

BILINGUAL BIMONTHLY

Shanghai continuous internal data verification (K) no. 0465

ELECTRIC

SHANGHAI

上海电气

2020
DEC
NO. 30

IN RETROSPECT EVOLUTION & RECONSTITUTION



上海电气
SHANGHAI ELECTRIC

CHANGES OVER FIVE YEARS

The monitor told me once amid a class reunion that many classmates had totally changed.

The 10,000-hour rule popularized by author Malcolm Gladwell occurred to me, which argued that being a nobody, anyone can be somebody by allotting 10,000 hours to become successful in any field. In other words, it takes at least 5 years to be an expert in a certain area based on the work schedule of an 8-hour day with 5-days per week.

Take Li for example. She started from scratch as a press photographer 5 years ago after working as an HR clerk for years, diving into camera user manuals, differences between different types of instruments, how lens work, picture composition, photography knowhow and Photoshop. She continued her work in the workshop and at the office during the day, and spared no effort to capture every detail and moment with her camera at night for a walk. After some time, her photos were published in the company's internal magazine and appreciated by a photography association, which enabled her to be enrolled as a member. Driven by strong passion and ambition, she found another job in a magazine and has become a fashion influencer.

Time spent never hides itself.

Yang, Li's roommate, is an example of the opposite. She started as a front desk associate after her graduation 5 years ago. Her daily routine across the 5 years has remained the same that is to handle phone calls and packages, chat on the phone and play games at leisure time. She has her own interpretation of a happy life so no attention is paid to how she is despised.

It is convincing that fundamental changes can happen to a man in 5 years. You can choose to be an expert like Li or stay the same like Yang. Be it good or bad, where you are is a direct result of the choices you have made up to this point.

There is no definite answer to which five years is the most essential, the five years after birth, graduation or marriage? Actually every 5 years matters because a new journey is embarked on periodically.

Just as Wang Guozhen, a contemporary Chinese poet, puts it: if you miss the last five years, seize the next!

2020.12 NO.30 Bilingual Bimonthly Journal

Shanghai Continuous Interior Materials Printing Permit (K) No.0465

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IN RETROSPECT EVOLUTION RECONSTITUTION



ELECTRIC NEWS

BRIEF NEWS

Shanghai Electric Increased Its Ranking in Top 500 Global New Energy Companies 2020 by 35 Places

On November 27, the "Global 500 New Energy Companies" list was announced. Shanghai Electric entered the top 100 for 6 successive years, and ranked 34 that was 35 places higher than 2019.

The top 500 enterprises selected in 2020 are from 38 countries and regions. From the perspective of the number of companies on the list, China, the US and Japan are firmly in the top 3. The minimum revenue of company in the list stands at 1.554 billion yuan with an increase of 9.21% compared with 1.423 billion in 2019, which sets a record high.



Shanghai Electric Listed as ENR's 2020 Top 250 International Contractors

On November 25, China International Contractor's Association held the 2020 China International Contractor's Development Forum in Beijing. Shanghai Electric obtained awards due to its excellent performances in overseas EPC (Engineering, Procurement, Construction) for CSP projects. On behalf of Shanghai Electric, Shanghai Electric Power Generation Engineering Co., Ltd. received two trophies at the forum, one for A-grade Credit Enterprise for Chinese international contractors 2020 and the other for ENR's 2020 Top 250 International Contractors. Engineering News Record (ENR) releases authoritative lists of top American and international engineering enterprises annually. Seen as "barometers" of the international engineering industry with remarkable influences, the lists reflect the development of engineering companies in the world throughout the year.

Shanghai Electric Earned the Highest AAA Rating in International Contractor Credit Evaluation

China International Contractors Association has recently released 2020 Enterprise Credit Evaluation for Chinese International Contractors and Labor Service Companies. Shanghai Electric is awarded the highest credit rating of The Enterprise Credit Evaluation of International Contractors is a professional and authoritative credit evaluation that is acknowledged by national commercial authorities, organized by China International Contractors Association, and evaluated by China Export & Credit Insurance Corporation. It examines a package of key indexes including company comprehensive quality, competitiveness, financial status, credit record, overseas market development and project implementation. Since its initiation, the credit assessment has been considered important in demonstrating a company's strength in overseas businesses.



Shanghai Electric's Two Projects Won Grand Prize of Science and Technology Award of China Machinery Industry

China Machinery Industry Federation and Chinese Mechanical Engineering Society jointly released the 2020 Science and Technology Award of China Machinery Industry not long ago. Shanghai Electric has 8 projects awarded including 2 grand prizes, 3 second and third prizes respectively. The "Development and Industrial Application of the New-generation High-capacity Phase Modifier" applied by Shanghai Electric Power Generation Equipment Co., Ltd. Generator Plant is one of the grand prize winners. The project uses the new-type high-capacity phase modifier to provide dynamic reactive power support to the grid, which will enhance the stability and safety in the grid's operation. Another winner is "The Near-Critical Design Technology and Application of Non-stationary Load Permanent Magnet Motor" of Shanghai Electric Wind Power Group Co., Ltd.. The project invents new parts of the permanent magnet motor that is characterized by a high power/torque density, which have been embedded in domestic and international commercial design software.

Two Units of Inner Mongolia's First 1000MW Thermal Power Project Began Operation

Two 1000MW ultra-supercritical air-cooling units of the No.2 power generation set of Inner Mongolia Shenglu Power Plant Phase I completed the 168-hour full load test run days ago. As of now, both units have been running stably and smoothly with data in a healthy range, realizing the goal of both units entering operation. Located in the northeast of the Shanghai Economic and Development Park, Otog Front Banner, Inner Mongolia, the project is the first power source of the Inner Mongolia-Shandong UHVDC (ultrahigh-voltage direct current) Electricity Transmission Project, and its two 1000MW power units represent the first of its kind in Inner Mongolia and Shandong Energy Group. Shanghai Electric provides boilers, steam turbines, power generators and main auxiliary equipment.

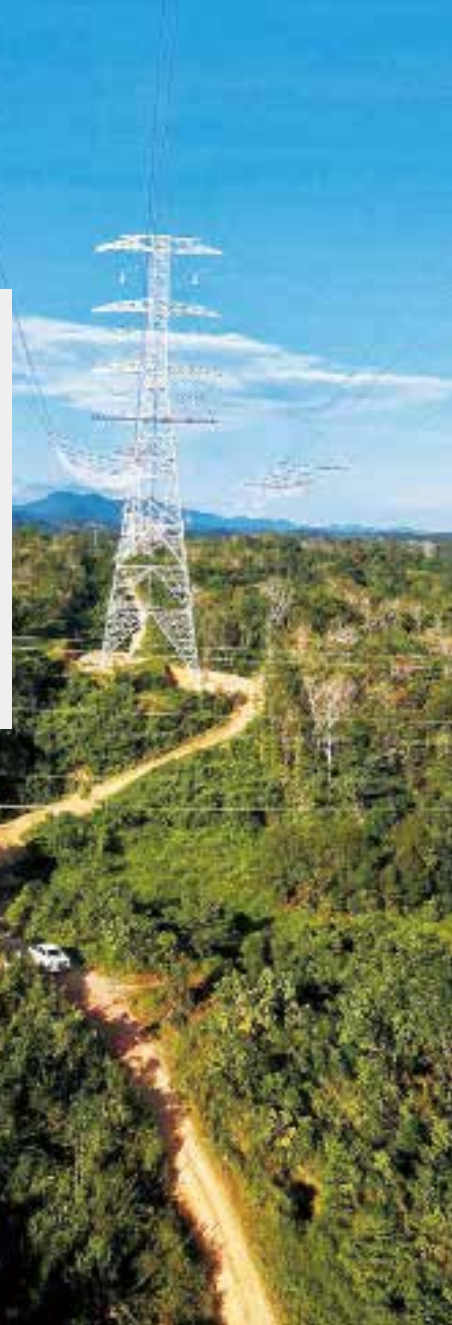
Shanghai Electric's "Double Reheat Power Unit" Was Awarded 3 Contracts

As all companies are striving to meet annual targets, Shanghai Electric Power Generation Group scores a hat trick who has been awarded 3 contracts, which are Jiangsu Guoxin Investment Group Limited's full host equipment of 2×1000MW double reheat power units at Sheyang Port, Guangdong Yudean Group Co., Ltd.'s Dabu Phase II 2×1000MW double reheat power unit's steam turbines, and Huarun Xijiang's full host equipment of 2×660MW double reheat power units. From the year start, Shanghai Electric Power Generation Group has obtained a number of purchase orders including Huaneng Shidongkou 2×660MW power units, Huarun Fuyang's full host equipment of 2×660MW power units and Huaikuang Panji 2×660MW steam turbines. The double reheat steam turbine gains 100% market share, and the boiler 64%. Shanghai Electric has strengthened its dominating position in the double reheat market, which so far is the most advanced and efficient technology in thermal power area.



Shanghai Electric Power Transmission & Distribution Group's Two Projects in Malaysia Won Local Environmental Impact Assessment Award

Recently, the Bunut 275kV Substation project and Medamit-Bunut 275kV transmission line undertaken by Shanghai Electric Power Transmission & Distribution Group have been awarded silver and excellent prizes of 2019 Contractors' Environmental Impact Assessment Award from Sarawak Energy, the proprietary company. To enhance environmental protection awareness and better protect Malaysia's ecology, Sarawak Energy launched the award in 2017. Since the inception of the two projects, execution teams have abided by the assessment proactively. Despite the strike of COVID-19, they have spared no efforts in meeting requirements of project management, local compliance and environmental protection, which is highly recognized and acclaimed by Sarawak Energy and local parties.



