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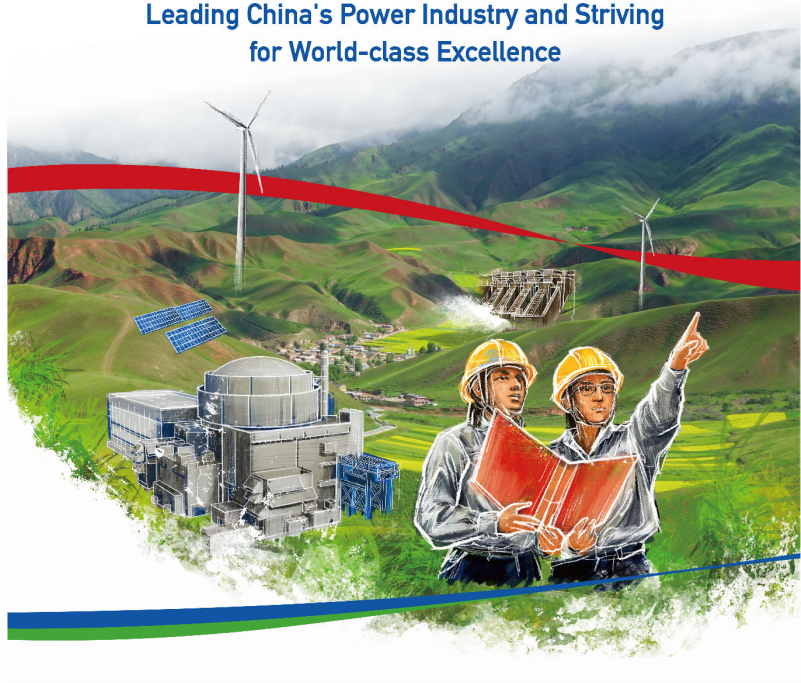
 中国华能集团有限公司
CHINA HUANENG GROUP CO., LTD.

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CHINA HUANENG GROUP CO., LTD.

2022

Environmental, Social and Governance Report

Leading China's Power Industry and Striving
for World-class Excellence



This report, the 17th consecutive sustainability report released to the public by CHNG since 2006, is the first special report named as "Environmental, Social and Governance (ESG) Report". Based on the principles of objectivity, standardization, and comprehensiveness, this report fully incorporates the latest policies and corporate strategy, and delves into the ESG concept embedded in its "three-color" culture, internalized in its main business, and coexisting with its development goals. Besides, this report explores an ESG management and practice system with "CHNG characteristics", systematically sorts out and truthfully discloses information concerning its fulfillment of ESG indicators with "CHNG characteristics", demonstrates corporate responsibility, and shapes a good image of corporate citizen that pushes the higher-quality and more sustainable corporate development.



The logo of China Huaneng Group consists of the deformation of letters "H" and "N". "H" and "N" are the first letters of Chinese phonetic transcription of "Huaneng", and the meaning of the combination is: contributing energy and adding power for national rejuvenation while creating happiness. Letter "H" adopts a bold font, which is powerful and vigorous, presenting a visual image of safety, reliability and steadiness; letter "N" connects letter "H" with three rays to form a lightning font, symbolizing perpetual and unlimited power; and dark blue is chosen as the base color, demonstrating solemnness, rigor, serenity and harmony, as well as broad-mindedness and lofty ambition. The shape of the letters resembles mountain peaks, emitting a grand atmosphere; the composition of the logo is neat and orderly, giving a sense of solemnness; and the superposition effect is concise and lively, full of vitality, exhibiting the sacred mission and demeanor of Huaneng as a key state-owned backbone enterprise.

About this Report

Reporting Period

January 1, 2022 to December 31, 2022. Some of the contents go beyond the above range.

Reporting Cycle

This report is an annual report released to the public in the third quarter of each year.

Main Contents

This report discloses CHNG's policies, practices and performance in 2022 in main business, environmental, social and governance aspects. Its relevant basic source materials are all drawn from relevant company documents, statements and grassroots enterprises.

Compilation Basis

The 2030 Agenda for Sustainable Development by the United Nations
The Ten Principles of the UN Global Compact by the United Nations
Unified Standard for the Sustainability Reporting from the Global Reporting Initiative (GRI)
Environmental, Social and Governance (ESG) Reporting Guidelines issued by Hong Kong Exchanges and Clearing Limited
ISO26000: Guidance on Social Responsibility (2010) issued by the International Organization for Standardization
Guidelines on Social Responsibility (GB/T36000-2015) issued by the Standardization Administration of the People's Republic of China
Reference-Index System for ESG-Special Reports of Listed Companies Controlled by Central SOEs issued by State-owned Assets Supervision and Administration Commission

Title Description

For convenience of expression, in this report, "CHNG", "Huaneng Group", "Huaneng", "the Company" and "We" refer to "China Huaneng Group Co., Ltd.".

Online Access to the Report

The Report is available in Chinese and English. The video version is also available. The Chinese version and the video version are released at the same time. Please visit our website at <https://www.chng.com.cn>, or call 010-63287711 to request for the Report.
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The 20th National Congress of the Communist Party of China is a meeting of great importance. It takes place at a critical time as the entire Party and the Chinese people of all ethnic groups embark on a new journey to build China into a modern socialist country in all respects and advance toward the Second Centenary Goal. The decisions, deployments, and achievements made at the national congress will undoubtedly play a very important guidance and assurance role in building a modern socialist country in all respects, advancing the great rejuvenation of the Chinese nation on all fronts, and striving for the new success of socialism with Chinese characteristics.

Study, publicity, and implementation of the guiding principles of the 20th National Congress of the Communist Party of China were our primary political task. A wave of study, publicity, and implementation has been sparked rapidly. Party organizations at all levels were organized to listen to or watch the 20th National Congress of the Communist Party of China. Members of the Party Leading Group took the lead in study based on the actual situation, and guided Party members and officials to hold high the great banner of socialism with Chinese characteristics. Moreover, by deeply studying and understanding the guiding principles of the 20th National Congress, forging ahead with fortitude, working perseveringly and diligently, China Huaneng promoted its high-quality development driven by the guiding principles of the 20th National Congress of the Communist Party of China, and strived to be the first to build a world-class company with global competitiveness in the industry, showcasing Huaneng's responsibility and making contribution on the journey to build a modern socialist country in all respects and advance the great rejuvenation of the Chinese nation on all fronts.

Party Organizations at All Levels Listened to or Watched the 20th National Congress of the Communist Party of China



- ① Members of the management team of the Group, and representatives of Party members and officials from various departments of the headquarters and units directly affiliated to the Group
- ② Members of the management team and department heads of Huaneng Power International, Inc.
- ③ Maintenance staff of Zhuribe Central Station of Huaneng Renewables Corporation Limited
- ④ Frontline employees of Changjiang Nuclear Power Project
- ⑤ "Raining 10" Ship employees of Raining Shipping
- ⑥ Production frontline employees of Gansu Company
- ⑦ Officials and workers of Lower Sesan II Hydropower Station
- ⑧ Officials and workers of Pakistan Sahwal Power Station

CHNG in High Quality Development

The 20th National Congress of the Communist Party of China has pointed out the direction and established the action guidelines for us to plan and promote high-quality development. We need to plan, reflect, and drive the Company's work within the overall interests of the Party and the country.

Standing at a new starting point, we must rely on tenacious efforts to open up a new field for Huaneng's cause. Adhering to integrity, innovation, and unity, comprehensively embarking on a new journey of leading China's power industry and striving for world-class excellence, are the company's strategic choice to adapt to the new situation, shape new advantages, and achieve new leadership position.

— Speech by Wen Shugang, Chairman of Huaneng, at the 2023 Working Conference

Guided by the "366" Strategy

Strategic Vision

Leading China's Power Industry and Striving for World-class Excellence

Basic Path

Deepen Reform for Better Quality. Deepen Reform for Higher Efficiency. Deepen Reform for Stronger Impetus

Development Strategy

Focusing on the "3 Guidances", Ensuring the "6 Persist-ins", and Realizing the "6 New Leaderships"

"3 Guidances" as the Overall Requirements

One Development Goal:

Accelerate the Building of a World-class Enterprise

One Development Theme:

Step up Efforts to Advance High-quality Development

One Development Direction:

Vigorously Accelerate Green and Low-carbon Transition

"6 Persist-ins" as the Strategic Direction

Persist in Green Development
Persist in Enterprise Reform
Persist in Value Creation
Persist in Risk Prevention and Control
Persist in Sci-tech Innovation
Persist in Party Building as the Guiding Force

"6 New Leaderships" as the Strategic Task

New Leadership in Sci-tech Innovation
New Leadership in International Development
New Leadership in Green Transition
New Leadership in Corporate Governance
New Leadership in Efficiency and Effectiveness
New Leadership in Party Building Quality

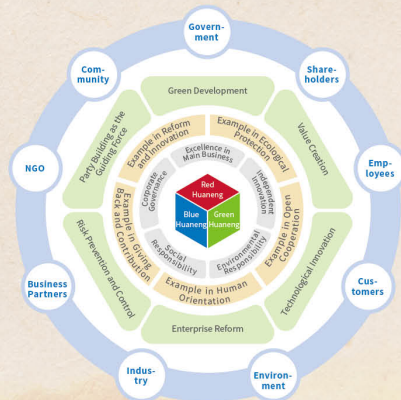
Driven by the Three-color Culture

A "red" company that serves national strategy, safeguards energy security, and serves the need of socialism with Chinese characteristics

A "green" company that facilitates energy revolution, protects the environment, and supplies clean energy to ensure a better life for the people

A "blue" company that participates in global energy governance, serves the Belt and Road Initiative, and contributes to building a community with a shared future for mankind

ESG System with Huaneng Characteristics



Persisting in serving national interests and development strategies
Serving as an example in promoting economic and social development in all respects

Persisting in scientific development and technological innovation
Serving as an example in building a resources-conserving and environmentally friendly society

Persisting in pursuing enterprise value in a rational way
Serving as an example in promoting harmonious progress of both the enterprise and society
Persisting in the principle of relying on employees and working with the public to develop the enterprise
Serving as an example in putting people first and sharing benefits

Persisting in giving back to society and benefiting the people
Serving as an example in practicing social ethics

Board of Directors



Wen Shugang
Chairman of the
Board of Directors



Deng Jianling
Board Director and
President



Zhang Wenfeng
Board Director



Xu Ping
External Board
Director



Zhu Yuanchao
External Board
Director



Zou Zhengping
External Board
Director



Liu Yuezhen
External Board
Director



Yan Xiaopeng
Employee Director

Management Team



Wen Shugang
Chairman of the
Board of Directors



Deng Jianling
Board Director and
President



Zhang Wenfeng
Board Director



Fan Qixiang
Vice President



Wang Yihua
Chief Financial Officer



Wang Wenzong
Vice President



Wang Limin
Chief Compliance Officer



LI Xiangliang
Vice President



Zhang Tao
Vice President

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Message from the Chairman



Chairman of the Board of Directors: Wen Shugang

In 2022, a significant year in the history of the Party and the country, the 20th National Congress of the Communist Party of China was successfully held to plan the great cause of national rejuvenation, create a blueprint for a powerful country, which has provided scientific guidance for promoting high-quality development of enterprises. The year of 2022 is also an extraordinary year in the development history of Huaneng Group. The Company focused on the overall situation of the Party and the country, and deeply understood the corporate mission and responsibility in the new era and on the new journey. Various undertakings for building a world-class enterprise have achieved vigorous development and significant progress in the year.

In response to the complex and severe situation of the overlapping of changes unseen in a century and the pandemic, as well as the deep adjustment of global political landscape and energy supply and demand pattern, CHNG has taken the initiative and overcome difficulties under the strong leadership of the Party Central Committee with Comrade Xi Jinping at the core, demonstrating the fearless and enterprising spirit to move forward. Study, publicity, and implementation of the guiding principles of the 20th National Congress of the Party are always CHNG's primary political task. CHNG continuously strengthens ideological and political guidance, and guides the Party members and officials to deepen their understanding and take practical actions; as a pacesetter in the power generation industry, CHNG has successfully completed the energy security tasks during important periods, hitting historical highs in power generation and heating capacity, and functioning as a pillar and stabilizer; according to the national strategic demand, we, with the pioneering spirit, continuously lead the industry's progress. CHNG has achieved new breakthroughs in core technologies in key fields, significantly enhancing the vitality of technological innovation.

Contributing Huaneng Wisdom for Green and Low-Carbon Transition. Pursuant to the national carbon peaking and carbon neutrality goals, CHNG actively promoted energy structure adjustment, and the clean energy sector became the primary source of profit and key supports. The approved renewable energy has exceeded 70,000 MW, and nearly 13,000 MW have been put into production, setting a record high; CHNG continuously improved the development of conventional energy, increased efforts to upgrade and renovate environmental protection equipment, and reduced resource and energy consumption, with an aim to resolutely tackle pollution prevention and control. The main energy consumption indicators and pollutant emission performance were leading in the industry, and the carbon dioxide emission intensity per kWh of electricity generation has decreased by 1.89% year-on-year; moreover, adhering to the concept of "Developing While Protecting, Protecting while Developing", CHNG has firmly established the awareness of ecological red line, creating a batch of green power projects that coexist harmoniously with the environment. **Providing Huaneng Solution for Building a Harmonious Society.** CHNG attached great importance to the health and safety of its employees, organized high-quality labor competitions and vocational skills competitions, cultivated multiple "Craftsmen of Huaneng" and "Craftsmen of the Nation", and continued to carry out safety education and training as well as "double-improvement" activities of safety management to ensure overall safety in various fields; while supporting its own business in becoming stronger and better, CHNG actively played a leading role, and opened up cooperation with governments, enterprises, and overseas institutions in a wider range of areas to support the national major regional strategies. Its targeted assistance work has received the highest evaluation in the national assessment for six consecutive years, making contributions to industry development, local development, and international development. **Offering Huaneng Strength for Modern Corporate Governance.** CHNG has established and improved the modern enterprise system with Chinese characteristics, strengthened the level of corporate governance according to law, continuously improved the market-oriented operation mechanism, and further enhanced the vitality of the enterprise. The three-year action of state-owned enterprise reform has achieved high-quality results. In this way, CHNG fully completed the key tasks of benchmarking first-class management, and won 35 national awards for management innovation achievements; with the continuous growth of the operating performance in adversity, the operating revenue was RMB 424.5 billion yuan, a year-on-year increase of 10%, and the total profit was RMB 22.7 billion yuan, a year-on-year increase of 71%, indicating new breakthrough in maintenance and appreciation of state-owned assets.

