since joining Highly Electrical Appliances, Yuan Hao has always devoted himself to the profound cultivation and exploration in technical research with the craftsman spirit of dedication, pursuit of excellence, concentrated attention, and innovation. He has directed and participated in a large number of key scientific research projects, making great contributions to the improvement of corporate profitability and industrial energy conservation. Among them, the "High APF Performance DC Inverter Compressor" has not only helped the company quickly occupy the domestic and foreign markets, but also led to a substantial increase in production and sales year after year. In addition, It has been awarded 9 patents and won a series of honors such as the Bronze Award of China International Industry Fair, the Second Prize of China Home Appliance Science and Technology Progress Award, the Second Prize of Science and Technology Award of China Machinery Industry, the Second Prize of Science and Technology Award of Shanghai Pudong New Area, Shanghai May First "Labor Medal" for 2017, and the Advanced Individual Award for Light Industry Scientific and Technological Innovation for the "Thirteenth Five-Year Plan," At present, Yuan Hao serves as the deputy general manager of the Customer and Product Center of Highly Electrical Appliances, with primary responsibilities for the research and development of environment-friendly new refrigerant inverter products.

He shares his personal growth experience with newcomers, and often emphasizes that: "When you start your career, be more patient. Sometimes slow progress is not necessarily a bad thing, and it is necessary to lay a solid foundation. Only through abundant accumulation, will one be able to achieve incremental utilization. Like crops, a slow process of growing may result in a greater harvest. Their slow growth doesn't mean a lack of vitality, but means taking a firm rooting first before focusing growth on stems and leaves. "

Yuan Hao always believes that his achievements originate from his endeavors. Excellence stems from diligence while accomplishment ensues through deliberation. Personal abilities can be cultivated, but responsibilities should be priority. In the workplace, we must first learn to be "an upright person" before learning to do 'right things'. And one should always maintain a progressive mindset and pace.

WHY ARE SOME PEOPLE WHO HAVE TRAVELED AROUND THE WORLD STILL SHORT-SIGHTED?

"On the way back from the museum, I saw a father holding a soccer ball, carrying a bag of toilet paper, with three children and a dog. I was instantly moved. Yesterday, I read an article written by someone after a self-drive to Mexico about how poor, backward, corrupt and dangerous that country is. His conclusion was also banal, believing that his understanding was the most brilliant and that nothing else was worth mentioning. Why are some people who have traveled around the world still short-sighted? It's very perplexing."

Early this morning, I saw this question from my WeChat Moments. I felt the same way about the matter, and then discussed it with my friend. More than three months ago, my friend, who has majored in Spanish, went to Mexico to work and often posted some local insights on WeChat Moments, and I like to read them. By reading these interesting stories, we can also expand our horizons.

My friend is surprised that though some people have traveled around the world, they have not gained any new insights at all. "Prejudice, and the encouragement of prejudice, is deep-seated foolishness." I couldn't agree more. "As you are not fish; how do you know what constitutes the enjoyment of fish?" We can't guess what others think and feel with our own perspective. "Do unto others as you would have them do unto you". Civilization has always been diversified, and it is because of its diversity that human civilization has the value of being exchanged. So, where does prejudice come from? Is it only from the limitations of personal perspective and cognition? Obviously not really; the key lies in the lack of the ability to think independently. It is also possible that there is something wrong with the education that makes people think there is only one standard answer. Although it's not the truth. There are all kinds of choices in life, and we can get different answers.

Shanghai Electric is a large international enterprise that needs professional talents in all areas. In particular, we need talents with independent thinking skills in international business operations so that we can know ourselves and our opponents well to strike a balance in conflicts and to maximize the interests of all parties.

At the inception of the power plant projects, we were also faced with countless challenges in the negotiation with foreign companies. A senior engineering leader has told us his personal experience. At that time, it took more than two months to negotiate a contract for a thermal power unit. The main reason was that foreigners did not understand the Chinese market and had deep-rooted prejudices covering technology, quality and delivery time; the most crucial issue was the differences in culture and thinking between China and foreign countries, so it was very difficult to carry on such negotiations.

To make things the best, we translated all the English contracts into Chinese and then carefully studied each clause. We also further investigated the global market of thermal power units, especially the change of procurement price, to understand the demands of other parties. Then, we clarified the technical terms and conditions one by one and dissolved the foreigners' prejudice against Chinese products, and finally made positive progress on the business negotiations. It is because of the good basis laid by the older generation that the popularity and reputation of Chinese products in foreign countries are rising day by day.

Thus, prejudice can exist in all kinds of people, and communication and independent thinking are the remedies to eliminate it. We should understand that people who have traveled around the world do not necessarily have great insights. We need talents who are not just international and knowledgeable; truly exceptional talents are those who can maximize the benefits of their work in practice. D

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