Payra Phase I won the Global Project Excellence Award in Mega-sized Project Category

Recently, the Phase I of Payra 2×660MW coal-fired power station project in Bangladesh won the 2020 Global Project Excellence Award in mega-sized project category organized by International Project Management Association (IPMA). The project employs 100% Chinese technologies and equipment. As the supplier of steam turbines and generators, Shanghai Electric Power Generation Group received an online interview by experts with the jury panel. The contract of Phase I was inked in July 2016. It was the first time for Shanghai Electric to export the ultra-supercritical 660MW unit that earned Shanghai Electric the acclaim of "excellent supplier" from the general contractor. So far, the two units have completed the 720-hour operation and performance test in April and October 2020 respectively.



Khulna Project in Bangladesh Was Handed Over

Recently, the Khulna 150 MW Peaking Power Plant to 225 MW Combined Cycle Power Plant Project undertaken by Shanghai Electric Power Generation Engineering Co., Ltd. has been successfully handed over after all letter of guarantees were released. As Shanghai Electric's first combined-cycle and expanded power plant project, it delivers many "firsts" with profound influence, such as carrying out heavy repairs on overseas steam turbines, combining the steam turbine system, renovate the bypass chimney flap and using three pressure reheat steam cycles in the combined cycle of E steam turbines.



Shanghai Electric Wins An Order for the New Industrial Air Cooling System of A 660MW Coal-fired Power Generator Set

Recently, the signing ceremony of Shaanxi Yulin Energy Group Co., Ltd. Yanghuopan Integrated Coal-fired Power Plant's contract to build a natural draft air-cooled condenser (NDC) was held in Shanghai. Shanghai Electric-SPX Engineering & Technologies Co., Ltd. ("SPX" for short) won the order for the world's first NDC project of a large power generator set, endorsing its leading position in industrial air-cooling technologies and taking the sector to new heights. This plant is one of the auxiliary power sources of the 3800 kV HVDC transmission project, which transmits power from the north of Shaanxi Province to Hubei Province, and is expected to get connected to the grid and generate electricity by the end of 2022. It is the world's first 660MW coal-fired air-cooled generator set that adopts the NDC system. Signing the contract is a strategic move for SPX, as a new industrial enterprise, to facilitate upgrading and transformation, to become smart and digital, and to achieve high-quality and sustainable development.

9 Overflow Tanks of Phase IV of Dubai Solar Power Project Were Lifted to Right Places

Recently, 9 overflow tanks in the trough-type No.2 area of the Phase IV of Dubai solar power project have been lifted to right places, another milestone in the on-site construction. Given that a single tank is 52 meters long, and all the 9 tanks weigh roughly 2,000 tons, both transportation and installation face huge challenges. Despite the blow of COVID-19 in overseas countries, the project team completed the task in only 20 days by ensuring epidemic containment and coordinating transportation companies and other relevant units, which cuts the time spent in No.1 area by half and guarantees that the project shall proceed as scheduled.



Shanghai Electric

The third China International Import Expo (CIIE) was held in Shanghai from November 5 to 10, attracting worldwide attention. Distinguished by a wide range of new products, technologies, services and global and China's debuts, it demonstrated stronger potential in global collaboration.

As a high-end equipment manufacturer in China, Shanghai Electric focused on global top 500 companies in CIIE's technology and equipment sector and leading players in Industrial Internet,

electrification and mechanization, and raked in a dozen of import contracts or framework agreements worth 2.375 billion yuan, up by nearly 500 million.

To name a few of purchase orders Shanghai Electric entered amid the expo: solar brackets with NT from the US, gas turbines with an Italian company, main bearings for wind turbines with Germany's Rothe Erde, and superconductive MRs and CTs with Japan's Canon. It also inked the agreement with Siemens Energy on establishing

Shanghai Electric and Siemens Energy to Establish Smart Energy Empowerment Center



Signed Contracts Totaling Roughly 240 Million at CIIE 2020

a smart energy empowerment center on the collective signing ceremony for state-owned-assets sub-group of the Shanghai trade group on November 7. The spillover effect of the 2nd expo added to the result.

From the perspective of Shanghai Electric, CIIE serves as a crucial platform to domestic companies in need of transformation and upgrade as well as innovative solutions by offering an access to new products, technologies and business landscapes of industrial leaders.

Shanghai Electric's transformation and upgrade will be reinforced by exchanging with learning from the development experience of foreigner counterparts in terms of R&D, management and marketing, which will further bolster up its reform speed and efforts, as well as improving services and production efficiency. Shanghai Electric will become more competitive by setting up a market-oriented innovation system and enhancing innovation ability. **D**

The collective signing ceremony for state-owned-assets sub-group of the Shanghai trade group was held in National Conference and Exhibition Center (Shanghai) on November 7 at the third China International Import Expo (CIIE).

Shanghai Electric and Siemens Energy signed the cooperation agreement on establishing a smart energy empowerment center, witnessed by Chen Yin, member of the standing committee of the CPC Shanghai Municipal Committee and Executive Vice Mayor, Ma Chunlei, Vice Secretary-general of Shanghai Municipal Government and Head of Shanghai Municipal Development and Reform Commission, and Bai Tinghui, Party Secretary and Head of Shanghai Municipal State-Owned-Assets Supervision and Administration Commission. It was attended by Huang Ou, Vice Secretary of the Party Committee and President of Shanghai Electric Group, and Yao Zhenguo, Senior Vice President of Siemens Energy and CEO of Siemens Energy Greater China.

As for the energy sector, "new infrastructure" characterized by smart technologies paves the way for the upgrading of energy technologies and equipment manufacturing in China, and speeds up the industrial transformation and upgrade.

Both Shanghai Electric and Siemens prioritize the leading role played by digital innovative technologies and business models in global

energy and their own development. The collaboration will leverage their respective industrial and technological strengths in building the smart energy empowerment center to better serve digital and energy industries at home and abroad.

Seizing the opportunity created by "new infrastructure" advocated by the country and energy industrial transformation and upgrade, the center is committed to empower production, maintenance and service value chains for energy companies with artificial intelligence (AI) and Industrial Internet technologies on basis of their digital knowhow and equipment expertise in order to become a digital experience center and incubation and partnership platform in the high-tech sector with core technology research and development.

With its roll-out, the center will provide digital solutions and bespoke new scenario development to end clients, opening up a new window for the public to have a better understanding of future energy structure and advanced technologies. What's more, it will facilitate the development of industrial clusters in the energy market in Shanghai and the Yangtze River Delta area.

Yang Hong, Vice President of Shanghai Electric Group, and Tang Yucheng, Chief Digital Officer of Siemens Energy, signed on the contract. **D**



SHANGHAI FANUC PHASE III PROJECT WITH AN ANTICIPATED OUTPUT VALUE OF

10 BILLION YUAN

STARTED CONSTRUCTION

On December 2, the Shanghai FANUC Phase III project jointly operated by Shanghai Electric and Japan's FANUC held its groundbreaking ceremony in Baoshan District of Shanghai.

It was attended by Wu Jincheng, Head of Shanghai Municipal Commission of Economy and Informatization, Gao Yiyi, Acting Head of Baoshan District, Dai Liu, Director of the Financial and Economic Committee of Shanghai Municipal People's Congress, Zheng Jianhua, Secretary of the Party Committee and Chairman of Shanghai Electric Group, and Huang Ou, Vice Secretary of the Party Committee and President of Shanghai Electric Group. Yoshiharu Inaba, Chairman at Fanuc Corp, and Yamaguchi Kenji, President and CEO at Fanuc Corp. were present at the event via the online platform.

With the first pile foundation laid, the Shanghai FANUC Phase III project jointly operated by Shanghai Electric and the robot giant Japan's FANUC, one of Shanghai's key construction projects in 2020, officially started construction. The new project covers an area of 431 mu (28.73 hectares), with a total investment of about 1.5 billion yuan. By combining intelligent manufacturing, R&D, display, sales and system integration centers, it is committed to build one of the most advanced flexible robot smart factories in the world.

Wu Jincheng congratulated the project, and said that Shanghai has been pressing ahead with manufacturers' high-quality development. Firstly, important opportunities shall be seized to enhance and expand Shanghai's robot industry. Secondly, new technology empowerment shall be promoted to drive intelligent manufacturing by launching over 100 smart projects in 3 years. Thirdly, strategic cooperation shall be furthered to facilitate R&D on core technologies and commercial application that benefits both parties, and to reinforce project-related services to ensure the project is completed as scheduled. Based on Fanuc's leading product and service expertise and Shanghai Electric's heritage, Shanghai Fanuc has made remarkable progresses in fundamental technology research,

talent nurturing, and innovative application development. We are optimistic that Shanghai Fanuc will have a brighter future and the promising Phase III project will achieve a big success in Shanghai, an exciting destination for businesses.

Zheng Jianhua said that Shanghai Electric is making effort to develop the "industrial triangle ecology" comprising smart equipment, Industrial Internet and smart supply chain to empower all businesses within and outside the group. Shanghai Electric will provide bigger support for Shanghai Fanuc and endeavor to make more contributions for China's intelligent manufacturing.