We forge ahead to write a new chapter in the new era. The year 2023 marks the start of the full implementation of the guiding principles of the 20th National Congress of the Party. It is a significant transitional year during the 14th Five-Year Plan period, and for Huaneng to embark on a new journey to lead China's power industry and strive for world-class excellence. Therefore, it is of great significance to do well in all aspects of work. CHNG will adhere to the guidance of Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era, comprehensively implement the guiding principles of the 20th National Congress of the Communist Party of China, work hard with a sense of responsibility and ensure the completion of the tasks with high standards and high quality, so as to build a world-class enterprise with global competitiveness.

Great truths are always simple, and actions speak louder than words. In the future, CHNG will unite more closely around the leadership of the Party Central Committee with Comrade Xi Jinping at its core, and comprehensively grasp the new demands in the new era and on a new journey. Moreover, by taking high-quality development as the primary task, supply-side structural reform as the main line, reform and innovation as the fundamental driving force, and high-quality party building as the guarantee, CHNG will make every effort to lead China's power industry and strive for world-class excellence, and make new and greater contributions to building China into a modern socialist country in all respects!



Supporting Main Business in Becoming Stronger and Better, Leading China's Power Industry

Report to the 20th National Congress of the Communist Party of China - Action Guide

We will thoroughly advance the energy revolution. Coal will be used in a cleaner and more efficient way, and greater efforts will be made to explore and develop petroleum and natural gas, discover more untapped reserves, and increase production. We will speed up the planning and development of a new energy system, properly balance hydropower development and ecological conservation, and develop nuclear power in an active, safe, and orderly manner. We will strengthen our systems for energy production, supply, storage, and marketing to ensure energy security.

— Report to the 20th National Congress of the Communist Party of China by Xi Jinping

Ensure Energy Supply

The Company firmly shouldered the political responsibility for energy security and supply guarantee. During the most severe period of the COVID-19 pandemic, nearly a hundred power plants and some coal mines implemented fully-enclosed management, ensuring that all power units were fully operational at full capacity. Under extreme weather conditions, all power units maintained safe and stable operation, standing the test of heavy loads and long-term electricity demand. With "preventing risks, ensuring safety, and welcoming the convening of the 20th National Congress" as the main task, 8 power plants including Beijing Cogeneration Power Plant improved the inspection and on-duty system to ensure power supply for the convening of the national congress. The Company was mobilized to pool strength in successful completion of important energy supply tasks during critical periods and major events such as "COVID-19 Prevention and Control", "Response to Power Demand Peak of the Summer", "Flood Control", "the 20th National Congress of the Communist Party of China", "Two Sessions", and "Winter Olympics (Paralympics)", and highly recognized by the relevant national ministries and commissions, as well as provincial Party committees and governments in various regions, demonstrating Huaneng's political responsibility.

In 2022, the Company's domestic power generation was 791,100 GWh in total, a year-on-year increase of 2.13%, reaching a new historical high, including 583,400 GWh from thermal power, 115,500 GWh from hydropower, 73,900 GWh from wind power, and 18,400 GWh from PV power, respectively, with a year-on-year decrease of 1.19%, an increase of 4.37%, an increase of 18.27%, and an increase of 66.09%. The utilization hours of thermal power, hydropower, wind power ranked first in the industry benchmarking. On August 15, the Company's domestic power generation reached 2,831 GWh, setting a daily record high.

The Company's merchant electricity trading is 539,300 GWh, accounting for 87% of the on-grid electricity of the Company. In terms of wholesale electricity market, the Company has cumulatively obtained a market trading electricity indicator of 584,400 GWh, with a year-on-year increase of RMB 0.082 yuan in contract prices; in terms of retail electricity market, the Company has signed a total of 284,600 GWh of retail electricity, a year-on-year increase of 49.8%, with 21,400 contracted retail customers, a year-on-year increase of 10,000 customers.

As the largest domestic civil heating enterprise, the Company has actively seized the market in northern China. Its 82 heating enterprises, 220 heating units, and 2,890 heating stations are all working at full capacity, resulting in an incremental heating area of 62.5 million square meters. The total heating area has exceeded 1 billion square meters, and the annual heating capacity was 487 million GJ, a year-on-year increase of 7.36%, reaching a new historical high. The annual steam supply capacity was 36.85 million tons, a year-on-year increase of 3.13%.



In December 2022, Wen Shugang, the Chairman of Huaneng, was invited by the Dialogue program of CCTV to introduce the Company's energy supply guarantee work to the national audience.



Scan the QR code to watch the complete interview

Power Supply Guarantee

Urging All Levels of Entities to Strengthen On-Duty Production: Enhanced the site organization and management of equipment maintenance, unit overhaul, and technical retrofit, and made full use of the downtime and holidays for decentralized implementation of maintenance projects at all levels, to ensure the backup readiness of the units to be put into operation at any time, strived for more power generation, and successfully completed the tasks of power and heating guarantee.

Reinforcing the Supervision of Unscheduled Shutdown and Output Limitations: Continuously carried out the special team work of restoring unplanned shutdown units and eliminating output limitations, conducted daily supervision of unplanned shutdown units, timely tracked the progress of repair and the recovery of unit output limitations, and made every effort to improve the start-up rate.

Enhancing the Assessment of Special Work on Energy Supply Guarantee: Developed and implemented the *Special Reward and Punishment Measures for Energy and Electricity Supply Guarantee*, made rewards and punishments after the end of the energy supply guarantee period, and made significant achievements in energy supply guarantee.

Fuel Supply Guarantee

Fulfilled Supply Guarantee Responsibility: Developed and implemented the supply guarantee plans for important periods such as "the 20th National Congress of the Communist Party of China", "Two Sessions", and "Winter Olympics (Paralympics)", organized a series of special meetings on supply guarantee, and effectively fulfilled the supply guarantee responsibilities at all levels.

Efficient Organization and Coordination: Played a role in centralized procurement, centralized allocation and transportation, and optimal resource regulation, balanced the surplus and shortage between hydropower plants and between the power plants in the same area, and maximized the effectiveness of limited resources to ensure supply safety.

Appropriate Inventory Management: Each power plant did well in inventory management in accordance with the "One Plant, One Strategy". At the end of October, the total inventory reached 18.5 million tons, an increase of 2.87 million tons year-on-year, achieving the winter coal storage target on schedule, and laying the foundation for ensuring supply and stabilizing prices during the heating season.

Strong Supply Guarantee in Key Areas During Critical Periods: Increased supply by way of emergency procurement and coordination with strategic suppliers, in timely and effective response to international geopolitical conflict events; placed emphasis on organization and transportation, purchased over 28 million tons of thermal coal in August, a year-on-year increase of about 2 million tons, effectively ensuring the high consumption of thermal coal caused by extreme weather.

Building High-Quality Projects

The Company attached great importance to the quality of power projects and laid a solid foundation for energy supply. For this reason, a full-process quality control system has been established, consisting of 32 management systems and 12 special inspection rules for 25 business sectors, to solidly promote the standardization and certification of the full-process quality management system; the Quality Supervision Center Station was organized to conduct quality supervision and inspection on 163 projects and 312 stages, and a total of 32,595 issues were identified. All issues have been promptly reported and rectified in a closed-loop manner, and the overall quality of each project has been under control; the equipment supervision entities were organized to supervise the equipment manufacturing of 308 projects, and a total of 5,167 issues were identified. Closed-loop measures for rectification were taken in a timely manner to ensure the quality of equipment delivery.

- Wunonglong Hydropower Station won the **Outstanding Project Award of China Quality Award**, one of the five global quality awards.
- Huangdeng Hydropower Station won the **National Quality Engineering Gold Award**.
- Puyang 500 MW Wind Power Project and Dafeng 400 MW Offshore Wind Power Project won the **National Quality Engineering Award**.
- Xiaowan Hydropower Station and Nuozhazu Hydropower Station have been selected as the **"Water Control by People Centennial Achievements" Water Control Projects** by the Ministry of Water Resources.
- Changing Power Plant and Huangtai Power Plant respectively won the **first and second prizes in the QC Achievement Publication Competition of Central SOEs**.
- Lidid Hydropower Station won the **China Electric Power Medium and Small-sized High Quality Engineering Award**.



Focusing on Industrial Synergy and Efficiency Enhancement

The Company focused on synergy to increase efficiency, centered on its main responsibilities and core business, and integrated the entire industrial chains and value chains to establish a new pattern of efficient collaboration in industries such as coal, finance, technology, and transportation, with the power industry as the core.

Focusing on the Development of Power Sector



The power sector of the Company adhered to the concept of green development, sped up the structural adjustment, strived to develop renewable energy such as wind power and photovoltaics, actively developed hydropower, developed nuclear power in a safe and orderly manner, to continuously improve the proportion of low-carbon and clean energy. In 2022, the installed capacity of the Company's wholly-owned and holding power plants at home and abroad reached 221.11 GW, a year-on-year increase of 7.38%, including the wind power installed capacity of 33.93 GW and the PV installed capacity of 17.35 GW, a year-on-year increase of 16.32% and 90.24% respectively.

Optimizing the Development of Coal Sector



The Company's coal sector achieved a profit of RMB 10.3 billion yuan, a year-on-year increase of 50.3%, exceeding RMB 10 billion yuan for the first time. The coal production capacity is 113.8 million tons per year, exceeding the threshold of 100 million tons, a year-on-year increase of 16.7%, ranking eighth in China and third among central SOEs. CHNG adhered to its internal collaborative strategy, with an investment of approximately RMB 4 billion yuan in the coal sector. Throughout the year, its coal mines provided a total of 62.9 million tons of coal to Huaneng power plants, a year-on-year increase of 21.3%, accounting for 2.2% of its own coal production, with a year-on-year increase of 6%. This not only effectively ensured its thermal coal demand, but also significantly reduced its power plant fuel costs, resulting in significant synergistic effects. In March 2022, Heaoyu Coal Mine was completed and put into operation, its main inclined shaft sinking of 5,853 meters set a construction record in domestic coal industry.

- A special team for internal industrial synergy has been established to deal with difficulties and problems in internal supply of coal in a timely manner, and the actual internal supply has reached the best level in history
- 4 new coal mines have been included as internal industrial synergy entities, with an annual synergy plan of 40.68 million tons, a year-on-year increase of 15.11 million tons, reaching a new historical high
- CHNG resolutely implemented the task of emergency replacement by imported coal, signed emergency replacement contracts for 4.5 million tons of imported coal, and effectively supplemented the supply gap of its coastal power plants
- The development of safe, green, intelligent, efficient and happy mines has been accelerated to create good conditions for transportation and sales of coal and electricity
- The intelligent integrated control platform for the coal industry has completed the hierarchical development of coal mines and been put into operation
- 2 national intelligent demonstration coal mines and 4 provincial intelligent coal mines have been completed

Effectively Developing Financial Sector



CHNG upgraded and adjusted the layout of the financial sector, actively served its main business of power and the real economy, prepared and implemented the *Key Points for Combining Industry and Finance, Improving Industry with Finance during the 14th Five-Year Plan Period*, improved the financial management system, to effectively plays the stable supporting roles of profit, function, and service.

- Guicheng Trust assisted the Group in issuing the first batch of carbon neutral bonds.
- Tiancheng Financial Leasing issued the first private renewable energy power station construction bonds in China.
- Great Wall Securities helped the Group successfully issue the first low-carbon transition linked bonds on the Shanghai Stock Exchange.
- Investment Company, Huaneng Invesco and others served the Company's renewable energy projects for over 6,000 MW.
- CHNG successfully issued its first special bonds for energy supply guarantee, with the issuance price at the minimum level of similar energy enterprise bonds with the same maturity.
- Huaneng Lancang River Hydropower Inc. issued the first perpetual medium-term notes labeled with Green Bonds + Rural Revitalization + Sustainable Development Linkage[®] in China.
- Great Wall Securities released the Smart Ecosystem Platform 2.0 for Technology and Innovation Finance to initially build a database of renewable energy technology and innovation enterprises, which has been selected as one of the "first batch of pilot projects of financial technology" by the China Securities Regulatory Commission.
- Great Wall Securities, Yuncheng Financial Services, and the like have provided financing of nearly RMB 30 billion yuan for CHNG and its upstream and downstream, and introduced an equity capital of RMB 13 billion yuan.

Vigorously Developing Science and Technology Sector



CHNG developed the *Special Plan for Scientific and Technological Innovation* and the *Implementation Plan for the Reform of the Scientific and Technological Innovation System and Mechanism*, to continuously improve the technological innovation system that focuses on CHNG, internal and external coordination, and full coverage of main business. The main business was closely integrated with scientific research, and the technological innovation provided more support and service for the early stages of projects, engineering and construction, production, and other fields of the power industry, to speed up the formation of a good development pattern in which the scientific research is financed by industrial development and the industrial upgrading is supported by scientific research. In 2022, the operating revenue of CHNG's technology sector was RMB 5.408 billion yuan, a year-on-year increase of 5.36%.

Developing Transportation Sector Steadily



CHNG continued to strengthen the industrial synergy, and improved the ability of coal, electricity, port and shipping sectors to jointly withstand the market risks. In 2022, the operating revenue of CHNG's shipping industry was RMB 5.91 billion yuan, a year-on-year decrease of 14.6%; the cumulative freight volume of shipping enterprises was 94.77 million tons, a year-on-year decrease of 6.49 million tons and a decrease of 7.1%, including 54.39 million tons of thermal coal transported for internal power plants, a year-on-year decrease of 8.7%; the cumulative throughput of CHNG's port enterprises was 89.54 million tons, almost unchanged year-on-year, including 30.21 million tons of thermal coal transferred for internal power plants, a year-on-year decrease of 2.7%.

Stepping up Efforts on Technological Innovation, Striving for World-class Excellence

Report to the 20th National Congress of the Communist Party of China·Action Guide

To meet China's strategic needs, we will concentrate resources on original and pioneering scientific and technological research to achieve breakthroughs in key fields. In order to enhance China's innovation capacity, we will move faster to launch a number of major national projects that are of strategic, holistic, and long-term importance. We will promote closer enterprise-led collaboration between industries, universities, and research institutes, stay goal-oriented, and promote the industrial application of technological advances.