Shanghai Fanuc was jointly established by Shanghai Electric Group and FANUC Group in 1997, each of which holds 50% of the shares. The first and second phases of the plant in Baoshan were completed in 2010 and 2014 respectively. The first and second phases of the plant have a total area of nearly 60,000 square meters, of which nearly 40,000 square meters are used for system integration's R&D, manufacturing, installation and commissioning and ex-factory inspection. In order to further plan for greater development, and cement Fanuc's leading position in China's robot and smart equipment markets, both sides agrees to launch the Phase III project in Shanghai Industrial Park of Robotics **D**



SHANGHAI ELECTRIC FORMULATED HYDROGEN ENERGY INITIATIVES

Hydrogen Industry & Energy Transformation and Development Forum was held not long ago by Ningdong Energy and Chemical Industry Base in its management committee in Ningxia Hui Autonomous Region. During the forum, Shanghai Electric Power Generation Group, Beijing Jingneng Power and the management committee signed a strategic cooperation agreement. It stipulates that the trio will inaugurate a number of green hydrogen demonstration projects as industrial drivers based on state-of-the-art technologies throughout the whole hydrogen industrial chain, including the comprehensive demonstration program containing hydrogen production-storage-filling integration + chemical industrial park and hydrogen-fueled heavy trucks, the demonstration program of source-grid-load-storage-hydrogen integration in the base, and the program of smart energy comprehensive development. Shanghai Electric Power Generation Group will use this opportunity to set up a benchmark in "renewable energy generation + peak load arrangement of coal-electricity + electrochemical energy storage + heat storage + hydrogen produced via electrolysis + green chemistry", making itself one of the most competitive companies in technology and industrial development. **D**

CHINA PAVILION EXPO
2020 DUBAI UAE OFFICIAL PARTNER



能源装备
ENERGY EQUIPMENT

工业装备
INDUSTRIAL EQUIPMENT

集成服务
INTEGRATION SERVICE

Shanghai Electric Raked in

1.4

Billion

from the Lithium Battery Automation Equipment

Shenzhen Yinghe Technology Co., Ltd. ("Yinghe Technology" for short), a subsidiary of Shanghai Electric, was awarded a purchase order of Lithium battery automation equipment by CATL not long ago. With a worth of 1.44 billion yuan, it is the biggest contract on Lithium battery equipment signed by the two companies so far. Yinghe Technology plays a leading role in power battery automation equipment, and provides intelligent digital factory solutions to power battery clients.

The contract endorses Yinghe Technology's strength in production equipment of new energy vehicles' power battery, and marks the high recognition of its comprehensive competence by top players, greatly amplifying its reputation and brand influence in the industry. It will create a positive impact on Yinghe Technology's production and operation in 2021.

Since Shanghai Electric became its shareholder in 2019, Yinghe Technology has greatly increased its product competitiveness and landed more top clients by leveraging the brand influence of Shanghai Electric, despite the waning growth in industrial investment and COVID-19. Yinghe Technology has rapidly gains more market share in Lithium battery market due to Shanghai Electric's investments in its R&D, production capacity and talent training. To further its influence in industrial synergy, it enhances cooperation with companies like Anwha Automation, Fanuc and Manz AG on Lithium battery automatic production equipment via the platform provided by Shanghai Electric Automation Group. Together, they develop Lithium battery solutions with Lithium battery equipment as the core and greatly enhance the leading position in this sector, paving the way for leading the development of lithium battery field. Backed by Shanghai Electric, Yinghe Technology will continue to rapidly expand its R&D and production scale to seize higher positions in the industry, and actively collaborate with other lithium battery companies to go abroad, as well as enhancing competitiveness. **D**

Shanghai Electric

Contributes to Hualong One Nuclear Reactor's Connection to Grid

On November 27, the world's first nuclear power unit using Hualong One technology was connected to the grid, indicating that China has broken the monopoly of overseas nuclear technology and officially become a country with advanced nuclear techniques.

As a domestically developed third-generation PWR nuclear power technology with completely independent intellectual property rights, Hualong One has a designed lifespan of 60 years. It adopts 177 reactor cores which will be replaced every 18 months, and it has a use ratio of over 90 percent. With both "active and passive" safety systems and a double-layer containment, it meets the highest international safety standards regarding safety.

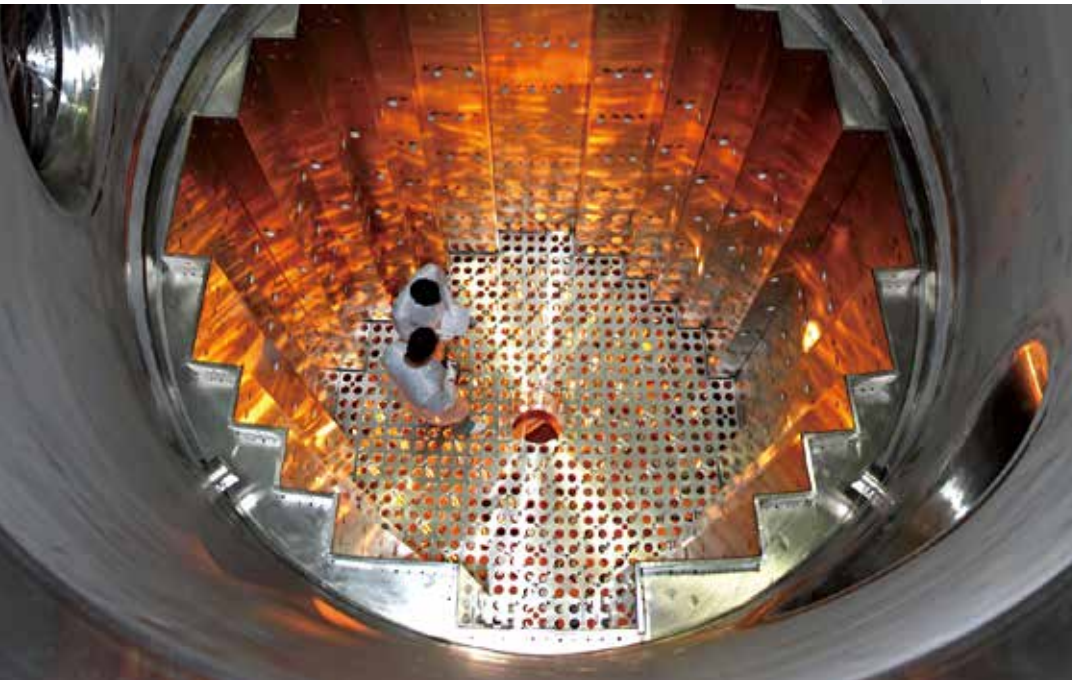
As a signature for China's nuclear power industry to go abroad, Hualong One is one of the most popular third-generation reactor designs in the world, and a landmark achievement in innovative development of China's nuclear power.

To ensure smooth and successful installation and operation of Hualong One, parties from design to engineering construction including research institutes, construction companies, owners and equipment producers have made contributions. It is a great honor for Shanghai Electric to be part of the team.

On March 15, 2018, Shanghai No.1 Machine Tool Works Co., Ltd. ("No.1 Machine Tool Works" for short), a subsidiary of Shanghai Electric passed the acceptance inspection on reactor vessel internals and protection parts used in installing flow-induced vibration sensors of No. 5 unit of China's Fuqing Nuclear Power Plant, thus ensuring that the first reactor adopting Hualong One technology in the world proceeded as scheduled.

Seen as the most important part of Hualong One, the reactor vessel internals are installed to accurately locate and support the fuel assemblies, properly signal the control rod to start or stop working and regulate power, provide

correct channels for measuring the reactor's temperature and neutron fluence, create a suitable flow path, and serve as a secondary safety support in case of a reactor accident. It took No.1 Machine Tool Works 33 months to produce these internals during which time it tackled 71 major processing and testing difficulties, made innovations in localizing 2 types of materials, 5 soldering technologies, 4 testing technologies and 7 processes, and obtained 10 patents for invention and manufacturing. Therefore, an all-rounded localization has been realized in Unit 5 internals' manufacturing, processing, assembling, testing, soldering, and tool design and manufacturing in acceptance test. **D**






Datang Shantou Lemen Offshore Wind Power Project with a Total Investment of 5.077 Billion Yuan Started Construction

On October 26, the groundbreaking ceremony of Datang Shantou Lemen Offshore Wind Power Project was held in Haojiang District, Shantou City, Guangdong Province, attended by Li Hongjun, Vice Governor of Guangdong Province, Zheng Jiange, Mayor of Shantou City, Chen Feihu, Chairman of China Datang Corporation, Huang Ou, Vice Secretary of the Party Committee and President of Shanghai Electric Group, and Jin Xiaolong, Vice President of Shanghai Electric Group, Party Secretary and Chairman of Shanghai Electric Wind Power Group Co., Ltd.

It is the first step in exploring wind power in offshore areas to the east of Guangdong, and writes a new and monumental chapter for China Datang and Shanghai Electric to develop new energy in this region.

Datang Shantou Lemen I Offshore Wind Power Project is near Lemen Islands in the southern sea area of Nan'ao County, Shantou. As the first offshore wind farm in construction, it is planned with a total installed capacity of 245MW, and to be more specific, 35 units of 7MW offshore wind turbines produced by Shanghai Electric will be put in place. It consumes 5.077 billion yuan in aggregate and is expected to be completed by the end of 2021. After operation, it is expected to save standard coal by 260,000 tons and reduce CO₂ emission by 500,000 tons every year.

All wind turbines will be produced and assembled in Shanghai Electric's Shantou Intelligent Manufacturing Base. The base adopts "Industry 4.0" and "Energy 4.0" standards in its construction and operation, and is the most advanced intelligent manufacturing site for high-power wind turbines in Asia so far. It will facilitate Shantou's offshore wind power industry to develop in an efficient and effective way, expand influence to other parts of Guangdong and even across China, which will be a big driver for China's offshore wind farm development in the "post-subsidy era". 

Shanghai Electric Released SEunicloud Industrial Internet Platform2.0



On December 12, Shanghai Electric released SEunicloud2.0, its upgraded Industrial Internet platform, creating another milestone in its commitment towards industrial Internet development.

The iterated SEunicloud has greatly upgraded its capacities in areas of artificial intelligence (AI), business intelligence (BI) and creation intelligence (CI).

The newly introduced "Uni-Cloud Intelligence" modular driven by AI and big data is able to display data values and analyze business values for various working scenarios like failure detection and diagnosis, maintenance strategy, product quality monitoring, energy consumption management and manufacturing process optimization. Therefore, it makes industrial intelligence modeling much easier, increases the closed-loop efficiency of industrial data value, and empowers enterprises in forging industrial intelligence systems in an ongoing way.

The "Uni-Cloud Image" BI modular meets the basic needs in data visualization via the efficient visualization tools, intuitive display effects, smart analysis engine and second-level response for massive data. Hence it can provide efficient development tools and templates for a wide range of purposes including production, businesses, maintenance-themed dashboards, display on big screens, POC promotion of products and private deployment systems, enabling visualization roll-out in a short time for enterprises.

What's more, the embedded visual integrated development environment "Uni-Cloud Tool"

allows the platform to offer innovative services in InaaS application, which enhances all types of industrial development scenarios and unleashes potential without employing any code through full-stack panorama data services, business logic layers in building blocks and WYSIWYG multi-screen applications. In addition to upgraded modular, another highlight is the "Uni-Cloud Flash Connect" that integrates sensors, IoT and data analysis technologies, providing collection and application solutions for all types of industrial energy-

consuming appliances. It is low in cost and easy in application, and can be used in managing equipment, energy consumption and production. It can meet needs in smart operation of industrial equipment due to a full coverage of facilities that are outdated or broken, mobile, for temporary management and confidential purposes. In the future, Shanghai Electric will develop SEunicloud into a hub for data asset storage and configuration, and leverage its scenario and industrial data strengths to offer platform users with smart application solutions featuring intelligent manufacturing, internet-based collaboration, customization and better services in order to speed up the combined online-and-offline development and connect industrial chain, value chain and innovation chain. Shanghai Electric will embrace more diversified business models and innovative applications with an increasingly open mind-set and platform. **D**

COVER TOPICS

IN RETROSPECT EVOLUTION



D RECONSTITUTION



5

5 years ago, China embarked on a profound transformation in all respects concerning the overall development. A new development philosophy has been embraced by all, which

takes innovation as the primary driving force, coordination as the endogenous characteristics, green as the universal form, opening-up as the only way, and sharing as the fundamental purpose.

According to the head of the Planning Department, Ministry of Industry and Information Technology, during the 13th 5-year plan period, China has made remarkable achievements in manufacturing development and building itself into a manufacturing power with hard efforts and at a fast speed. Integrating with new information technologies like the internet, big data, artificial intelligence (AI) and blockchain, the manufacturing industry has been advancing towards a high-end and high value-added pattern, and accelerating its transformation into a smart and service-oriented model with an increasing proportion of advanced manufacturing. Shanghai Electric ranked No. 48 in the 2020 China's 500 Most Valuable Brands, a list based on financial data, brand strength and consumer behavior analysis, released at the 17th World Brand Summit. Shanghai Electric has developed into a leader of China's machinery industry with a brand value of 105.637 billion yuan that skyrocketed by 30% compared with last year.

Looking back on the growth and evolution over the last 5 years, Shanghai Electric has seen more behind the impressive brand value. The most difficult thing is to not only respond to complex and changing external conditions, but also break constraints in mindset and development stereotypes with resolution and courage. "We need a fundamental change",

said Zheng Jianhua, Secretary of the Party Committee and Chairman of Shanghai Electric (Group) Corporation.

Regular patterns are everywhere and growth is realized only when breakthroughs are made. Over the past 5 years, Shanghai Electric has prepared its plans for the bigger picture. The 5 years have witnessed Shanghai Electric's further openness in mind, huge changes in development philosophy and enormous progresses in transforming and upgrading industrial structure. Shanghai Electric has managed to replace old growth drivers with new ones by proactively promoting advanced technologies and shutting down outdated facilities with a firm hand. Urged by market needs, Shanghai Electric has reformed internal systems and institutions to reactivate internal growth energy and explored a new path in supply-side structural reform.

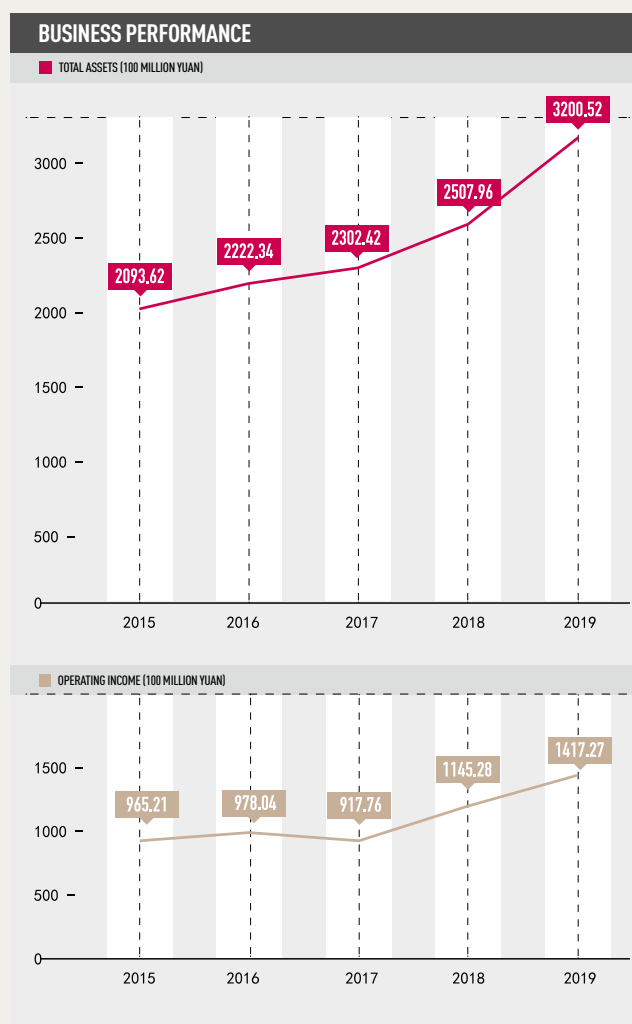
Only hardship can highlight courage, and only toughness can lead to glory. Defined by breakthrough and reshaping, Shanghai Electric, the giant enterprise, has maintained stable growth and charted a clear new roadmap with strategic focus over the 5 years.



CREATE A NEW BUSINESS LANDSCAPE DURING THE 13TH FIVE-YEAR PLAN PERIOD WITH STRATEGIC FOCUS

Reflecting on the 13th Five-year Plan period, Shanghai Electric moved forward against the changing and complex external situation and increasing challenges of international economy, and achieved transformation and breakthroughs in all respects by removing obstacles in development with a focus on high-end equipment, its major business, and comprehensive solutions that are green, smart, connected and digital. Since 2017, Shanghai Electric has maintained steady growth in both revenue and profit at roughly 20% and 15% respectively despite daunting business environment. What's more, Shanghai Electric survived the big blow of COVID-19 in 2020 and delivered a steady improvement in its performance, acclaimed by market participants who comment that "It delivers a performance far beyond what the market expects".

At the managers' conference held at the end of 2017, Zheng Jianhua, Chairman of Shanghai Electric (Group) Corporation, answered the strategic question of "where we are, where we will be, and how we get there", and drew the blueprint for the company in the next 5-10 years, signifying Shanghai Electric's endeavor to reshape the business landscape and accomplish bigger achievements. Having standing at 80-90 billion yuan for more than a decade, its revenue exceeded 100 billion in 2018, jumped to 141.7 billion in 2019, and is highly expected to grow for a third year in spite of the global economic recession caused by COVID-19. For the last few years, Shanghai Electric has aimed at developing high-end equipment manufacturing and seized opportunities brought about by the historic industrial transformation. Based on the industrial strengths and characteristics, it has strived to boost both traditional and new businesses and speed up digital transformation by combining equipment manufacturing with digital technologies. Furthermore, it has expanded its presence in overseas markets to improve the company's competitiveness at home and abroad and to propel its sound and sustainable development in the future.



The above data are based on Shanghai Electric (Group) Corporation

BUILD A NEW ENERGY STRUCTURE BY TRANSITIONING TO NEW ENERGY FROM THE TRADITIONAL ENERGY

"Five years ago, we doubted the reliability of renewable energy, troubled by cost and technological problems. Two years ago, smart energy was just traditional energy under the camouflage of internet. Today, Shanghai Electric has revolutionized its basic business structure, and its new energy sector is growing in scale," said by Zheng Jianhua, Chairman of Shanghai Electric (Group) Corporation, during an interview by the media at a new energy-themed press conference. The green and smart philosophy that directs the future of energy industry is fully implemented in Shanghai Electric's transformation of industrial equipment manufacturing. Although Shanghai Electric was a record holder in China's equipment manufacturing sector with utmost resource utilization efficiency, it had to face the harsh reality of excessive capacity of the traditional energy industry and plunging market needs. Shanghai Electric tackled problems occurred in transformation in a calm manner by focusing on limited resources at hand rather than getting allured by short-term interests. It pressed ahead upgrading towards a world-class high-end manufacturer by outdating unpromising businesses and occupying bigger market share in strategic emerging industries at a faster speed through international collaboration and M&A, laying a solid foundation for developing new industries and upgrading traditional ones.

In recent years, Shanghai Electric has established a whole industrial chain in the new energy sector by setting up a number of subsidiaries including Shanghai Electric BrightSource Solar Energy Co., Ltd., Shanghai Electric Guoxuan New Energy Technology Co., Ltd., Chongqing Shenhua Thin Film Solar Technology Co., Ltd. and Suzhou THVOW Technology Co., Ltd. In terms of energy structure, it has transformed to new energy including solar power, wind power and biomass power from traditional energy including coal, natural gas and nuclear power.