— Report to the 20th National Congress of the Communist Party of China by Xi Jinping

Consolidate the Foundation of Technological Innovation Management

According to the national strategic demand, CHNG deepened the reform of the scientific and technological system and mechanism. Thus, innovation vitality and efficiency have been significantly enhanced, and innovation achievements continuously emerged, making solid progress in the development of national strategic scientific and technological strength. In 2022, CHNG received the bonus points (1.3 points) for scientific and technological innovation assessment by the State-owned Assets Supervision and Administration Commission, ranking first in the power generation industry. CHNG received a total of 63 ministerial/provincial-level technology awards, including 12 first prizes, ranking first among enterprises of the same type; two management innovation achievements were awarded the "Electric Power Innovation Award" by China Electricity Council.

Completion of R&D Investment Tasks: The R&D investment business training and supervision assessment were improved, and RMB 13 billion yuan was invested in R&D throughout the year, with an intensity of 3.06%.

Deepening the Process Management of Technological Projects: The special action of "Compliance of R&D Funds and Inspection of Technological Projects" was carried out to simplify the budget subject system of technological projects, and vigorously promote the development and efficiency improvement of technological innovation management system.

Improving the Development of the Technological Talent Team: CHNG prepared the *Action Plan for the Development of Technological Innovation Talents*, created a "Talent Zone", and cultivated strategic technological talents, leading talents in key fields, top technological talents, young technological talents, and high-level innovation teams according to levels and classes.

Improving the Quality of Standards and Patents

In Terms of Standard Setting, CHNG established standardization committees for renewable energy, hydropower, nuclear power, thermal power, coal, and information technology, standardized the entire process management of standard-related work, and actively organized project solicitation. CHNG approved 12 international standard projects throughout the year, with a funding of RMB 26.11 million yuan; 138 national standard, industry standard, and group standard projects were approved, with a funding of RMB 12.65 million yuan. In 2022, CHNG released 6 international standards, 4 national standards, 18 industry standards, and 14 group standards. Throughout the year, 41 employees were trained to become registered experts of international standard organizations, among which one was successfully elected as the representative of the Chinese IEC Young Professional. CHNG's international standard quality and number of awards ranked first in the industry.

In Terms of Patent Application, CHNG has established an intellectual property center to comprehensively strengthen the strategic layout of intellectual property in the core technology field, vigorously enhance the ability to create, apply, protect, and manage intellectual property, and promote the innovative development of the enterprise. In 2022, CHNG won 3 China Excellent Patent Awards, ranking first in the industry in terms of patent quality and number of awards, and became the only power generation enterprise to be listed in Class A patent quality evaluation by the State-owned Assets Supervision and Administration Commission. In 2022, CHNG has 11,629 patent grants, with year-on-year growth of 84.38%, including 1,217 patent grants for invention, 277 overseas patent grants. The average number of patents owned by 10,000 people is 1,975, ranking among the top central enterprises of the same type.

11,629

Patent Grants

1,217

Patent Grants for Invention

277

Overseas Patent Grants

Breakthroughs in Core Technologies in Key Fields

CHNG achieved breakthroughs in core technologies in key fields, and undertook the most national breakthrough tasks in the industry. CHNG successfully completed the breakthrough tasks at the first phase of the "1025 Special Program" and received 5 awards for outstanding team and individual contribution, ranking the first in the industry; 5 independently developed technologies were included in the *Recommended Catalogue of Technological Innovation Achievements of Central SOEs*, multiple achievements were selected into the list of the first (set of) major technical equipment in the national energy field, and 18 projects passed the evaluation of directly-entrusted projects on technology service with innovation advantage. CHNG promoted a new batch of major technological tasks in a well-planned way, and undertook over 40 national research projects; 3 national key R&D programs were approved, with the maximum number of CHNG-led programs over the years; 5 national major technology demonstration projects featured by "Technology Reward System" were launched; and CHNG undertook "breakthrough tasks at the second phase of the "1025 Special Program".

- The world's largest 18 MW half-direct-driven wind turbine, of which the research and development were led by CHNG, rolled off the production line, pushing China's wind power technology forward to the world's leading level
- CHNG led the research on key technologies for efficient and stable perovskite PV modules, with large-area perovskite PV module efficiency exceeding 18.5% (effective area 1,449cm²), the world's highest efficiency of similar batteries
- The world's first 1.5 million tons/year CCUS full process demonstration project completed engineering design independently
- The world's first large-sized homemade crystalline silicon matrix stacked PV module independently developed and manufactured by CHNG has completed the construction and commissioning of pilot line, with a yield rate of over 99.5%
- CHNG led the research on national efficient heterojunction battery technology task, delivered 8 PECVD units and 5 PVD units in cooperation with equipment manufacturers. Through collaboration with manufacturing enterprise, the mass production efficiency of heterojunction battery production line reached 25.2%, an advanced level in the industry
- CHNG developed a "coal power + solid-waste integrated collaborative disposal system with the largest single-unit treatment capacity of 300 tons/day in China
- CHNG developed high-throughput tower internals with low-pressure drop, as well as ultra-large tower equipment, achieving 100% localization of equipment and a reduction in packing pressure drop of over 30% compared to conventional industrial packing



Promoting the Commercialization of Scientific and Technological Achievements

CHNG vigorously advanced the implementation of innovative technologies, sped up the promotion and application of independently controllable technologies, made further headway in the commercialization of scientific and technological achievements, and effectively leverage its own advantages to lead the technological progress of the power industry.

- Promoted and applied Huaneng Ruwuo DCS system in 13 thermal power units, 5 hydroelectric units and utility systems, and renovated 8 thermal power units throughout the year
- Completed and put Ruijin Power Plant Phase II Project into operation as China's first large-scale smart power plant using the homemade control and information system (DCS/DEH/SIS)
- Built Huaneng Zhejiang Virtual Power Plant into the first virtual power plant in China, directly dispatched by the grid and participating in real-time response regulation, and won the **First Prize of Smart Industry in the 5G Application Competition** organized by the Ministry of Industry and Information Technology
- Accelerated the localized application, improvement and upgrading of homemade wind power PLCs, with a total of more than 100 units transformed and replaced
- Started construction of the first set of 135 MW validation project for COAP at Linyi Power Plant, which was the first in the world and original from Huaneng
- Built Huaneng Energy Storage Power Station, the world's first 100 MW-class energy storage power station under decentralized control, with the efficiency of refined and decentralized intelligent control technology for electrochemical energy storage up to 87.8%, at the international leading level
- Developed and put into service the world's first 2.7 MW tandem dual-wind turbine unit
- Huating Coal Industry's 200 thousand tons/year Polypropylene Technology Demonstration Project succeeded in one-step charging
- Developed internationally-leading intelligent key vibrofloatation equipment with independent intellectual property rights for deep overburden of hydropower, and applied it in Yingliangbao Hydropower Station
- Built the first 5 MW-class supercapacitor hybrid frequency modulation demonstration project in China, significantly improving the flexible regulation ability and power generation efficiency of units
- Successfully put into operation the world's first coal power coupled molten-salt heat storage demonstration project
- Applied the "Intelligent Monitoring System for Photovoltaic Power Stations" in Dezhou Dingzhuang Floating Photovoltaic Power Station
- Promoted and applied the 100% domestically-made core packaging for water-feeding pumps of GW-level units in Dalat Phase V and Zhengning Phase II

The Company Achieving the Localization of the "Brain" of Hydropower Stations



The core control system of hydropower units deemed as the "brain" of hydropower stations relies on imported key components for a long time. In order to overcome this "bottleneck", CHNG established a technical team to fully meet the advanced hydroelectric application needs of "remote centralized control and unmanned duty" in China. Extensive adaptation, comparison, and R&D work have been carried out in terms of the software and hardware of the hydroelectric core control system, with a total of 34 major innovations, of which 17 have filled the domestic gap. CHNG has successfully developed the Huaneng Ruwuo Hydroelectric Core Control System. This marks for the first time that the software and hardware of the core control system for large hydropower stations in China have achieved 100% localization, with a fully autonomous and controllable "domestic brain".

In November 2022, Xiaowan Hydropower Station successfully put into operation the Huaneng Ruwuo Hydropower Core Control System, and completed the localization transformation of four major control systems: computer monitoring system, governor, excitation system, and relay protection equipment. Thus, CHNG became the only power enterprise in China to master the key technologies of the four core control systems of hydropower units.



Scan the QR code to watch CCTV report on Localization of Core Control System of Hydropower Units for the First Time

Focusing on Building a Research Platform

With a focus on the national scientific and technological innovation development strategy, CHNG participated in the construction of Huanrou Laboratory, and took the lead in undertaking 2 major special research tasks. The "Efficient and Flexible Coal Power and CCUS National Key Laboratory" led by CHNG was listed into the first batch of 20 "National Key Laboratories". The Renewable Energy Grid Simulation Center, the Artificial Intelligence and Big Data Laboratory, and the Advanced Photovoltaic Technology Research and Development Laboratory were built, and the Energy Storage Laboratory was officially put into operation. CHNG deepened the collaborative innovation and integrated development between upstream and downstream enterprises, universities, research institutions and consumers, and took the lead in establishing a network security technology innovation alliance for power infrastructure.

Based on domestic independent and controllable development, CHNG has initially established a renewable energy intelligent operation and maintenance platform integrating "group-level company-plants". Through comprehensive and full-chain digital intelligent information management of the renewable energy industry, 75 application functions have been launched, connecting 484 renewable energy plants with a total of 44.95 GW. It has basically achieved full connection and has become the data platform system with the largest installed scale of renewable energy plants in China and the highest number of points.

Persisting in Stimulating Staff Innovation

CHNG furthered the "Mass Entrepreneurship and Innovation", guided the employees to carry out technological innovation according to needs and applications. Throughout this year, 419 Crowd Innovation Projects were established and 639 employees' technological innovation achievements were collected, which continuously stimulated employees' innovation potential and vitality.

CHNG formulated the *Management Measures for the Promotion and Transformation of Employees' Technological Innovation Achievements*, held a press conference on employees' technological innovation achievements and a signing ceremony for achievement transformation on which a total of 15 promotion and transformation achievements were signed, and participated in the First Innovation Exchange Conference for Craftsmen of the Nation organized by National Federation of Trade Unions to showcase 19 achievements and the deeds of 10 Craftsmen of the Nation.

The management of innovation studios have been improved, and 81 innovation studios were evaluated, which were generally in good operating condition; the development of innovation studios for maker and craftsmen was propelled, and 20 Huaneng makers and 44 Huaneng craftsmen were selected and commended; the members of innovation studio Alliances have increased to 153, and 242 key research (transformation) projects and activities of such alliances have been reviewed and released throughout the year. Moreover, training courses on alliance innovation methods have been organized to promote collaborative research and talent cultivation.

In 2022, 90 achievements of the Company were awarded the **National Technical Achievement Award for Electric Power Employees**, and 56 achievements were awarded the title of **National Technical Innovation Achievements of Excellent Employees in Energy Chemical and Geological Sectors**. The number and quality of award-winning achievements maintained industry-leading position; 5 achievements were awarded the title of **Technological Innovation Achievements of Employees by the China Workers' Technical Association**; 15 achievements were awarded the title of **Excellent Projects for Innovation and Efficiency Creation in Power Enterprise Teams**, and 1 entity was awarded the title of **Demonstration Entity of Power Enterprise Team Building**.



Contributing Huaneng Wisdom for Green and Low-Carbon Transition

6



7



13



14



15



ESG

Directional Navigation

Nature provides the basic conditions for human survival and development. Respecting, adapting to, and protecting nature is essential for building China into a modern socialist country in all respects. We must uphold and act on the principle that tural waters and lush mountains are invaluable assets, and we must remember to maintain harmony between humanity and nature when planning our development. We will advance the Beautiful China Initiative and take a holistic and systematic approach to the conservation and improvement of mountains, waters, forests, farmlands, lakes, grasslands, and deserts. We will carry out coordinated industrial restructuring, pollution control, ecological conservation, and climate response, and we will promote concerted efforts to cut carbon emissions, reduce pollution, expand green development, and pursue economic growth. We will prioritize ecological protection, conserve resources and use them efficiently, and pursue green and low-carbon development.

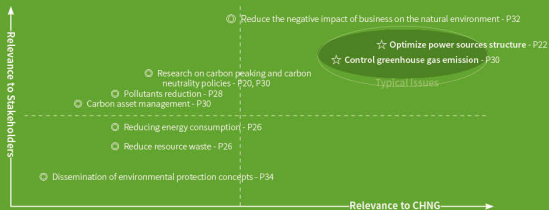
—Report to the 20th National Congress of the Communist Party of China by Xi Jinping

Hands-on Practice

- 22 Optimizing Power Sources Structure
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- 36 Focusing on the Carbon Peaking & Carbon Neutrality Goals and Exploring the Blue Ocean of Energy Storage Technology

Environmental

WHAT Identification of Core Environmental Issues



WHY Background Analysis of Typical Issues

More than 130 countries around the world have clarified the timeline for carbon neutrality, and promoting carbon peaking and carbon neutrality has become a universal consensus in the international community.

The proposal of the carbon peaking and carbon neutrality goals by the Party Central Committee with Comrade Xi Jinping as the core is a solemn commitment of China to the international community. According to the Report to the 20th National Congress of the Party, we need to work actively and prudently toward the goals of reaching peak carbon emissions and carbon neutrality, thoroughly advance the energy revolution, and speed up the planning and development of a new energy system to ensure energy security.

Under the guidance of carbon peaking and carbon neutrality goals, the national "1+N" policy system for carbon peaking and carbon neutrality" is constantly improving, and various provinces, regions, and industries have introduced carbon peaking plans. The total carbon emissions generated by energy combustion in China account for nearly 90%, with the emissions by the electricity industry accounting for about 40% of the energy industry's emissions. This shows that to achieve the carbon peaking and carbon neutrality goals, energy is the main battle position, electricity is the main battlefield, and coal-fired power is the main force.

CHNG is benchmarking 14 energy companies of the same type globally, and the green indicators urgently need to be improved. The industrial structure is mainly based on coal-fired power, and the installed capacity proportion of clean energy is still lower than the industry average. Some regional and industrial companies have not yet broken away from traditional path, and little impetus and few methods to develop clean energy have become the biggest weakness restricting the high-quality development of enterprises.