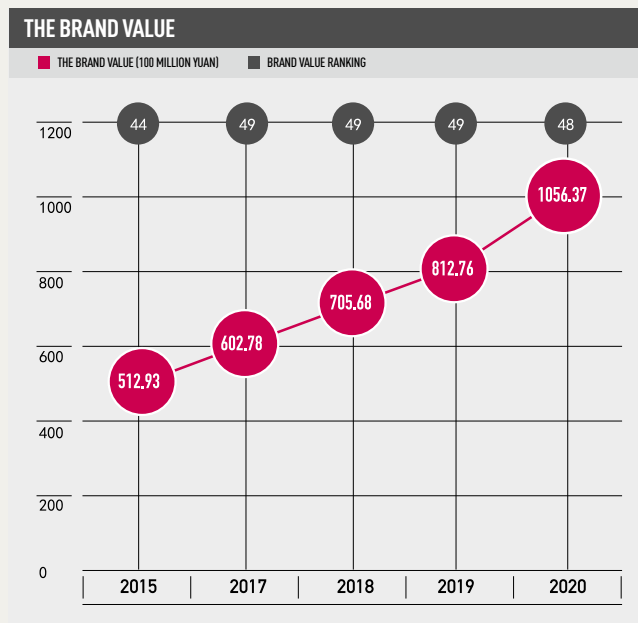
As a pioneer in renewable energy, Shanghai Electric has stepped into the spotlight by undertaking the 1850MW Concentrated Solar Power and Photovoltaic Power Generation Project in Dubai which is known as the largest and most advanced solar project in the world. The project is a landmark in the international solar and PV market and Shanghai Electric's globalization, and its completion establishes the core status of Shanghai Electric in the photo-thermal PV market and accelerates Shanghai Electric's transformation towards green and smart energy. Moreover, Shanghai Electric is capable of offering comprehensive wind power solutions in renewable-energy-based power generation. It has developed a portfolio of smart turbines ranging from 10MW to 60MW for converting biomass, wastes and solar energy into electricity. Meanwhile, it carried out continuous R&D on cutting-edge technologies for leveraging hydrogen and ocean energy as well as supercritical-carbon-dioxide power generation.

It is worth noticing that Shanghai Electric started its electrochemical energy storage business as early as

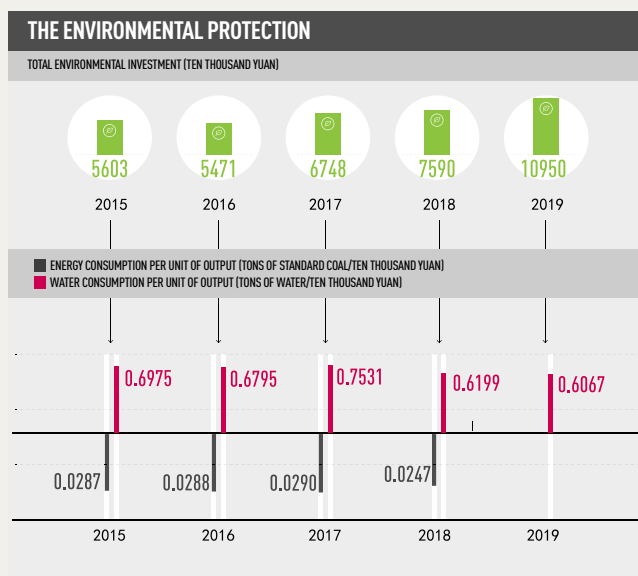
2015. While setting up the joint venture Shanghai Electric Guoxuan New Energy Technology Co., Ltd., it purchased Gotion High-tech's factory in Kunshan. In 2018, it acquired Suzhou THVOW Technology Co., Ltd., which completes its capacity in designing large heat storage and transfer facilities together with boilers and auxiliary equipment produced by Shanghai Electric Power Generation Group. Therefore, Shanghai Electric has become a provider of high-end chemical engineering equipment. With regard to the promising niche market of energy and heat storage, Shanghai Electric has covered the whole industrial chain from cell production to storage system by developing leading technologies and innovative mechanisms. It finishes the last mile in using renewable energy via a complete business landscape and state-of-the-art technologies, achieving sustainable development in a real sense.

Increasing investment into technologies leads to the structural change characterized by shrinking traditional energy and ballooning new energy. Shanghai Electric has been spending over 3.4% of its revenue on R&D for years. In 2020, Shanghai Electric further increases its expenditure on scientific innovation with a year-on-year growth of 21%. Funds spent on new industries and businesses mark a 6% increase compared with that of 2019, and on the advanced R&D an 11% increase.

So far, the new energy segment has developed into a relatively major pillar of Shanghai Electric, and its strategic emerging businesses have occupied over 10% of Shanghai Electric's traditional energy, making the single-digit percentage of such businesses history. Emerging industries are on the way to become the driver of Shanghai Electric.



The above data are from the World Brand Lab



The above data is extracted from the social responsibility report of Shanghai Electric over the years

IDENTIFY NEW OPPORTUNITIES IN TRADITIONAL INDUSTRIES FOR BUSINESS GROWTH

"There are still plenty of potential to be unleashed in traditional industries in the new round of development. New opportunities can be identified in existing markets, which require new methods and innovative business models," said Zheng Jianhua, Chairman of Shanghai Electric (Group) Corporation.

"Shanghai Electric will develop into a world-class leading enterprise respected by all with strong competitiveness, profitability and development capacity." This is the future described by Zheng Jianhua to all managers and employees of the company. He demanded a recreated Shanghai Electric in 5 years. Recreation means far more than becoming bigger. Shanghai Electric, a century-old enterprise, encountered a bottleneck under the production factor-driven model because its traditional business model centering on equipment sales was severely hindered by the short industrial chain, low value and poor profitability. What was worse, excessive production capacity and economic downturn added up to the difficulty in selling equipment. Shanghai Electric responded to fast-changing industrial situation and fierce competition with strong sense of crisis, which pushed it to enhance innovation and transformation. Philosophy guides development and mind-set determines direction. The key to tackle the difficulty was to innovate external business models and reform internal systems.

In recent years, Shanghai Electric has adhered to equipment manufacturing, its major business, and enhanced real economy while promoting

industrial model transformation and business model innovation. Sales of "project + equipment" have become history, and Shanghai Electric offers comprehensive solutions comprising "project + equipment + operation + service + finance". A number of power plant owners who launch overseas projects through EPC are in need of staff training, equipment maintenance and regular maintenance after projects start operation, which provides an opportunity for Shanghai Electric to extend its service chain and develop it into a new business model. In fact, operation and maintenance services are more profitable than equipment sales. Moreover, Shanghai Electric expands its industrial chain into financial investment. Take the No.1 Area 2x660MW plant of Pakistan Thar Coal-electricity Integration Project that costs 1.8 billion US dollars for example, Shanghai Electric benefits from its investment and an EPC contract worth 1.36 billion US dollars and a dozen of orders on equipment, operation and long-term services. New ideas open the door to a wider market. Shanghai Electric enters developed economies including United Arab Emirates, the UK, Japan, Australia and Greece via undertaking large-scale overseas projects, such as the 1850MW Concentrated Solar Power and Photovoltaic Power Generation Project in Dubai, biomass power generation plants in foreign countries, Colon 420MW Combined-cycle Power Plant Project in Panama and the desalination project in Brunei. So far, the overseas sector yields about 20% of Shanghai Electric's total revenue with a network of offices in nearly 50 countries and

regions and about 9,000 employees. What beneath transformation in business models is in-house coordination between different industries and changes in how employees see development. "Inter-company competition appears to be reflected in product and technology, but ultimately comes down to talent and management. Interpersonal competition depends on initiative and creativity," said Zheng Jianhua. Shanghai Electric is forging an internal institution featuring "strong incentives and rigorous control" by streamlining management and increasing staff motivation, which rewards the competent with higher positions and salaries and impedes the incompetent through equity-based incentives, mixed ownership and contract-based management. The headquarters used to be responsible for hundreds of subsidiaries from head to toe, which was beyond its capacity and capped their potential. The only way to reactivate and reinforce these subsidiaries' own capacity of innovation and development is to delegate power and offer necessary support. Since 2018, Shanghai Electric has empowered subsidiaries in 21 administration areas under 7 categories including independent management, and personnel and distribution management within its main businesses. By promoting integrated management of legal affairs, auditing, risk control and compliance and setting up shared service middleground concerning HR, finance and purchasing, Shanghai Electric offers better and more efficient professional services to its subsidiaries to improve their management quality and efficiency. Reform is not completed in one day and has to adapt to different subsidiaries. Shanghai Electric Guoxuan New Energy Technology Co., Ltd. and Shanghai Automation Instrumentation Co., Ltd. are chosen as pilot companies

in the mixed ownership reform of state-owned enterprises (SOEs) - the former, a sci-tech start-up, managed to inspire employees' passion and sense of responsibility through the reform; and the latter, a typical SOE, recorded a positive growth in the very year of the reform implementation after being trapped in deficit for years, and yielded a growth rate of over 30% for 2 years in a row. Shanghai Electric Environmental Protection Group, a representative of new industry, introduced a contract-based management system in 2018, leaving traditional SOE institutions obsolete. With its size doubling for 2 consecutive years, its revenue exceeded 10 billion yuan in 2019 thanks to the mandatory performance evaluation imposed on business units' heads, which is completed by consequent rewards or punishments. At the same time, practices and experience accumulated in these pilot cases are reproduced in more segments and companies. A group of traditional enterprises aspiring to revitalize themselves by reform are making every effort to develop their own plans.

BUILD A NEW INDUSTRIAL ECOLOGY BY COMBINING ONLINE WITH OFFLINE

At Hall 1.1 of the China International Industry Fair (CIIF) held in September 2020, Shanghai Electric presented a panorama of digital industry in the "Smart Cosmos" area: a quality life in a smart city rooted in intelligent manufacturing, enhanced by smart energy and navigated by intelligent transportation. This is the "smart solution" from a century-old equipment manufacturer braving waves of digital economy.

Shanghai Electric unveiled its Industrial Internet platform SEunicloud at CIIF 2019, which is able to support energy and manufacturing industries based on Shanghai Electric's manufacturing expertise and industrial know-how accumulated over the past 100 years. SEunicloud has completed the PaaS, the basic middle ground, Internet of Things (IoT) connection, artificial intelligence (AI) platform, and implemented a number of applications and industrial solutions for different scenarios based on the platform. Shanghai Electric mitigated the blow of COVID-19 by active digital transformation and gained advantages by seizing opportunities created by "online new economy".