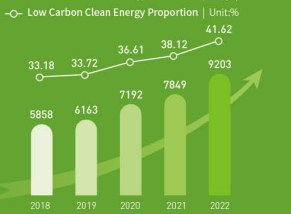
HOW Management and Response to Typical Issues

Guided by the carbon peaking and carbon neutrality goals, based on the guiding document on the country's work to achieve carbon peaking and carbon neutrality goals, the Action Plan for Carbon Dioxide Peaking Before 2030, and the Guidelines for Preparation of the Carbon Peaking Plan of Central SOEs formulated by the State-owned Assets Supervision and Administration Commission, CHNG resolutely implemented the new energy security strategy and formulated its *Action Plan for Carbon Dioxide Peaking* to accelerate green-oriented transition, according to the development goals and strategic layout of the 14th Five-Year Plan, in combination with the industrial structure.

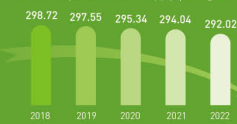
The Theoretical Learning Group under our Party Leading Group focused on studying issues related to carbon peaking and carbon neutrality, and made arrangements and deployments for relevant work according to the Company's *Action Plan for Carbon Dioxide Peaking*. CHNG should move faster to build a new pattern of high-quality development, adhere to increment with clean energy as the main focus, and strive to create the "three major pillars" including renewable energy, nuclear power and hydropower, ensuring that by 2025, the additional installed capacity of renewable energy will exceed 80 GW, and the installed capacity proportion of clean energy will exceed 50%. We need to vigorously promote the development of low-carbon and zero-carbon energy technologies, promote the application of low-cost carbon capture and sequestration technologies, and make effective use of technological innovation to help us become the pioneer and model in achieving carbon peaking and carbon neutrality.

PERFORMANCE Huaneng Intelligence

■ Low Carbon Clean Energy Installed Capacity | Unit:10 MW



■ Coal Consumption for Power Supply | Unit:g/kWh



■ Auxiliary Power Ratio | Unit:%



■ Greenhouse Gas Emission Intensity | Unit:g/kWh



PRACTICE Huaneng Intelligence

Electricity generation of Large-Scale Wind-Solar-Hydro-Storage Multi-Energy Complementary Energy Base Exceeded Trillion Kilowatt Hours.

The first batch of 7GW peak-shaving coal-fired power and supporting renewable energy projects in the Eastern Gansu Energy Base were under construction, and the second batch of 2.78GW renewable energy projects were approved.

The three hydro-wind-solar multi-energy complementary clean energy bases respectively located at the Tibet Section of Lancang River, Yunnan Section of Lancang River and Yajiang Middle Reaches were included in the national "14th Five-Year" power development plan and renewable energy development plan.

Two reactors of Shidao Bay High Temperature Gas Cooled Reactor Demonstration Project were brought into full-load power operation, and the PWR Project Phase I was available for approval.

Changjiang Nuclear Power Project Phase II was constructed in a safe and orderly manner, and the installation of Unit 3 nuclear island was started 46 days ahead of schedule, achieving the on-schedule completion of annual secondary milestone.

Jiangsu Jintan Salt-cavern Compressed Air Energy Storage National Demonstration Project was officially put into operation as the world's first large-scale non-supplementary combustion compressed air energy storage power plant.

PRIZE Huaneng Intelligence

The Company won the title of "Leading Enterprise in China's Industrial Carbon Peaking" awarded by China Federation of Industrial Economics for its outstanding practices and contributions in promoting green and low-carbon transformation.

The Company's theoretical article titled *Demonstrating the Responsibility of a Central SOE in Advancing Carbon Peaking & Carbon Neutrality* won the award of "Outstanding Theoretical Research Achievement in Learning and Faithfully Implementing General Secretary Xi Jinping's Important Statements on Developing the State-owned Economy" granted by State-owned Assets Supervision and Administration Commission of the State Council.

The pre-carbonization integrated machine developed by the Company was identified by the Chinese Society for Electrical Engineering as an internationally leading technology, and related technologies were included in the List of Leading Technologies of "INNOVATION CHINA" in the green and low-carbon field.

The "Key Technology of Systematic Ecological Restoration in Open-pit Mining in Extreme Cold Grassland Area" of Yimim Open-pit Mine was listed as the "Advanced and Applicable Technology for Mineral Resource Conservation and Comprehensive Utilization" by the Ministry of Natural Resources.

Miaowei Power Station was awarded the title of "National Soil and Water Conservation Demonstration Project" by the Ministry of Water Resources.

Optimizing Power Sources Structure

The Company actively served the national energy policy, and by promoting the Carbon Peaking & Carbon Neutrality goals and energy security, developed a medium- and long-term "3411" energy development framework focusing on building a new power system and a new energy system, continuously improved the energy security guarantee capabilities and advanced green and low-carbon transformation. The Company used renewable energy, nuclear power and hydropower as three major pillars for transformation, and promoted the construction of clean energy bases as the development path to boost the upgrading and adjustment of energy structures. In 2022, the Company's low-carbon clean energy accounted for 41.62%, an increase of 3.5% year-on-year, and its power generation set a new record, becoming the main source of profit and a key support.

Medium- and Long-Term "3411" Energy Development Framework of the Company

3 The "Three Major Pillars" (renewable energy, nuclear power and hydropower) and the optimized development of coal-fired power

1 "Ten Major Bases" with multi-energy complementarity from east to west and from north to south were basically completed

1 A decentralized and distributed contiguous development belt was basically completed

4 "Four Development Models", namely the integration of wind, solar and energy storage combined with environmental treatment in northern China, the integration of wind, nuclear power, gas and energy storage combined with comprehensive energy services along the eastern coast, and the integration of distributed scenarios for wind, solar, load and energy storage in mid-eastern China, gradually entered the mature stage

The Company adhered to optimizing its main business and strictly controlled investment in other businesses. Throughout the year, it invested RMB 104.4 billion yuan in the infrastructure in the power industry, including RMB 98.1 billion yuan in low-carbon and clean energy field, accounting for 94%, an increase of 5% year-on-year. The Company continuously increased effective investment in three pillar areas, i.e. renewable energy, nuclear power and hydropower, to ensure an incremental investment with good economic benefits. In 2022, the Company invested RMB 81 billion yuan in wind power and photovoltaic projects, an increase of RMB 28 billion yuan year-on-year; RMB 8.2 billion yuan in nuclear power projects, an increase of RMB 2.6 billion yuan year-on-year; and RMB 7 billion yuan in hydropower projects, an increase of RMB 1.1 billion yuan year-on-year.

Electricity Generation of Large-Scale Wind-Solar-Hydro-Storage Multi-Energy Complementary Energy Base Exceeded Trillion Kilowatt Hours



Case

As the main power source of the national "West-to-East Electricity Transmission" project, Huaneng Lancang River wind-solar-hydro-energy storage multi-energy complementary energy base had a total installed capacity of over 24GW, including 22.96GW of hydropower, making it an example of the world's longest and most complete whole basin development. This base successively built 10 large and medium-sized cascade hydropower stations, including Xiaowan and Nuozhadu, and developed 15 wind and PV projects, continuously delivering clean energy to the Guangdong-Hong Kong-Macao Greater Bay Area. At 20:18 on October 25, 2022, the total power generation of the base exceeded 1,000,000GWh, equivalent to reducing about 310 million tons of standard coal consumption and about 780 million tons of carbon dioxide emissions.



Scan the QR code to watch CCTV report titled *The Power Generation of the Multi-Energy Complementary Base in the Yunnan Section of Lancang River Exceeded 1,000,000GWh*

Striving to Vigorously Develop Renewable Energy

Renewable Energy Installed Capacity Exceeded

50 GW

The development of the Company's renewable energy sector reached a record high, with an approved capacity of 70.82GW throughout the year, including 23.98GW which commenced construction and 12.95GW which was put into operation, leading the industry in aspect of scale. In 2022, renewable energy installed capacity of the Company exceeded 50GW, accounting for 23.19%, an increase of 4.59% year-on-year, and the resulted profit reached RMB 15.595 billion yuan, an increase of 11.37% year-on-year, making it the largest contributor to the Company's total profit and leading the industry in terms of the profitability per kilowatt in the wind and PV power fields.

The Company focused on deserts and Gobi areas, upheld the synergy of wind and solar resources, regulation capacity and transmission channels, and strove to promote the implementation of large-scale wind and solar power bases with intensive management and competitiveness.

- The development right for 12GW renewable energy in Southern Ordos of Kubuqi Desert was obtained
- The first batch of 2GW peak-shaving coal-fired power and supporting renewable energy projects in the Eastern Gansu Energy Base were under construction, and the second batch of 2.78GW renewable energy projects were approved



Collaborative Development of Offshore and Onshore Wind Power

Offshore Wind Power

The Company focused on building a "centralized and contiguous" offshore wind power development zone integrating investment, construction, operation and maintenance. Projects in the north of Shandong Peninsula and Lingao County in Hainan have been approved, and projects located in Lemen of Shantou City and Cangnan of Zhejiang have commenced construction smoothly. In 2022, the Company's annual investment in offshore wind power project was over RMB 6 billion yuan; the combined offshore wind power capacity including those approved, under construction and operational was 9.32GW, ranking among the best in the industry.

Onshore Wind Power

RMB 4.1 billion yuan was invested in Shanduo GW-level Wind Power Base throughout the year. The first batch of 1,200MW units were connected to the grid, and the complete key technology for the design and construction of large turbine onshore wind farms achieved breakthrough. 4MW or above large capacity wind turbines were applied in all the GW-level wind power bases for the first time.



Simultaneous Construction of Centralized and Distributed PV Power Projects

Centralized PV Power

Yajiang Company's three PV projects for power supply guarantee were fully connected to the grid for power generation, so that the Company achieved the breakthrough of renewable energy project in Tibet region.

Distributed PV Power

The Company upheld the centralized and efficient contiguous development of distributed rooftop PV projects throughout the county, actively explored the development and operation management models of distributed PV projects, and created a customized and standardized model for "small, scattered and disorderly" distributed development status.



Actively Developing Hydropower

The Company's hydropower sector made solid progress, with a profit of RMB 9.2 billion yuan throughout the year, an increase of 18.3% year-on-year, leading the industry in benchmarking the profitability per kilowatt. The three hydro-wind-solar multi-energy complementary bases respectively located at the Tibet Section of Lancang River, Yunnan Section of Lancang River and Yajiang Middle Reaches were included in the national "14th Five-Year" power development plan and renewable energy development plan.

- Rumei Hydropower Station and Gushui Hydropower Station were included in the national list of major hydropower projects that would accelerate development.
- The key parts (i.e. diversion tunnel and hub of the plant area) of Huangliangbao Hydropower Station were under construction as planned in an orderly manner.
- The Toba Hydropower Project made solid progress according to national deployment.
- The agent-construction contract for the Aoku Project in Xinjiang was executed and its construction was commenced.
- Jiexu Hydropower Station was approved and its construction was commenced.
- The preparations for Banda and Guxue Hydropower Projects were started.



Developing Nuclear Power in a Safe and Orderly Manner

The Company's nuclear power sector was strengthened continuously. The Company advanced the construction of three coastal nuclear power bases respectively located at Shidao Bay (Shandong), Changjiang in Hainan and Kapu in Fujian, and made solid progress in cascade development with regard to demonstration, construction, commencement and reserve of nuclear power projects.

In 2022, three projects of the Company won the **Scientific and Technological Progress Award of China Nuclear Energy Association**, the first prize for the **Research and Engineering Application of Manufacture Technology of High Temperature Gas Cooled Reactor Steam Generator**, and the third prize for the **Development of Helium Mass Spectrometric Leak Detection System for Heat Exchanger Tubes of High Temperature Gas Cooled Reactors** and for the **Research and Development of Nuclear Power Industrial Control Network Security Protection System**. The "Maintenance Technology Research of Control Rod System for High Temperature Gas Cooled Reactor Demonstration Project" won the **"Golden Apple Award"** in the technical achievement category granted by China Electricity Technology Market Association.

- Two reactors of Shidao Bay High Temperature Gas Cooled Reactor Demonstration Project were brought into initial full power operation, and the PWR Project Phase I was available for approval.
- Changjiang Nuclear Power Project Phase II was constructed in a safe and orderly manner, and the installation of Unit 3 nuclear island was started 46 days ahead of schedule, achieving the on-schedule completion of annual secondary milestone.
- Xiapu PWR Project obtained the "Permit" for the four units, leading to the successful commencement of feasibility study stage.

Reducing Resource and Energy Consumption

Building Water-Saving Enterprises

The Company made efforts to promote the comprehensive water-saving and wastewater treatment, strengthen the informatization of water resource management, and improve the real-time online monitoring platform for water intake and discharge to play a role in daily monitoring. Through technological transformation, the water withdrawal of Jinling Power Plant was reduced from 0.25k/MWh to below 0.1k/MWh in 2022, so it won the title of "Water-Saving Demonstration Enterprise" in Jiangsu Province. Huaneng Gulin Gas Distributed Energy Project won the title of "Advanced Urban Water-Saving Entity" in Gulin City.

Reducing Energy Consumption

Pursuant to applicable laws and regulations in China, the Company prepared the enterprise policy documents, e.g. *Measures for Energy-Saving Management, Standard for Outstanding Heating Enterprises, and Rating Standard for Power Generation Equipment*, and improved the energy-saving system. In terms of management, technology and energy-saving, multiple measures were taken to continuously improve the energy-saving level.

In 2022, the Company achieved 3.65% station service power consumption rate, a drop of 0.06% year-on-year; the total coal consumption was 182.11 million tons of standard coal, a drop of 1.05% year-on-year; the heating coal consumption reached 41kG/GJ, a drop of 0.3kG/GJ year-on-year; the coal consumption for power supply was 292.02g/kWh, a drop of 2.102g/kWh year-on-year, of which the coal consumption for coal-fired power supply and the coal consumption for gas-fired power supply were 296.23g/kWh and 202.57g/kWh, respectively; and the coal consumption for power supply of seven main unit models, including 1,000MW ultra-supercritical unit and 600MW ultra-supercritical unit, maintained a leadership position in the industry.