The epidemic forces many companies to reconsider their strategies towards future. With regular epidemic control as the backdrop, Shanghai Electric reinforces its industrial digitalization. Based on equipment manufacturing, it leverages advantages brought forth by policies on "online new economy" and "digital new infrastructure" to enhance the Industrial Internet platform. It lays the technical foundation for industrial economy with IoT, manufacturing, services and supply chain that are

STAFF COMPOSITION

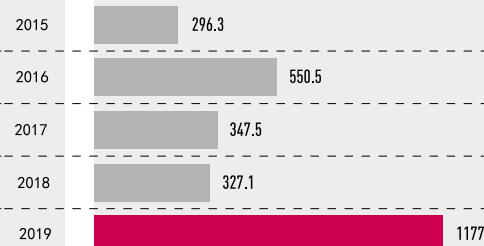
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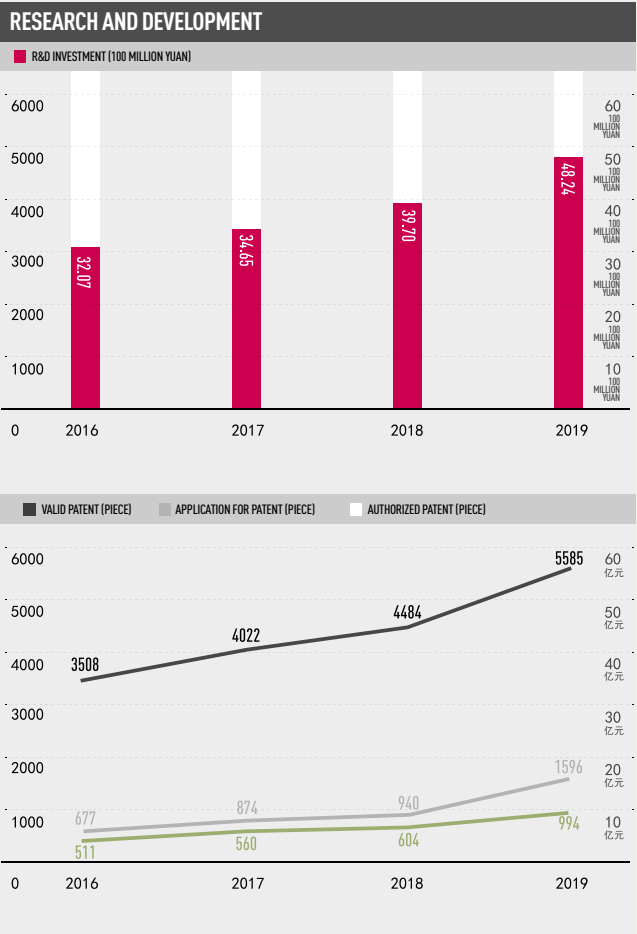
The above data are based on Shanghai Electric (Group) Corporation

PUBLIC WELFARE

PUBLIC DONATION (TEN THOUSAND YUAN)



The above data is extracted from the social responsibility report of Shanghai Electric over the years



The above data are based on Shanghai Electric (Group) Corporation

interconnected by facilities and enabled on cloud, and develops an industrial ecology supported by smart equipment, Industrial Internet and smart supply chain, all of which have been clearly defined in Shanghai Electric's strategy and implemented in various projects.

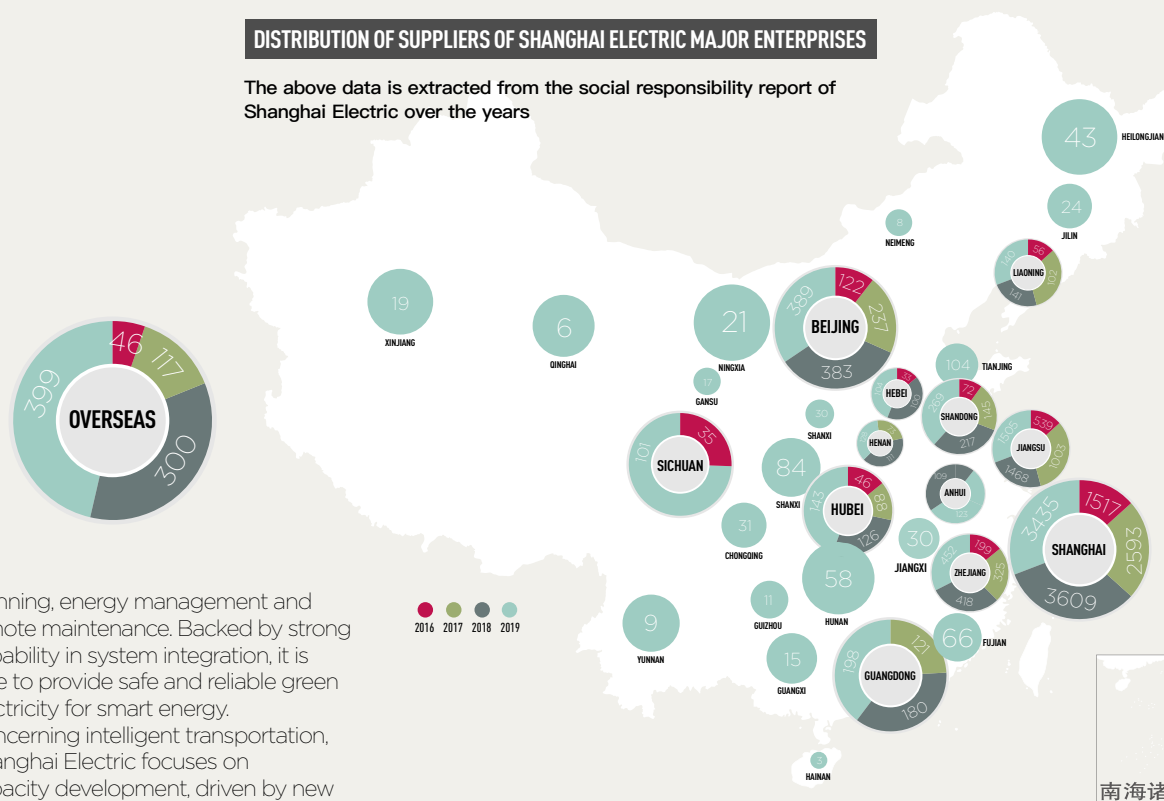
In the past few years, Shanghai Electric has empowered its industrial transformation and upgrading and built industrial clusters for smart cities with digital, internet-based and smart means. It provides smart city solutions to Nantong City, Qidong City and Yancheng City of Jiangsu Province, Chongming District of Shanghai and Shantou City of Guangdong Province where contracts or MOUs on smart city development are executed. According to Shanghai Electric, smart city does not merely stay on paper, but aims to make the urban life more convenient and smart by optimizing projects in every segment.

Regarding smart energy, a journalist with Xinmin Evening Post described what he/she saw in person like this: "Electricity is generated by wind turbines and PV panels. The energy storage container stores power in off-peak hours and discharges it in peak hours. Retired batteries of new energy vehicles are recycled. Minhang Industrial Park Smart Energy Project (Phase I) co-invested by Shanghai Electric and State Grid Shanghai Municipal Electric Power Company is officially put into operation in Shanghai Electric Group Shanghai Electric Machinery Co., Ltd. As a wind-solar-storage-charging-control integrated 'magic box of energy', the project leads by example in Shanghai-based industrial parks' transformation to green and smart energy.

As a leading manufacturer in smart transformation, Shanghai Electric has developed a range of "new energy +" application scenarios to consolidate its leadership in the new energy era, which include solar/PV + desalination, new energy + hydrogen production, and wind + solar + thermal + storage. As for smart energy management, Shanghai Electric has independently developed platforms for design,

DISTRIBUTION OF SUPPLIERS OF SHANGHAI ELECTRIC MAJOR ENTERPRISES

The above data is extracted from the social responsibility report of Shanghai Electric over the years



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planning, energy management and remote maintenance. Backed by strong capability in system integration, it is able to provide safe and reliable green electricity for smart energy.

Concerning intelligent transportation, Shanghai Electric focuses on capacity development, driven by new technologies employed in urban rail transit systems, such as electrical, smart and digital use of green power, smart maintenance and autonomous driving. It offers a number of solutions for rail transit signal systems, comprehensive monitoring system, strong and weak electricity integration, and electromechanical equipment EPC. Shanghai Electric installs a "smart brain" on rail vehicles via digital control and makes them smarter by manufacturing new medium trains.

In terms of intelligent manufacturing, Shanghai Electric has released its 3-year intelligent manufacturing action plan to build its intelligent manufacturing ecology by activating demonstration projects, applications, integration and equipment. From 2018 onwards, Shanghai Electric has carried out several in-house pilot projects targeting typical enterprise application scenarios based on its Industrial Internet platform SEunicloud and tried to build such projects into benchmarks of intelligent manufacturing by utilizing strengths of related parties. Specifically, the smart factory project of Shanghai Electric Power Generation Equipment Co., Ltd. Generator Plant steadily deployed

smart technologies on production lines after upgrading key processes with smart technologies. Shanghai Highly (Group) Co., Ltd. built the unmanned factory by replacing workers with robots to improve quality and efficiency and reduce costs. The smart factory in Nantong site of Shanghai Electric Group Battery Technology Co., Ltd. has digitalized 85% of its operation with an annual capacity of 5GWh, recording a 50% increase in digitalization and 63% decrease in quantity of front-line workers compared with the previous production line. Up to now, SEunicloud has connected over 100,000 facilities worth 140 billion yuan in total whose real-time operation data shows their health condition and provides evidence for value-added services like leasing, maintenance and big-data-based analysis offered to clients. Therefore, it serves as a major driver for Shanghai Electric to transform to a "manufacturer + service provider" from a single equipment manufacturer.