The Rooftop PV Power Generation Project of Dongshan Gas Power Station Achieved Self-Consumption



In July 2022, the first batch of rooftop distributed PV power generation pilot project of Dongshan Gas Power Station was successfully connected to the grid, and the "green power" was generated for the first time. Therefore, it was the first project in Shanxi Province to achieve grid-connected power generation in rooftop distributed PV power generation pilot projects throughout the county (city, district) in China. This project realized the reuse of value-added rooftop resources, and the generated power was entirely consumed by the station itself. This effectively upgraded and improved the auxiliary power structure of the station, and contributed to promoting the Carbon Peaking & Carbon Neutrality goals and green development.



Rooftop PV Power Generation Project of Dongshan Gas Power Station

A Year-on-year Drop of

31 kcal/kJ

for the Calorific Value Difference Between the Coal as Received and the Coal as Fired

Completed

66

Energy-Saving Technology Renovation Projects

Management on Energy-Saving

- Strengthened monthly energy-saving assessment, carried out 98 performance assessments for subsidiary companies, and granted 43 rewards
- Organized the coal-fired power plants with a single unit capacity of 300MW or above to carry out a three-year activity on compliance with relevant standards
- Improved fuel management to achieve a year-on-year drop of 31kcal/kJ for the calorific value difference between the coal as received and the coal as fired
- Strengthened unit rating management and included the rating results into the annual performance assessment

Technology on Energy-Saving

- Developed the energy-saving technical supervision standards for various power generation types, i.e. coal-fired units and gas-fired units
- Carried out energy-saving diagnosis for 11 units, including Shang'an, Bajiao and Diandong power plants
- Completed 66 energy-saving technology renovation projects, including air pre-heater sealing and cooling tower efficiency improvement, to promote a reduction of 0.2g/kWh in the Company's coal consumption for power supply
- Developed and implemented the "Three Transformation Linkage" plan (i.e. energy conservation and carbon emission reduction transformation of 120 coal-fired power units, flexibility transformation of 58 units and heating transformation of 65 plants)
- The maintenance of turbines A and B of 49 units restored the performance of thermal equipment, promoting a reduction of 0.1 g/kWh in the Company's coal consumption

Energy-Saving through Structural Adjustment

- Enhanced the heating capacity of in-service thermal power plants, made efforts to vigorously promote the heating capacity expansion and renovation for long-distance heating and low-pressure cylinder zero-output, and reinforced the comprehensive governance of heating network
- All new coal-fired units complied with the ultra-low emission criteria, high-efficiency co-generation units (such as Dalian and Dongjiakou) and the double reheat unit of Ruijin Phase II were put into operation, and five outdated units were decommissioned, leading to a reduction of 0.4g/kWh in coal consumption for power supply
- By optimizing the operation mode of large coal-fired units, the generation of units with a capacity of 600MW and above increased by 900GWh year-on-year, while the generation of units with a capacity below 600MW declined by 7,500GWh year-on-year, leading to a reduction of 1g/kWh in coal consumption for power supply

Optimizing the Operation Mode of Large Coal-Fired Units Leads to a Reduction of

1 g/kWh

in Coal Consumption for Power Supply

Stringently Implementing the Clean Production Strategy

The Company developed and implemented the *Accountability Methods for Ecological Environmental Protection and Pollution Control* and the *Management Measures for Real-time Monitoring Platform of Pollutant Emissions*, invested RMB 1.695 billion yuan in environmental protection throughout the year, and accurately arranged 49 major environmental improvement projects covering comprehensive treatment of wastewater, coal yards and ash yards in key power plants located in the Yellow River Basin and the Circum-Bohai Sea Region. Additionally, the Company continuously conducted in-depth pollution control activities. In 2022, the installed capacity of the Company's ultra-low emission units accounted for over 99.5%, and the environmental emission performance remained the best in the industry.

Reduction of Wastewater Discharge

The Company systematically advanced the treatment of major hazard sources of liquid ammonia in 63 plants, with 12 underway and 9 completed. The Company completed the transformation of 52 wastewater treatment projects in three plants (i.e. Jinling, Yangluo and Baotou). In 2022, the Company's wastewater discharge reached 33.8224 million tons, a drop of 7.48% year-on-year.

Reduction of Exhaust Gas Emission

The Company's pollutant emission concentration remained stable at the ultra-low emission level. The emissions of sulfur dioxide and nitrogen oxides from thermal power units were 0.068g/kWh and 0.137g/kWh, respectively and their compliance rate exceeded 99.9%. The emissions of sulfur dioxide and nitrogen oxides per 10,000 yuan of output value were 1.05kg and 2.10kg, respectively, a drop of 27.8% and 26.7% year-on-year.

Retrofit for Flow Passage of GW-level Units

Qinbei Power Plant invested RMB 127 million yuan to complete a series of key technological upgrades, including the renovation of all components for flow passage of Unit 5 steam turbine and the modification of HP main stop valve direct connection design. After retrofit, this plant can save 65,000 tons of standard coal, and reduce 170,000 tons of carbon dioxide emissions, 550 tons of sulfur dioxide emissions and 480 tons of nitrogen oxide emissions annually. All environmental indicators were at the leading level of units with similar capacity in China.



Qinbei Power Plant



Case

Reduction of Solid Waste Discharge

Hazardous Solid Waste Management

Accelerated the construction of hazardous waste warehouses for the stations in service, comprehensively established and improved the ledger of hazardous solid wastes, and took appropriate measures for collection, storage, utilization and disposal management of hazardous solid wastes, e.g. waste mineral oil, waste resin, waste denitrification catalysts, asbestos waste, etc.

General Solid Waste Management

Made efforts to improve the recycling and reuse of solid waste resources, with a daily treatment capacity of 8,000 tons for coupled solid waste power generation. Strictly implemented the "Three Prevention" measures to prevent the spreading, loss and leakage of general solid wastes, including desulfurization gypsum, slag, fly ash, dust, etc. In 2022, the Company's smoke and dust emission performance was 0.009g/kWh with a compliance rate over 99.9%. The smoke and dust emission per 10,000 yuan of output value was 0.144kg, a drop of 28.7% year-on-year.

- Wuhai Power Plant actively advanced the closure and renovation of ash yards, and completed the closure of its main works.
- Luoyang Thermal Power Plant has completed the construction of the sludge co-incineration project and put it in operation, which is the first time for harmless treatment of sludge in the Yellow River Basin. In this project, a total of 125,000 tons of sludge was co-incinerated, which greatly relieved the disposal pressure of municipal sludge.
- The first domestic waste incineration power plant of the Company, Nanjing Jiangbei Domestic Waste Incineration Power Plant Project Phase II, has connected its first unit to the grid. The project is designed to dispose of 2,000 tons of domestic waste per day, with an annual on-grid electricity of nearly 300GWh, achieving a "glorious transformation" from waste to green electricity.

Practicing "Pollution Control and Carbon Emission Reduction" with Coupled Multi-Source Solid Waste Generation Technology

The Company actively promoted multi-source solid waste power generation technology, and undertook or independently invested in 16 coal-fired multi-source solid waste coupled co-incineration projects. 12 projects of equipment have been put into operation, with a designed annual disposal capacity of about 1.029 million tons of multi-source solid waste. Compared to landfill, the potential synergistic carbon emission reduction of coupled multi-source solid waste power generation is about 1.23 million tons per year, significantly improving the disposal capacity of solid waste from coal-fired power plants and providing effective support for the large-scale coordinated disposal of multi-source solid waste in China's coal-fired power industry. In 2022, the pre-carbonization integrated machine developed by the Company was identified by the Chinese Society for Electrical Engineering as an internationally leading technology, and related technologies were included in the *List of Leading Technologies of "INNOVATION CHINA"* in the field of low-carbon field.



Demonstration Project for Coupled Solid Waste from Coal-fired Power Plants



Case

Reducing GHG Emissions



In 2022, the Company's carbon emissions reached 526 million tons, an increase of 1.64 million tons year-on-year; the carbon emission intensity was 62g/kWh, a drop of 1.9% year-on-year; the carbon emissions per RMB 10,000 yuan of output value reached 13.8 tons, a drop of 30.3% year-on-year. The Company won the title of "Leading Enterprise in China's Industrial Carbon Peaking" awarded by China Federation of Industrial Economics for its outstanding practices and contributions in promoting green and low-carbon transformation.

Biomass Cogeneration Projects Effectively Contributed to Carbon Emission Reduction



Case

Zhaodong biomass cogeneration project, as one of the "Top 100 Projects" in Heilongjiang Province, had a total investment of RMB 431 million yuan and an installed capacity of 40MW. It was officially put into commercial operation in March 2022. Upon the completion of this project, it consumes 300,000 tons of straw and 150,000 tons of industrial waste furfural residue every year, generates 260GWh of electricity every year and provides 1.2 million square meters of heating, with an annual reduction of 91,400 tons of standard coal consumption and 62,200 tons of carbon dioxide emissions. This has a positive effect on promoting the achievement of China's Carbon Peaking & Carbon Neutrality goals at an early date.

Carbon Emission Data Quality Control

The Company developed and implemented the *Detailed Rules for Carbon Emission Data Quality Management (Trial)*, opened a Carbon Peaking & Carbon Neutrality management training course for the leading group of subsidiary companies, and organized three special meetings on improving carbon emission quality management of thermal power enterprises. This accelerated the improvement of carbon emission level and comprehensively advanced carbon emission data quality management.

- Carried out comprehensive inspection and rectification of carbon emission data, established a rectification team led by the Company's Vice President, and completed the self-inspection and rectification of carbon emission data quality issues in thermal power enterprises
- Advanced the development and application demonstration of continuous monitoring systems for carbon dioxide emissions in thermal power enterprises, and installed online carbon dioxide monitoring devices in 35 plants to improve data accuracy, reliability and standardization

Soft Science Research on Carbon Peaking & Carbon Neutrality

The Company accelerated the development of carbon emission reduction models and tools, focused on the key areas of "Five Carbons" (carbon emission reduction, carbon assets, carbon monitoring, carbon footprint and carbon market), and completed six soft science topics and 13 optional topics, including the *Research on Carbon Emission Reduction Models and Methods in the Power Industry under the Carbon Peaking and Carbon Neutrality Goals*. The theoretical article titled *Demonstrating the Responsibility of a Central SOE in Advancing Carbon Peaking & Carbon Neutrality* won the award of "Outstanding Theoretical Research Achievement in Learning and Faithfully Implementing General Secretary Xi Jinping's Important Statements on Developing the State-owned Economy" granted by State-owned Assets Supervision and Administration Commission of the State Council.

Management of Carbon Trading and Green Certificate Trading

A Total of

13.32 Million Tons

were Traded in Internal Carbon Trading

Applied for and Obtained a Total of

1,853,000

Subsidy-free Green Certificates

The Company developed and implemented the *Interim Measures for Carbon Emission Right Trading Management*, and organized internal carbon emission trading in an orderly manner during the second performance period (2021-2022) of the national carbon market. A total of 13.32 million tons were traded, and thus the management and operation of carbon assets achieved remarkable results.

The Company strengthened the coordination of production and sales of green power and green certificates, established a cross-regional green certificate consignment mechanism to share sales channels, and opened up the international market for green certificates to promote the sales of green certificates. In 2022, the Company applied for and obtained a total of 1,853,000 subsidy-free green certificates, accounting for 11.5% of the total number in China; sold 350,000 green certificates, accounting for 12.3% of the total number of subsidy-free green certificates issued in China; and developed and sold 260,000 international green certificates for hydropower projects.

- Gansu Company completed the international green certificate delivery with Tuas Power Ltd. in Singapore, with a trading number of 10,000 green certificates. This marked the first sale of international renewable energy green certificates for the Company.
- North China Energy Sales Company and Huaneng Renewables Company completed the first cross-regional green power trading in Eastern Inner Mongolia. This supported Huaneng Headquarters to achieve 100% green power supply for the first time and established the transmission channel for external power supply to Beijing.
- The subsidy-free renewable energy project which was newly put into operation by Shanxi Company exclusively participated in the green power trading in the core office area of urban sub-center in Beijing, with a scale of 122GWh.



Protecting the Natural Ecological Environment

Prevention of Ecological and Environmental Risks

Focused on Advancing the Rectification of

122

Environmental Risk and Hazard Issues

The Company attached great importance to strengthening the prevention of ecological and environmental risks and hazards, upheld the principle of "Simultaneous Design, Advanced Implementation, Operation Ahead of Schedule and Effective Operation", and established a new concept of "Prevention First, Full-Process Control and Management". Besides, the Company adhered to promoting the monthly inspection and rectification mechanism of ecological and environmental risks in all business sectors (including thermal power, renewable energy, coal, transportation, etc.), strengthened daily supervision and management, and focused on advancing the rectification of 122 environmental risk and hazard issues. As a result, the on-site risks were under control without major environmental events happened throughout the year.

For better standardization, process and information level of environmental protection management, the Company innovatively developed the environmental protection management standard with the "Four Ones" as the core, and successfully completed the establishment of standardization pilot enterprises in 9 plants, such as Haimen, Jinling and Rizhao, leading to accumulated rich experience for the comprehensive promotion of environmental protection management standardization work in the future.

Harmonious Coexistence of Project and Environment

The Company firm-ed up and further built the ideal of ecological conservation bottom-line, continuously strengthened the protection of biodiversity and ecological environment, and strictly implemented various protection measures. Additionally, the Company actively carried out biodiversity research, and established 7 river basin ecological environment monitoring systems, including water temperature, water quality, total dissolved gas (TDG), aquatic ecology, terrestrial ecology, local climate and environmental protection facility operation, to minimize the adverse impact of power projects on surrounding flora, fauna and ecological environment. In 2022, the Company successfully completed the acceptance of 14 environmental protection and water conservation projects, and Miaowu Power Station was awarded the title of "National Soil and Water Conservation Demonstration Project" by the Ministry of Water Resources.

Protecting Biodiversity

A Cumulative Total Stock Quantity of Over

1,050,000

Fishes Released

Five stations, including Longkaikeu Hydropower Station and Dahuqiao Hydropower Station, put the fish collection and transportation systems into operation, and innovatively used a "Blocking First and Combination of Blocking and Luring" approach to effectively improve fish collection efficiency.

Zangmu Hydropower Station and Jiacha Hydropower Station built the smart monitoring systems for fishways, which improved the observation effect, operational performance and statistical accuracy of fishways.