THE PAST IS A PRELUDE TO THE FUTURE. AT THE CRITICAL TURNING POINT, THE BEST ATTITUDE TO EMBRACE THE NEW ERA AND EMBARK ON A NEW JOURNEY IS TO REFLECT ON AND LEARN FROM HISTORY. WITH CHANGES HAPPENING EVERY DAY, A BRIGHTER FUTURE IS TO BE EXPECTED IN THE NEXT 5 YEARS. D

YANG YING

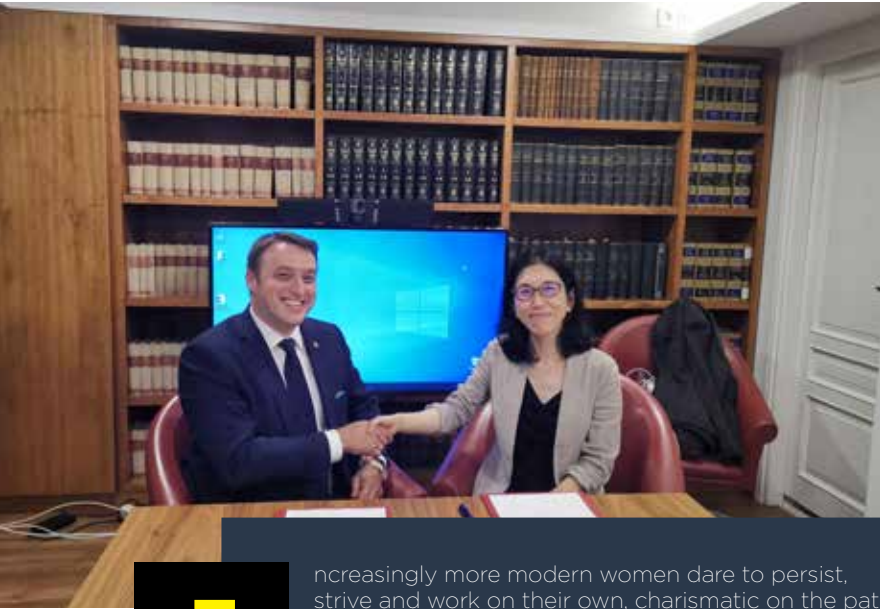
Yang Ying:

Vice President and Sales Director of Shanghai Electric
Power Generation Engineering Company

SOAR WITH DREAM AND MISSION

Some define a good manager as a good observer and listener who runs a good team with good logic and mindset. Mind determines landscape and horizon determines height. To a certain extent, a manager's openness of mind and breadth of vision are decisive factors to market development and customer retention. The farther a manager can see, the larger the market landscape will be!





I

Increasingly more modern women dare to persist, strive and work on their own, charismatic on the path of chasing their dreams. Yang Ying is a case in point. She insists on treating others and handling affairs with honesty, which forms the basis of and facilitates building a sound interpersonal relationship at low cost. Reputation is built on excellence in project building. Successful project history always works better than hype in winning customer recognition. In 1994, Ms. Yang joined Shanghai Electric as a regular salesperson. Since then she has been working on markets, products, customers, and industrial trends in all days, significant or insignificant. And she has built up a career in marketing ever since. Merely a regular salesperson at first, she has kept making incredible records by being promoted to the General Manager of Sales, Deputy Head and Head of Business Department, Deputy Chief Economist, GM Assistant, and Vice President and Sales Director of Shanghai Electric Power Generation Engineering Company (hereinafter referred to as the Engineering Company) right now. In 2019, the sales team was rated "Advanced Collective in China's Mechanical Industry" under her leadership. "Mounting titles bind me to reassure users by successful projects out of responsibility. It's honored to relentlessly forge ahead with mission, accountability and motivation as part of the industry," said Ms. Yang. She shows the tender power of women, characterized by tolerance, all-inclusiveness and profoundness.

FORWARD WITH NO MEANS OF RETREAT

"Those successful spare no effort to move ahead and cut off all means of retreat." For Chinese enterprises, going global is not easy whatsoever. When the Engineering Company was originated, it had neither orders nor potential customers on international engineering market. All needed to be done from scratch. Under such circumstances, Ms. Yang realized the necessity of enhancing the Company's capabilities of international operation by studying international trade and engineering knowledge and building relevant capabilities by reference to world-class enterprises in the industry. By successfully contracting international power generation engineering projects one after another, the Engineering Company kept making breakthroughs in shifting priority of market development from Vietnam, India and Bangladesh to moderately developed states/regions, e.g., the Middle East, Eastern Europe or Latin America. Lately it began entering such developed countries as the UK, Japan, Australia, Greece and Spain. So far it has built a remarkable project performance network covering over 30 states/regions around the world. Typically order taking is not a job done in "stay-at-office" manner. Instead, only "go-global" for face-to-face communication can get the job done. Stationed abroad, Ms. Yang run a tough schedule. To get a good knowledge of geography and customs in different countries, she did a considerable amount of work, "because our job is concerned with visits by and large." Now she is an expert in customs and folkways of all countries concerned, "only when you respect customers can they grant an opportunity

of negotiation." Besides, she also masters history and current political situation of every relevant nation, "it works well by standing in customers' shoes when it comes to engineering." In addition, she is a bookworm, who prefers original-edition books, "translations deliver translators' ideas only. By reading original editions, I can better understand authors' ideas and countries authors are from." Ms. Yang left her footprints almost all over the world. She led the team to undertake orders worth approximately CNY 300 billion in accumulation. Wherein, India alone ordered 103 generator sets. Moreover, she deemed building a global marketing network as an essential condition for greater market development. To this date the Engineering Company has set up 25 international establishments, offices or branches/subsidiaries. The Company's international landscape has taken shape initially. Furthermore, she gave a priority to management of international institutions and people assigned overseas. She demanded that relevant units and staff keep following local policies, laws and regulations as well as concerns and challenges in international market, do a research on rivals and key customers, and take the initiative to establish sound relations with local embassies, laying a solid foundation for international market development. Initially composed of three members only, the Company's sales team has been upsized to comprise nearly 100 employees with ambition.

"ROAD WARRIOR"

Winning international power generation engineering bids was not all roses. The international electric power market competition was aggravated by global economic meltdown and uncertainties, e.g., malicious price competition, challenging financing or failed attempt of new business models. Despite the setbacks, Ms. Yang did not give up. She organized the preliminary bidding department in each failed project to analyze reasons for the failure and set up an international market bidding project team for working on groundbreaking know-how. The team initiated a project Report on More Competitive Pricing and put into practice relevant research findings in project bidding with significant effectiveness thereafter. Ms. Yang seems a pathfinder from where her subordinates and other employees can see. "While working, she is at the forefront at all times. She is detail-oriented, giving all respects into consideration. Her female nature of subtleness plays a vital part in business negotiations in particular," said Xu Di from the Business Department. "She

impresses us all by sensitivity to market."

Seizing the opportunity of China's "One Belt One Road" Initiative, Ms. Yang as a team leader kept deepening the Company's international energy cooperation for gaining first-mover advantage in the energy market. Under the witness of national leaders, the Company contracted many major large projects with global influence, e.g., Pakistan Thar Project, UAE Dubai CSP Project, or Egypt Hamrawein Clean Coal Power Project.

Hard work is the key to success. Dubbed "road warrior" by her colleagues, Ms. Yang spent more than 200 days a year on business trips around the world. Speaking of her busy schedule, Ms. Yang neither moaned nor groaned. Instead, she appreciated the time up to her to use her discretion. Waiting for flights, she adjusted her mood by listening to music,



local music from destinations in particular, "it (music) is a medium of mind communication, which gives a better description of the local city than words." She has been an advocate of having fun in working. Over the past two decades, Ms. Yang kept being conscientious with no room for a trace of slackness in corporate development. Yet not all international engineering projects were built in peaceful and safe places. Apart from harsh circumstances, wars and terrorism among other risks sustained in some projects.

Years ago the Engineering Company got involved in the power generation engineering reconstruction project of a certain nation that lately recovered from war. Predictably it was a challenging project for full forecast on various possibilities in the future based on guarantee on safety and progress. Nonetheless Shanghai Electric won the project and completed relevant contracting and building work safe and sound. Shanghai Electric is now spoken highly of by the nation of project which meets nearly 35% of electric power needs within territory of the nation.

DOWN-TO-EARTH WITH FORESIGHT

In the ever-changing times, all industries and sectors become more standardized, transparent, normalized, service-, market- and data-oriented. For international projects in particular, various creative industrial patterns keep emerging one after another, optimizing and substituting former ones. Besides, relevant firms are better aware of openness and fairness needed in competition and service rendering.

EPC and BTG apply to most projects of the Engineering Company but fail to gratify emerging market customers in the new era, particularly those acting on international standards or raising personalized requirements, "if we make no breakthrough through innovation, we will hit a bottleneck and even end with debacle in international market development." Ms. Yang saw a quick and radical movement from traditional energy to green energy on the international energy market, indicating new requirements, new markets and new changes.

Innovation-minded Ms. Yang began tapping into CSP, PV, sea water desalination, energy storage, waste-to-energy plant and other emerging energy niches regardless of hardships. Besides, she had a shot at a plurality of new investment and financing models. UAE Dubai PV CSP Hybrid Project was put into practice in the corresponding period as well, which, as the world's largest solar CSP project by installed capacity, will supply green clean energy to Expo Dubai 2021 with total installed capacity of 1850MW.

Ms. Yang is adept in learning, coordinating and addressing problems arising out of balance between life and work or industrial arrangement. She longed for well sleeping for days when she was busy. But realizing that she is bound to discharge duties subject to jobs taken, she gets accustomed

to shift between life and work through self-regulation and -balance step by step. She has learned to enjoy herself in life and work. Even when she takes days off, she gets immersed in research and study for fun.

In this respect hobbies are helpful. Ms. Yang is fond of fine arts and music. She spends spare time working on the brushwork and composition of every painter that falls into the neo-classical school or impressionist school. For example, she feels delighted while appreciating Renoir's paintings or gets stunned by fantastic landscape in Levitan's landscapes. When she is upset, she prefers listening to music to calm down, "those works of arts are thought-provoking. Spending time on my hobbies, I am reassured and can clear my mind to consider what really matters."

"I prefer to look ahead. After projecting this year's development, I work out plans for one or two years later. Then I work hard every day to implement the plans." With dream and mission, Ms. Yang is ready to soar. **D**



DEPTH REPORTS

INNOVATIVE APPROACH



“HYDROGEN” UNIT INSTALLATION:

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min hydrogenation, 700km endurance, categorically zero emission “hydrogen vehicles” stepped into our vision are giving us boundless leeway to visualize means of transport.

Technical evolution changes our life. Every new technology moves our times one step forward while emerging from its corresponding field. For energy, there is a growing call from the international community for environmental protection. Hydrogen energy has stolen the limelight of the industry and become next inflection point in development history of new energy technology for such distinctive strengths as diversity of sources, high fuel efficiency, and zero emission and pollution. In recent years, with the escalation in the technology readiness level, the industrialization of hydrogen energy has stepped into the “acceleration period”. Seizing the development opportunity, Shanghai Electric has sped up its green energy transformation and development through “hydrogen” unit installation. Lately Shanghai Electric contracted its first integrated hydrogen energy demonstration project at Ningdong Base. Many more integrated green hydrogen energy demonstration projects are to be arranged and play a leading part in the industry based on advanced technologies in the full hydrogen energy industry chain.

SHANGHAI ELECTRIC ON THE FAST TRACK OF HYDROGEN ENERGY DEVELOPMENT

FASTER HYDROGEN ENERGY DEVELOPMENT UNDER POLICY SUPPORT

In recent years, China has spared no effort to promote construction and development of environment-friendly new energies, hydrogen energy in particular. In 2020, relevant national policies and guides as well as local measures were unveiled one after another, which is a clear signal for expediting development of hydrogen energy industry. On March 17, the National Development and Reform Commission and the Ministry of Justice co-delivered the Opinions on Establishing a System of Green Production and Consumption Regulations and Policies at Faster Pace, where reference is made to studying and making standard specifications and favorable policies for hydrogen energy development.

On March 23, hydrogen energy was listed among the key project fields of the year 2020 in the annual project application guide of the National Key R&D Program "Basic Technologies and Key Spare Parts in Manufacturing". 14-28 projects are to be initiated in hydrogen energy, solar energy, wind energy, renewable energy, etc., which will be funded CNY 606 million in estimation.

On April 28, the Ministry of Finance, the Ministry of Science and Technology, the Ministry of Industry and Information Technology (MIIT) and the National Development and Reform Commission jointly issued the Notice on Improving Policies of Fiscal Subsidies for New Energy Vehicle Promotion and Application, proposing a 4-year plan for building industry chains of hydrogen energy and fuel cell vehicles, making breakthroughs in core technologies in key fields, and setting a sound paradigm with fair arrangement and coordinated development. In November, piles of relevant documents were introduced, concretely setting the industrial goal in hydrogen fuel cell technology. On November 2, the General Office of the State Council issued the Development Planning on New Energy Vehicle Industry (2021-2035), urging development of technologies in favor of the application of hydrogen fuel cell vehicles, such as the hydrogen energy storage and transport, hydrogen filling station, and on-board storage of hydrogen.

On November 9, the official website of the Ministry of Science and Technology announced that, in conjunction with plans for national scientific and technological development over the medium and long term and dedicated efforts for key projects of the National Key R&D Program during the period of the "14th Five-Year Plan", it will continue to strengthen the research on hydrogen energy and fuel cell technology, accelerate the substantive breakthrough of core technologies, and improve the maturity of fuel cell technology, so as to provide a powerful support for technical progress and industrial development of fuel cell vehicle commercialization.

Policies unveiled at high frequency have also expedited building a hydrogen fuel cell industry chain in China. So far, Guangdong, Wuhan, Shanghai, Qingdao and Chongqing, among other places, have promulgated favorable policies for hydrogen energy development.

TRANSFORMATION AND UPGRADING TO HYDROGEN ENERGY AND COMPREHENSIVE ENERGY FIELD

Hydrogen energy is an important direction of global energy technology revolution. Accelerating the development of hydrogen energy industry is a strategic resort in coping with global climate change, safeguarding national supply of energy and realizing sustainability, as well as a significant move to build a "clean, low-carbon, safe and efficient" energy system and promote energy supply-side structural reform.

Conventional hydrogen production by fossil energy yields a considerable amount of carbon dioxide. In contrast, production of hydrogen by water electrolysis is environment-friendly

HYDR



for generating no incidental carbon, seen as a new path of delivery of renewable energy. The production of hydrogen by water electrolysis has great market potential. In 2020, relevant market size hits 880,000 ton/year, and will skyrocket to 5.25 million ton/year by 2030 as predicted by authoritative organizations. As the core sector of Shanghai Electric Group, Shanghai Electric Power Generation Group specializes in the manufacture of power generation equipment, engineering and services of power plants. This year Shanghai Electric Power Generation Group set up its own Business Unit of Hydrogen Energy as

an act of building a paradigm in the hydrogen energy industry. Through transformation and upgrading, it takes aim at speeding up crossover development.

Taking a prime position in application of fuel cells in heavy-haul and long-haul transportation, Shanghai Electric Group Co., Ltd. Central Academe began researching into PEM fuel cell technology targeting logistics vehicles, trucks, and cold chain vehicles among other applied scenarios of transportation in 2016. After three years of cumulative efforts on independent research & development, fuel cell engine system, pile and membrane electrode technologies and products have been successfully developed.

Actually relevant technologies and products have been delivered a year earlier, which Shanghai Electric holds complete intellectual property rights for. It indicates that Shanghai Electric has built up competitiveness in the fuel cell engine system-pile-membrane electrode industry chain based on full mastery of relevant technologies. Meanwhile Shanghai Electric has set a technology roadmap for other core NEV parts as well, bearing the advantage of shared channels and R&D resources.

Subject to the technology roadmap for hydrogen energy development, Shanghai Electric is aimed at quickly grasping capabilities of developing core technologies and manufacturing core devices for environment-friendly production of hydrogen through technology research & development and industry cooperation. Besides, it will also establish a new energy industry ecosystem integrating power supply, grid, load and storage of hydrogen catering to relevant applied scenarios. Hydrogen energy will act as the prime medium of all links between energy and chemical engineering. Complementing core devices for power supply, grid, load and storage of hydrogen, the ecosystem is expected to drive common development of relevant equipment sectors in Shanghai Electric.

HYDROGEN



POWER SUPPLY-GRID-LOAD-STORAGE- HYDROGEN ENERGY INDUSTRY BUILDING

PWC projects the demand for hydrogen for lab purposes will reach about 530 million tons by 2050 in The Dawn of Green Hydrogen published in 2020. "Hydrogen will account for 10%-15% of China's energy system by 2050. As vital part of our national energy strategy,

the base will be able to provide energy in various types efficiently, like cooling, heat, electricity, steam and hydrogen, as an excellent example of source-grid-load-storage-hydrogen integrated development and hydrogen's whole chain development of "manufacturing-

HYDROGEN

hydrogen energy will play a collaborative and complementary role in the energy system to fuel emerging industries valued dozens of trillions of Yuan for end users in the system with the electric power industry," predicted Gan Yong, an academician from the Chinese Academy of Engineering.

As one of China's biggest energy equipment manufacturers, Shanghai Electric continues to promote the transformation and innovation of new energy. It has a full range of project development capabilities, marketing & branding capabilities, investment & financing capabilities, and EPC capabilities in new energy power generation in the field of new energy power generation. Besides, it also lays a solid foundation of synergy and builds up a superiority of resources in upstream power generation and downstream chemical metallurgy in the industry chain. Put together, such elements concerned will accelerate the switch of Shanghai Electric into production of hydrogen.

On December 14, Shanghai Electric signed the collaboration agreement on the demonstration project of source-grid-load-storage-hydrogen integration and hydrogen battery's application in heavy trucks, which is located in Otog Front Banner, Ordos City, Inner Mongolia Autonomous Region. According to the agreement, the project includes building a super-large new-energy-based power generation base that is equipped with large electrochemical energy storage and hydrogen-producing facilities, steam-powered islands, smart regional distribution networks, and heat and hydrogen pipelines. After being completed,

transportation-storage-application". Shanghai Electric will leverage its industrial and technological strengths to formulate solutions for new-energy-based power generation + energy pipelines + hydrogen + energy storage + green chemistry, and transportation systems, and assist the development of the new energy ecosystem defined by source-grid-load-storage-hydrogen integration.

Currently, Shanghai Electric has devised a number of integrated green hydrogen energy demonstration projects with leading effects at Ningdong Energy Base, one of the four modern coal-fired chemical industrial demonstration zones in China. Among them, the "power supply-grid-load-storage of hydrogen" integrated demonstration project at the Ningdong Base combines renewable energy power generation, energy storage, production of hydrogen by water electrolysis and green chemical/metallurgy industry chain together, deemed by Shanghai Electric as one of major orientations in energy transformation and development. All demonstration projects concerned are expected to facilitate Shanghai Electric to transform and upgrade towards hydrogen energy and comprehensive energy. As hydrogen energy industry is booming, new energy + hydrogen is emerging step by step. Facing the challenges in the new field, Shanghai Electric will keep following national and local policies on the hydrogen energy industry and strengthen exchange and cooperation with government sectors, and relevant enterprises and scientific research institutions to carry out more demonstration projects with effort. **D**

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