Zangmu Hydropower Station launched the "Joint Action on Fish Stock Enhancement in the Hydroelectric Industry for Celebration of World Environment Day", and released 231,000 fishes of rare species with a cumulative total stock quantity of over 1,050,000 fishes. This effectively advanced the recovery of precious indigenous fish species.

Luoyuan Power Plant invested over RMB 4 million yuan in three batches of marine stock enhancement activities throughout the year, including 18,630,000 large yellow croakers, 54,760,000 sand silkworms and 2.06 billion metapenaeus ensis, which effectively protected the marine ecological environment of Luoyuan Bay.

Rumei Hydropower Station completed a research on alpine vegetation restoration, and two achievements, i.e. *A Germination Device for Acanthochlamys Bractea Seeds* and *A Mixed Planting Device for Building Artificial Grassland in Dry and Warm River Valley Slag Yards in High Cold Regions*, were patented as the **utility model**.

Protecting Terrestrial Ecology

Completed the Restoration and Upgrading of

410

Hectares of Vegetation Restoration Zone

As a national-level green mine, Yimin Open-pit Mine started the construction of ecological restoration demonstration zone from the beginning of 2021, and invested total RMB 200 million yuan for three consecutive years to upgrade the ecological restoration. It has completed the restoration and upgrading of 410 hectares of vegetation restoration zone and the construction of 70 hectares of core ecological restoration demonstration zone. In 2022, the "Key Technology of Systematic Ecological Restoration in Open-Pit Mining in Extreme Cold Grassland Area" of Yimin Open-pit Mine was listed as the "Advanced and Applicable Technology for Mineral Resource Conservation and Comprehensive Utilization" by the Ministry of Natural Resources.

Yimin Coal Power Co., Ltd. adheres to the environmentally-friendly sustainable development path of resource development and utilization, with equal emphasis on development and environmental protection, geological environment restoration and governance, green mine construction and comprehensive utilization of solid waste resources.

—Liu Guohong, Chief Engineer, Ministry of Natural Resources of the People's Republic of China

The Company Carried Out Various Forms of Environmental Protection Publicity Activities



In June 2022, on the occasion of the 51st World Environment Day, the companies at the grassroots level, including Anhui Wind Power Branch, Linhe Thermal Power Plant, Xigu Thermal Power Plant and Dezhou Power Plant, actively spread the concept of green and low-carbon lifestyle through exchanges, discussions, site visits and expertise explanations, to effectively enhance the staff's awareness of ecological and environmental protection.

Anhui Wind Power Branch carried out the Party Day activity themed on "Supporting Green Development", and organized online learning, exchange and discussion activities in terms of environmental protection knowledge. Following the seminar, all staff collected garbage and removed weeds in the plant area, to practice the environmental protection concept of green, low-carbon, civilization and health through practical actions.



Party Day Activity Themed on "Supporting Green Development"

Linhe Thermal Power Plant held a public opening event for the World Environment Day (June 5) environmental protection facilities. 35 junior reporters visited the reclaimed water reuse system of the plant on site, and gained a deep understanding of the process flow and significance of the reclaimed water system through explanations from the plant's staff, to promote them to build a concept of green environmental protection and water conservation.



Public Opening Event for Environmental Protection Facilities

On the World Environment Day, Xigu Thermal Power Plant held an environmental protection publicity event themed on "Building a Clean and Beautiful World Together", with the aim to explain to visitors from all walks of life the operation condition of ultra-low emission facilities, pollutant emissions, and renovation of online environmental monitoring equipment, etc.

Xigu Thermal Power Plant, as a power generation enterprise, ensures the industrial heating and winter heating for residents while a good ecological environment is maintained. So it faithfully fulfills the responsibilities of a central SOE.

—A Visitor Representative

Dezhou Power Plant carried out the awareness campaign on the World Environment Day (June 5), with the aim to demonstrate its efforts and achievements in accelerating the green and low-carbon transformation and upgrading by the online + offline model, and conducted in-depth exchanges and interactions with the local environmental protection bureau and the public to build a good environmental image.

Through this campaign, I have an in-depth understanding of the conventional thermal power plant. The plant made every effort to guarantee the power supply to residents and kept improving the environmental protection level. Thus, it is worthy of Huaneng "Three-color Company".

—A Visitor Representative

Zhongwei Power Station actively took the desert control measures and used the grass grids and sand barriers for desertification control. Zhongwei Power Station has completed the sand stabilization work of 4 photovoltaic areas in the desert where it is located, including sand leveling (7,100m²), module backfilling (42,000m²) and grass grid installation (242,360m²), thus expanding greenery in the desert.

Biedili Hydropower Station, relying on the diversion channel, promoted the increase of more than 45,000mu of irrigation area and the planting of over 70,000mu of big sea buckthorns, and built a wetland park, making the gobi desert covered with green trees and become a habitat for migratory birds. Consequently, the local ecological environment is improved.

Protecting Marine Ecology

In the construction project of Changjiang Nuclear Power Plant, the conventional construction method of underwater reef blasting and pipe sinking was resolutely abandoned, and the "front shield tunneling + rear sinking pipes" plan was used instead, with an additional cost of RMB 140 million yuan and a construction period of 1.5 years. This could effectively maintain the coral growth environment and protect the marine ecology in the construction area.

Spreading the Concept of Low-Carbon Lifestyle

Through a series of green office measures, the Company guides the employees to start from small things to reduce energy consumption in daily life and enhance their awareness of environmental protection.

- Strictly control air conditioning temperature, and promote the use of energy-saving electrical appliances
- Standardize the use of company-owned vehicles, and strictly control the purchase of company-owned vehicles and fuel consumption of the vehicles
- Purchase, apply for and use office consumables according to demand; replace toner cartridges when they are used up, and print on both sides of the paper
- Substantially simplify meetings and briefings, comprehensively promote video conferences, and reduce energy consumption caused by business travels
- Promote IT-based and paperless office work, reduce paper printing by setting up an internal WLAN

The Company makes efforts to strengthen publicity and education of green concepts, cultivate employees' awareness of ecological protection, advocate a frugal and low-carbon lifestyle, and actively organize employees to participate in environmental and public welfare activities and environmental knowledge training. The Company has set up a communication platform for stakeholders to better respond to the demands of relevant parties.

Focusing on the Carbon Peaking & Carbon Neutrality Goals and Exploring the Blue Ocean of Energy Storage Technology

In May 2022, Jiangsu Jintan Salt-cavern Compressed Air Energy Storage National Demonstration Project, jointly developed by the Company together with China National Salt Industry Corporation and Tsinghua University, was officially put into operation as the world's first large-scale non-supplementary combustion compressed air energy storage power plant. It is the first national demonstration project for compressed air energy storage built and put into operation in accordance with commercial power station standards, which marks a substantive leap in China's compressed air energy storage technology from "Theoretical Experiment" to "Engineering Application". It is an important milestone in the development of new energy storage technologies in China.

This project has an energy storage capacity of 300MWh and an electrical-to-electrical conversion efficiency of 69%. It utilizes the underground salt cavern resources in Jintan and compresses air as the main medium to achieve energy conversion. The entire process is pollution-free and zero-emission, which is of great significance for achieving China's Carbon Peaking & Carbon Neutrality goals. The project is scheduled to operate at any time during the peak demand period in Jiangsu Province to achieve flexible operation such as "charging once and discharging twice per day." It has completed the energy storage/generation cycle for 72/75 times, and after putting into operation, it will provide ±60MW of peak shaving capacity. The annual increase in peak shaving electricity is about 100GWh, effectively guaranteeing the power supply in summer and making positive contributions to safe and stable power supply.

As the sole national demonstration project and the first commercial power plant project in the field of compressed air energy storage in China, this project used the first domestically produced set of equipment and faced many difficulties and challenges, e.g. lack of experience in technology research and development, lack of standards for project construction, etc. The Company successively overcame several key technical challenges, and summed up the "Chinese Standards" in practice to fill the gap in the field of compressed air energy storage, assumed the mission of self-reliance with high-level technology, and promoted the technology progress of compressed air energy storage field in China.

The First to Establish National & Industry Standards

Since the commencement of the project, the Company put a premium on the development of standards in the field of compressed air energy storage, summarized project construction experience and unit operation experience, and prepared relevant standards. A total of one IEC international standard and two association standards were issued, and the first national and industry standard in the field of compressed air energy storage was approved. 35 enterprise standards were prepared, in which 24 were patented. The *Compressed Air Gas Double-Working Medium Combined Cycle Power Generation System* was authorized by Japan National Intellectual Property Administration.



Scan the QR code to watch the CCTV report titled *China's First Salt-cavern Compressed Air Energy Storage Power Station Connected to the Grid for Power Generation*.

The salt-cavern compressed air energy storage technology is a revolutionary and disruptive technology for consuming large-scale renewable energy and building a strong smart grid and an energy Internet. It is of great strategic significance for promoting the upgrading of China's energy structure and ensuring the sustainable development of energy and electricity.

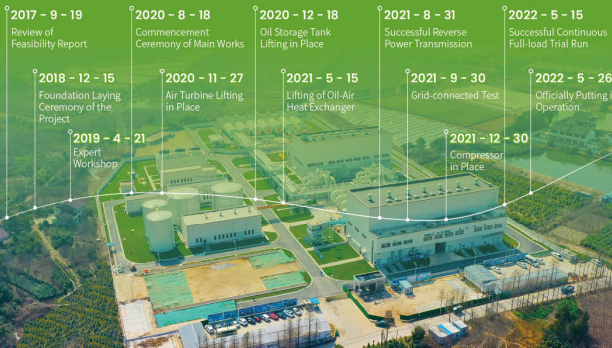
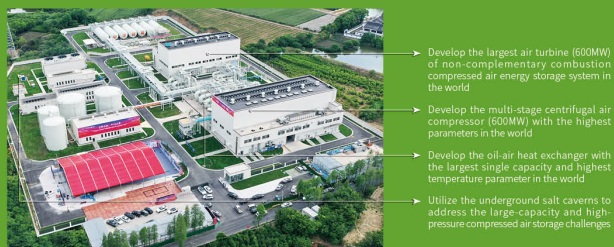
—Lu Qiang, Academician of the Chinese Academy of Sciences

The operation of Jiangsu Jintan Salt-cavern Compressed Air Energy Storage Project has created a new path for high-quality development of new energy storage technologies. It is not only a significant practice in advancing the development of a new power system and contributing to the achievement of Carbon Peaking & Carbon Neutrality goals, but also a significant practice of the strong alliance between central SOEs and universities to improve China's ability to innovate energy storage technology in a systematic manner.

—Shu Yinbiao, Academician of CAE and President of IEC

Exploring the Blue Ocean of Energy Storage Technology

Compressed air energy storage technology is a large-scale new energy storage technology that has rapidly developed in recent years. It is a key technology for building new power systems and achieving Carbon Peaking & Carbon Neutrality goals. The Company upheld the industry-university-research-application integration strategy and set up a "National Team" with central SOEs and universities to jointly explore the Blue Ocean of energy storage technology in China. In the promising "Energy Storage Experimental Field" of Jintan Salt-cavern Compressed Air Energy Storage Project, a number of firsts and sole "Chinese Technologies" are definitely here to stay, and the localization rate of core equipment has reached 100%.



Providing Huaneng Solution for Building a Harmonious Society



ESG

Directional Navigation

We must ensure and improve the people's wellbeing in the course of pursuing development and encourage everyone to work hard together to meet the people's aspirations for a better life. We must strive to realize, safeguard, and advance the fundamental interests of all our people. To this end, we must do everything within our capacity to resolve the most practical problems that are of the greatest and most direct concern to the people. We will stay deeply engaged with our people and the grassroots level, adopt more measures that deliver real benefits to the people and warm their heart, and work hard to resolve the pressing difficulties and problems that concern them most. We will improve the basic public services system to raise public service standards and make public services more balanced and accessible, so as to achieve solid progress in promoting common prosperity.

— Report to the 20th National Congress of the Communist Party of China by Xi Jinping

Hands-on Practice

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SOCIETY

WHAT Identification of Core Social Issues



WHY Background Analysis of Typical Issues

Since the industrial revolution, the overall trend shows that accidents at work are increasing. In 1981, the International Labour Organization of the United Nations issued *The Convention Concerning Occupational Safety and Health and the Working Environment*. April 28 was designated as the "World Day for Safety and Health at Work" in 2001. The health and safety of laborers have become a globally recognized priority issue.

Ensuring safety at work is a long-term fundamental national policy of China. According to several important instructions from General Secretary Xi Jinping, Party committees and governments at all levels must prioritize people's lives and safety. In 2002, the *Work Safety Law of the People's Republic of China* was issued and implemented, and was revised respectively in 2009, 2014 and 2021. In 2022, the *15 Measures to Further Strengthen the Implementation of Work Safety Responsibilities and Resolutely Prevent and Curtail Major and Serious Accidents* was launched, putting forward more stringent requirements for work safety in the new development stage.

The power industry is a pioneering and fundamental industry in the national economy. The Party and the government always attach great importance to the electric power industry's work safety. *The Electric Power Law of the People's Republic of China* states that the power enterprises shall strengthen work safety management, uphold the policy of Safety First and Precaution Crucial, and establish and improve their work safety responsibility systems.

The Company has a large amount of industrial sectors. As a result, it faces great pressure to safely guarantee the power supply and huge challenge in respect of safety risk control. In 2022, safety accidents occurred in several sectors such as thermal power, hydropower and coal industry, and in various stages such as production, maintenance and infrastructure. This fully reveals that the Company safe production foundation is not that solid and the management for work safety is inadequate. The safety situation remains grim and complicated.

HOW Management and Response to Typical Issues

In response to safety issues in thermal power, the Company conducted a comprehensive and in-depth safety inspection, during which 5,677 safety vulnerabilities in such areas as hazardous chemicals and fire control were identified and addressed. Safety inspections were also executed in 32 secondary units and over 50 enterprises at the primary level.

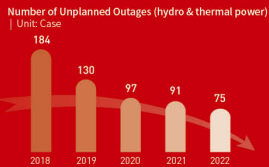
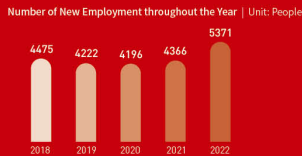
In response to safety issues in coal mines, the Company regularly conducted major safety risk identification and assessment activities for coal mines, identified 9 major hazard sources, and developed and implemented 30 prevention and control measures.

In response to safety issues in hydropower, the Company conducted comprehensive hazard control for hydropower stations and small-scale and remote power generation enterprises, and 142 risks and hazards in 64 hydropower stations were identified and addressed.

In response to safety issues in nuclear power, the Company overcame various difficulties including lack of production management experience and shortage of nuclear power professionals, and focused on safety management in nuclear power production and project construction.

In response to safety issues in new energy project construction, the Company took specialized hazard control measures for outsourcing projects, hazardous operations and emergency management. Over 800 safety hazards related to inadequate on-site supervision and incomplete flood and typhoon prevention measures were identified and corrected through closed-loop management.

PERFORMANCE Huaneng' Scheme



PRACTICE Huaneng' Scheme

The installed capacity of new energy generation is 80GW, and the construction of Longdong Energy Base of Multiple Energy Sources with Complementarity, the hydropower development in the middle reaches of the Yarlung Zangbo River, the Hydro-photovoltaic Complementary Base in the upper reaches of Lancang River, and the five major Gathering Strength to Overcome Difficulties (Juligongjian) Cup labor competitions of Changjiang Nuclear Power Plant were rated as the 14th Five Year Plan National Leading Labor Competition, ranking at the forefront among central SOEs.

The Company has actively participated in 5 national and industry-level employees' vocational skills competitions and organized 6 Huaneng Craftsman Cup group-level competitions, thereby improving the overall vocational skills of the workforce.

The Company carried out the activity of Improving Both Shift-team Safety Management Level and Safety Education and Training Quality, strengthened the pertinence and effectiveness of safety education and training, and effectively improved the team's risk identification and countermeasures rule-breaking ability.

The Company held a centralized signing ceremony for central SOEs' cooperation agreements in new energy intelligent operation and maintenance services, involving a total capacity of 288 MW of photovoltaic and wind power projects. 13 central SOEs including the Company signed 22 project agreements.

The Company has established a "1+5+N" procurement system, led by the Beijing Procurement and Operation Center, supported by procurement sub-centers of 5 clean energy development bases, and guaranteed by N remote bid evaluation sub-centers covering various provincial-level regions across the country, forming a new "centralized + remote" bidding and evaluation management model.

PRIZE Huaneng' Scheme

Multiple collectives and individuals of the Company were awarded The National May 1 Labor Award and the title of May 4th Red Flag Youth League Organization, National Worker Pioneer, Great National Craftsmanship, National Youth Post Expert, National Technical Expert etc.

The Company won 21 Science and Technology Progress Awards from the China Association for Work Safety, including 2 first prizes, 4 second prizes, and 15 third prizes.

The Company won the highest recognition of China in the cultivation of skilled talents - the honorary title of National Outstanding Contribution Organization in the Cultivation of Skilled Talents.

The research achievement of the *Company's Application of Intelligent Remote Bid Evaluation Supervision Platform in Huaneng's Centralized + Remote Bidding and Procurement System* won the Special Prize for Innovative Achievements in Material Management in the National Power Industry.

The volunteer service project *Mother River Protection of Jinghong Power Plant* was awarded the bronze medal in the 6th China Youth Volunteer Service Project Competition.

The Company's targeted assistance work has been consistently recognized and rated as "excellent" for six consecutive years, achieving the highest national assessment level. Compared to other energy enterprises of the same type, the Company's frequency of receiving such a high rating is the highest.

Sincere Care for Employees' Development

Guaranteeing Employees' Basic Rights and Interests

According to the Labor Law of the People's Republic of China, Labor Contract Law of the People's Republic of China and other laws and regulations of China, the Company has formulated series of enterprise policy documents such as the *Guiding Opinions on Standardizing Labor Employment and Labor Contract Management* and the *Guiding Opinions on Improving Market-oriented Labor Management* to continuously improve the basic management of labor employment and effectively protect the rights and interests of employees. As of the end of 2022, the Company had 121,164 employees, with an employee turnover rate of 5%. The total labor productivity was RMB 1.1156 million yuan per person, with an increase of 14.61 percent year-on-year, maintaining the industry's leading position.

Guaranteeing Remuneration and Welfare

- Improving the normal salary increase mechanism, and promoting high salary distribution towards organizations with outstanding contributions, personnel in key frontline positions, and high-quality & high-tech skilled talents
- Standardizing the employee welfare and security system, strictly taking social insurance for 100% coverage of employees in accordance with regulations, and providing employees 10 days of paid leave per capita

Strictly Regulating Employment

- Providing equal employment opportunities and labor security for employees of different nationalities, races, genders, religious beliefs, and cultural backgrounds, 100% openly recruiting new employees and eliminating forced labor and employment discrimination
- Strictly observing the provisions of national laws and regulations on the minimum age limit, and avoiding the risk of violating regulations related to the use of child labor from both institutional and operational perspectives

Deepening Democratic Management

- Convened the Third Session of the Second Employee Representative Meeting of the Company, completed 126 proposal responses, which achieved 100% satisfaction rate
- Standardizing the management and performance of employee directors and supervisors, and completed the election of employee directors and supervisors in two secondary organizations
- Continuously deepening the open and democratic management of plant affairs, with the establishment rate of trade unions, and employee representatives meeting, and open plant affairs in secondary and tertiary organizations reached 98.7%, 98.9%, and 98%, respectively
- Initiated the trial operation of the smart trade union system and built a new system of Internet+ trade union to serve employees

Building the Home for Employee

- Selected and commended 33 model Homes for Employees, 50 model Home Huts for Employees, 40 outstanding union workers, and 40 outstanding union work projects to build a home-work brand
- Developed the *Standard Guidelines of Home for Employees Building for Wind Farms and Photovoltaic Power Stations* to support the home building for employees working in Xinjiang, Qinghai, Yunnan, Hainan and other small, scattered, far and tough regions

Caring for Female Employees

- Completed the *Company's Occupational Health Protection Standards for Female Employees* to implement labor protection for female employees and arrange and adjust their work reasonably according to their health status
- Convened the female employees' symposium on the Women's Day, the women workers' symposium with the theme of Studying the Guiding Principles of the 20th National Congress and Forging Ahead on the New Journey and other female workers' symposiums to fully leverage the role of female employees as half the strength of the Company
- Held a health knowledge lecture titled Health Escort on caring for women's health

Safeguarding Employees' Health

According to the Law of the People's Republic of China on Prevention and Control of Occupational Diseases, the Measures for Administration and Supervision on Occupational Health Surveillance of Employers and other laws and regulations, the Company has formulated series of enterprise policy documents, including the *Occupational Health Management Standards*, *Employee Health Monitor and Care Management Standards*, *Personal Protection Equipment Management Standards*, and *Occupational Disease Hazard Management Standards*, and established an occupational health management system with clear division of responsibilities, hierarchical responsibilities, and departmental collaboration. The Company has completed a sound occupational disease prevention and control responsibility system, and established files for monitoring, testing and evaluating occupational hazard factors of employees, occupational health monitoring management files, and personal occupational health monitoring files of workers, so as to realize dynamic maintenance in real time and ensure the health and safety of employees during the working process.

- Organizing health examinations for employees exposed to occupational disease hazards in accordance to pre-job, on-job, and off-job categories, and timely adjusting the positions of employees with occupational taboos
- Strictly implementing the system of "three simultaneities" on occupational disease prevention for construction projects and major technical renovation projects, which can only be commenced after passing the pre-evaluation of occupational hazards
- Organized overseas employees to participate in 10 remote health training sessions on traditional Chinese medicine treatment, common occupational disease prevention and control, etc.
- Further optimized the construction plan of "health huts" in Qinghai and Tibet based on the climate conditions in the plateau region

Training on Occupational Disease Prevention and Control at Haikou Power Plant



Case

In September 2022, Haikou Power Plant organized training on occupational disease prevention and control from the perspective of caring for the physical health of employees. Professional trainers in the occupational disease prevention and control field were invited to provide training lectures. Based on the actual situation of power production and the characteristics of occupational disease incidence, it focused on explaining the hazards of occupational diseases such as dust and noise and prevention knowledge, introducing the occupational health rights and corresponding obligations of employees in the workplace, and elaborating on the importance and necessity of occupational health and safety. This training received unanimous praise from the participants, providing a strong guarantee for safeguarding the occupational health rights and interests of employees.

Yajiang Company Contributing in Improving the Physical and Mental Health Level of Employees in Tibet



Case

In 2022, Yajiang Company actively promoted the construction of "health huts" in the Shannan Camp. The Group Working Committee allocated RMB 490,000 yuan to improve the supporting facilities of the "health huts", achieving the goal of providing remote consultations for employees while checking their physical indicators at all time, and providing professional diagnosis and treatment advice for employees with poor physical health. In addition, RMB 16.98 million yuan was invested in the construction of a diffuse-type oxygen supply project in the "health hut". The phase II project construction was completed, and more than 700 oxygen supply terminals were installed, with a total oxygen supply area of over 19,000 m², contributing to improve the physical and mental health of employees in Tibet.

Facilitating Career Development

Selected More than

700

Middle-Level Officials from Grassroots Enterprises by Competition

Selected

125

Excellent High-Level Technical Backbone

The Company has been actively building a three-level technical and skilled talent management system, expanding the career development channels for employees, and improving the dual channel construction of technical and skilled job sequences in grassroots enterprises.

Optimizing the Layout for the Personnel Development

The Company hired 38 chief experts and 30 chief technicians for the second term, selected more than 700 middle-level officials from grassroots enterprises by competition, and introduced 125 excellent high-level technical backbone.

Strengthening the Development of Labor Skills

The Company organized multiple labor competitions such as the Shidao Bay Nuclear Power's Gathering Strength to Overcome Difficulties (Juilongnian) Cup, 100 billion kWh capacity new energy generation, and high quality patent cultivation, to improve the technical capabilities of employees by competition. Among them, the installed capacity of new energy generation reaching 80GW, the construction of Longdong Energy Base with Multiple Energy Sources of Complementarity, the hydropower development in the middle reaches of the Yarlung Zangbo River, the Hydro-photovoltaic Complementary Base of the Lancang River in the upper reaches of Lancang River, and the five major Gathering Strength to Overcome Difficulties (Juilongnian) Cup labor competitions of Changliang Nuclear Power Plant were rated as the "14th Five Year Plan" National Leading Labor Competitions, ranking at the forefront among central SOEs.

Enhancing Selection of Model Workers & Craftsmen

Ten collectives and individuals of the Company won "the National May 1st Labor Award" and the title of "National Worker Pioneer", leading the industry in number. Shidao Bay Nuclear Power Co., Ltd. made a themed speech at the national commendation meeting as a representative, which was the first time in the Company's history. Four employees were awarded the title of "Great Nation's Craftsmen" by China Energy, Chemistry and Geology Workers' Union; Two collectives were awarded the title of "May 4th Red Flag Youth League Organization"; Five young staffs were awarded the title of "National Youth Post Expert"; One employee was awarded the title of "National Technical Expert".



Frontline Employee Work Scenarios

Jiangsu Company Continuously Improving the Building of Skilled Talent Training System



Case

Jiangsu Company has established the first regional company level talent evaluation and training center of Huaneng Group, and has integrated the dispersed education and training resources within the region into a "1+1+4" skilled talent training system with clear levels & division of work, and being emphatic on specialties. In 2022, the Company won the highest recognition of China in the cultivation of skilled talents—the honorary title of "National Outstanding Contribution Organization in the Cultivation of Skilled Talents".

- 1 Network College** Relying on "Huaneng Network College" to create a "classroom around employees". Throughout the year, 341 online seminars were organized, with a total of 17,218 trainees attended, which effectively promoted employees' vocational skills improvement by utilizing the Internet.
- 1 Management Training Base** The management training base provide management training according to the actual business needs, playing a overall guiding role. Nearly 200 management skills training on finance, technology and marketing were provided covering more than 20,000 person-times.
- 4 Skill Training Bases** Four skill training bases for centralized control operation, thermal power maintenance, gas turbine operation and maintenance, and wind power skills in Taicang Power Plant were built. More than RMB 16 million yuan has been invested in the development of quality special courses, meeting the needs of frontline skill training and giving solid support for the construction of skilled talent teams.

Enrich Employee Life

According to laws and regulations such as the *Opinions on Building a Higher Level Public Service System for National Fitness in China*, the Company has allocated RMB 550,000 yuan to establish 10 culture and sport exchange associations to coordinate and carry out diverse online and offline cultural and sports activities, enriching employees' leisure life and enhancing employee communication.

- Calligraphy and Painting Association**
Organized the collection of workers' calligraphy and painting works, and actively participated in the national exhibition of workers' calligraphy and painting works such as "Chinese Dream, Labor Beauty".
- Tennis Association**
Organized introductory and junior training courses and group competitions to continuously improve competitive skills.
- Running Association**
Held office activities such as the Half Marathon in Olympic Forest Park and Parent-child Running Race, and participated in online activities such as "Million-mile Online Running Race to Welcome the 20th National Congress", with gradually enhanced influence and appeal.
- Yoga Association**
Over a hundred professional yoga courses were organized throughout the year, with over 1,000 members participated.
- Badminton Association**
Held the first exchange activity, invited professional coaches to provide professional guidance to members of different levels, and got positive responses from members.
- Photography Association**
Carried out employee photography collection activities, and actively participated in the National Electric Power Photography Exhibition and documentary photography training courses.
- Basketball Association**
Organized 8 training, competitions, and other activities to improve the competitive skills of members.
- Chess and Card Association**
Gave full play to online advantages and held various chess and card activities to guide employees to open up their minds and relieve their emotions.
- Table Tennis Association**
Organized to participate in the 5th "STIGA-Huadong Cup" Table Tennis Invitational and won third place in the team competition.
- Football Association**
Organized the "Yongcheng Cup" football match to enhance the football skills of members.

Strictly Abiding by the Red Line of Safe Production

Consolidating the Management of Safety

Firmly adhering to the concept of human-oriented and safe development, and in accordance with laws and regulations such as *Law of the People's Republic of China on Work Safety*, the Company has formulated the *Headquarters Responsibility System on Work Safety, Inspection and Evaluation Standards of Responsibility System on Work Safety, Management System Specifications (Standards) for Intrinsic Work Safety*, and other enterprise policy documents. Throughout the year, the Company revised and released 53 systems and 24 safety technical standards in terms of safety production, which further improved the standardization, effectiveness and operability of the system and continuously improved the safety production system.

In 2022, the Company set a zero accident objective, refined 14 specific safety measures on potential hazard investigation, equipment rectification, flood and typhoon prevention, and other aspects, fulfilled the safety production responsibilities level by level. The overall safety production state of the Company was stable, with no major or above safety production accidents occurring throughout the year. With first ranking reliability and energy efficiency in the industry, the Company effectively responded to natural disasters and extreme weather tests such as high temperatures, droughts, typhoons and earthquakes, and successfully completed safety assurance tasks during special and important periods such as the 20th National Congress of the Communist Party of China, the Winter Olympics (Paralympic) Games, and summer peak of power consumption.

Investigation and Correction of Potential Hazards

The Company has formulated and implemented the *Implementation Plan for Safety Inspection*, listed 130 inspection items, comprehensively and deeply carried out major inspections and correction, fulfilled the safety responsibility system level by level, and carried out special inspections and correction on dust collectors, hazardous chemicals, housing safety, oil and gas storage, etc. A total of 5,677 potential safety hazards have been identified and rectified, which effectively reduced the risk of accident and significantly improved the intrinsic safety level.

Dynamically Learning Risks

The Company has established a weekly safety risk control reporting mechanism for timely issuance of accident notifications, proposal of key requirements, urging grassroots organizations to effectively learn the daily and weekly key work and high-risk operation, and risk management and on-site guardian of major projects, important procedures, key links, and high-risk operations to ensure that safety risks are under control.

Double Prevention Mechanism

The Company has fully implemented the *Guidelines for Risk Classification Management and Control*. The grassroots enterprises have detailed the responsibility for risk classification management and control in light of the actual situation, so as to ensure that risks are correctly identified, responsibilities are correctly performed, and measures are correctly taken. In addition, the Company has also updated the "Two Lists" of potential hazards and institutional measures, implemented the "dual prevention" mechanism, gradually achieving the healthy operation of "dual prevention" mechanism.

Strengthening Safety Improvement by Science and Technology

The Company has promoted the integration of science & technology and work safety, comprehensively promoted the running of online unified work safety management platform, and achieved full coverage of 116 thermal power plants. Actively carrying out research and application of key technologies for "intelligence + intrinsic safety" in electric power industry. In 2022, the Company won 21 **Science and Technology Progress Awards from the China Association for Work Safety**, including 2 first prizes, 4 second prizes, and 15 third prizes. Among them, the *Research and Application of Intelligence + Intrinsic Safety Management and Control System for Power Generation Enterprises of Shanghai Shidongkou No.2 Power Plant*, and the *Scenario Buildup and Comprehensive Demonstration of Dam Break of Cascade Hydropower Stations in Small Watersheds of Huaneng Sichuan Hydro-power Co., Ltd.* (Sichuan Company) won first prize.



Course of the Accident

On October 16, 2022, Qinggangping Coal Mine affiliated to Huaneng Coal Industry Co., Ltd. Shaanxi Mining Branch, took the fire extinguishing measure of spraying polymer materials to the excavated-empty-area on working face for the purpose of preventing spontaneous combustion and ignition in the excavated-empty-area on working face during shutdown and maintenance period. At the job site, an employee detected an open flame in the working face. He immediately informed the personnel of the Dispatching Room, Safety Supervision Section, and other departments of the on-site situation, who in turn reported the situation to the relevant responsible persons of Qinggangping Coal Mine and Shaanxi Mining Branch companies level by level. After receiving the report, the relevant responsible person immediately arranged for on-site firefighting, but it was impossible to put out the fire directly because it was too fierce. Then the Qinggangping Coal Mine Fire Emergency Plan was launched immediately, and 148 personnel underground were organized to safely ascend the pit. On the evening of the same day, the pithead was quickly closed for emergency treatment. The shaft closing operation began in the early morning of the next day. Two days later, the main shaft, the auxiliary shaft and the air shaft were closed, and firefighting work started. Through investigation, this accident was identified as a fire accident (with a direct economic loss of RMB 8.7 million yuan) and a general work safety responsibility accident.

Causes of the Accident

Polymer materials that do not comply with regulations were used to spray the working face to stop leakage, and the polymer material had chemical reactions and coalescence combustion, leading to an exogenous fire.

Handling of the Accident

The responsible organizations and persons of the accident were severely punished as follows according to the Company's *Reward and Punishment Measures for Coal Mine Safety Production*:

- Shaanxi Mining Branch was given an economic penalty of deducting 1% of the total wages, and five people, including the General Manager, Deputy General Manager in charge and heads of relevant Departments, were given corresponding administrative and economic penalties
- The Qinggangping Coal Mine was given an economic penalty of deducting 3% of the total wages, and 13 people, including General Manager, Chief Engineer, Deputy Chief Engineer, heads of relevant Sections and on-site duty supervisors, were given corresponding administrative and economic penalties
- Other responsible persons in Qinggangping Coal Mine were investigated for accountability of inadequate safety production management
- Shaanxi Sushu Trading Co., Ltd. was identified as a supplier with particularly serious misconduct, and removed out from the supplier database and held accountable in accordance with the law

Reflections

- Enhancing political stance and implementing safety responsibilities
- Deeply learning lessons from the accident and well conducting rectification and implementation
- Strengthening major disaster management and effectively preventing major safety risks
- Strengthening the management of polymer materials use and prohibiting the use of unqualified products in shafts
- Strengthening job safety training and effectively improving the quality of employees
- Strengthening emergency management and enhancing emergency response capabilities

Improving Equipment Safety

Arranged

358 Times

of Thermal Power Unit Maintenance in Total Throughout the Year

The Company has highlighted the importance of equipment safety maintenance, arranged 358 times of thermal power unit maintenance and 202 times of hydroelectric unit maintenance in total throughout the year. The overall excellence rate of units overhaul has reached 81.5%, maintaining a high level in the industry, and the reliability level of the units has been improved constantly.

Arranged

202 Times

of Hydroelectric Unit Maintenance in Total Throughout the Year

In 2022, the equivalent availability coefficients of hydropower, wind power and photovoltaic of the Company were 93.93%, 99.21% and 99.49%; 75 unplanned outages, with an average unplanned outage rate of 0.120 time/unit-year; A total of 601 units in 137 thermal power plants and 59 hydropower plants achieved no unplanned outage for 36 consecutive days from March 23 to April 27, setting a new record in the past three years; No equipment accidents occurred throughout the year, with a year-on-year decrease of 1; 2 Class 1 obstacles, with a year-on-year decrease of 2.

In the National Benchmarking Competition of Thermal Power Units' Energy Efficiency Level, totally 76 units of the Company won awards, ranking first in the industry; In the National Benchmarking Competition of Power Generation Units' Reliability, a total of 13 coal-fired turbines, 1 gas turbine, and 2 hydropower units won awards, with a total number of awards leading the industry; *The Construction and Application of Power Generation Equipment Rating System* won Second Prize in Management Innovation (National Level) of China Enterprise Confederation, and First Prize in Management Innovation (Industry Level) of China Electricity Council.

Key Area Safety

Safety in Coal Industry

The Company strictly implements the safety guarantee responsibility system and mine management and engineering shift system for its coal industry, and focuses on the whole engineering process control; In order to improve the management system and technical support system for major disaster management, the Company has established a technical guidance service team for controlling major disasters such as rock burst, coal and gas outburst, promoting the precise governance of "One Strategy for One Aspect" to ensure the safe production and supply of coal.

Safety in Nuclear Power Industry

Strictly following the national deployment of a new round of safety and quality improvement actions for the nuclear power industry and guided by the "Three-color Mission, No Risk at All" nuclear safety culture concept, the Company formulated the *Implementation Plan for Nuclear Power Safety and Quality Improvement Action (2022-2025)* to continuously improve the nuclear power safety management system.

The Company carried out "A Hundred Actions" with "Nuclear Safety Management System" as the core, arranged special activities such as conducting inspections and evaluations of deepening the implementation of the safety production responsibility system, adhering to procedures and standardizing records, continuously deepened the operation of safety and quality supervision system, strengthened the supervision and assessment of nuclear power industry, completed the appointment of safety and quality directors of nuclear power projects on site, and effectively ensured the safety and stability of Shidao Bay Nuclear Base trial operation and Changjiang Nuclear Base construction.

The Company continued to promote the development of nuclear emergency response and safety production capacities, held the "Nuclear Safety Culture Month" activity for the first time, and carried out activities such as "Nuclear Safety Lecture Hall", "Nuclear Safety Culture Shock Education Day" and "Comprehensive Nuclear Emergency Response Drill", through which its nuclear power safety level was constantly improved.

Key Sector Safety



Safety in New Energy Industry

- Full coverage of key components in wind power fault prediction and diagnosis system
- Deployed photovoltaic fault prediction and diagnosis system in 148 sites and stations
- Developed and implemented safety technical specifications for road traffic, fire protection, anemometer towers, and unattended operations



Safety in Hydropower Industry

- Developed and implemented the Regulations on Safety Management of Dam Operation in Hydropower Stations
- Carried out pilot safety risk assessment of major hydropower infrastructure
- Gave full play to the role of the Dam Safety Supervision Center and dynamically monitored the risks and hidden dangers of hydropower dams



Safety in Construction Sector

- Promoted the construction intrinsic safety system and continuously increased on-site control efforts
- Strengthened front-load risk management and control, and promoted the advancement of safety risk review checkpoints for operations high above the ground, lifting and hoisting, construction electricity, and blasting



Outsourcing Engineering Security

- According to the principles of "Four Consistencies" and "Safe Co-construction", formulated and implemented the Standardization Management Standards for Outsourcing Projects, focusing on addressing key, difficult, and weak links, with 178 grassroots enterprises completed self-check according to quantitative scoring standards, of which 168 passed the second level organization acceptance



Overseas Security

- Organized specialized meetings on overseas safety management, and formulated and implemented the Company's Specialized Work Plan for Preventing and Resolving Risks of Overseas Projects
- Completed the risk assessment and emergency drills of overseas projects and institutions
- Built the Company's overseas safety emergency command system and achieved interface with the system of State-owned Assets Supervision and Administration Commission of the State Council
- Conducted safety risk prevention training for overseas personnel, ensuring full coverage of management and work levels



Power Network Security

- Developed a special management system for network security protection of power monitoring systems
- Took the lead in setting up a network security innovation consortium for power infrastructure
- Power network security range approved as a national range
- Comprehensively upgraded and strengthened the network security boundary isolation device, and adopted the data transmission software independently developed by Huangeng to ensure the network security of the power monitoring system

Joining Hands with Partners to Achieve Win-Win Value

Enhance Safety Awareness

The Company carried out the activity of Improving Both Team Safety Management Level and Safety Education and Training Quality, formulated and implemented the of Double Improvement work plan, strengthened the pertinence and effectiveness of safety education and training, and effectively improved the team's risk identification and anti-rule breaking ability; Promoted emergency drill mode based on scenario construction, conducted emergency drills for significant on-site risks, tested emergency mechanisms, trained teams, and enhanced employees' emergency response capabilities.

The Company Conducted a Series of Safety Education Activities



Case 1

The Company attached great importance to cultivating employees' safety awareness and organized various safety education activities such as publicity and consultation, management training, knowledge competitions, emergency drills, etc. during important periods such as the "National Safety Education Day" and "National Safety Production Month" to build a "firewall" for safety production.

Promotion Consultation

- Rizhao Power Plant fully utilized media platforms such as the "Internet, WeChat/Weibo, and Video Screen" to carry out online safety education. By setting up offline activities such as the "National Safety Education Day", it actively promoted the core principles of the overall national safety concept and further enhanced employees' awareness of safety risk prevention.
- Hetaoyu Coal Mine organized the "Safety Production Publicity and Consultation Day" activity, where safety inspection staff explained the hazards and consequences of the "Three Habits" and "Three Violations" to employees, distributed safety publicity manuals, and organized the employees to watch accident warning education display boards, so that employees could firmly establish a safety awareness of abiding by rules and operating in compliance with regulations.



The Safety Promotion and Consultation Day of Hetaoyu Coal Mine

Management Training

- The Company launched the "Safety Lecture Hall" activity, with members of the Publicity Team based on their positions and combined with actual situations, providing a safety education for the employees. A total of over 60,000 officials and employees watched the publicity online through Huaneng eLearning, with 76,400 times of interaction.
- Xi'an Thermal Power Research Institute Co., Ltd. invited external experts to carry out safety training for middle-level and above officials and employees in safety supervision positions. They deeply interpreted the *Work Safety Law of the People's Republic of China*, introduced the dual prevention mechanism of risk classification control and potential hazard investigation and management, and analyzed production safety accident cases, effectively improving the professional ability of employees in safety emergency.

Knowledge Competition

- Mengdong Company, Huaneng Hainan Clean Energy Branch, Laiwu Power Plant and other companies respectively held safety production knowledge competitions to comprehensively examine employees' mastery of safety production knowledge. Through the competition, safety production management and indicators were applied to production labor, widely forming a strong atmosphere of valuing safety production and safeguarding employee safety, and continuously promoting safety production work and safety culture construction.

Emergency Drill

- Huaneng Lanzhou Thermal Power Co., Ltd. organized a fire emergency drill, a full process practical drill from receiving alarms, emergency response initiation, rescue actions, emergency recovery, and other links. After the drill, it analyzed the shortcomings and summed up experience to further improve the emergency rescue ability of employees.
- Ninghua Shiji Company organized safety skills training activities for outsourced team to conduct multiple rounds of emergency rescue drills in terms of fire protection, electric shock, and falling from heights at construction sites and living areas, comprehensively improving employees' safety awareness and self-protection ability.

Building Cooperation Platforms

The Company has actively strengthened strategic cooperation with local governments, upstream and downstream enterprises, technology research and development institutions, adhered to the mutual benefit and win-win principle, and opened up cooperation in a wider range and field.

Government-Enterprise Cooperation

The Company has established a mechanism for tracking and implementing cooperation agreements, following up the progress of 35 strategic cooperation agreements signed by 21 provincial and municipal governments, actively providing feedback to local governments, and coordinating to solve problems arising in cooperation. In 2022, the Company signed strategic cooperation agreements with governments of Inner Mongolia, Shandong, and Hebei's Baoding City, and built a low-carbon city research institute with Nanjing City, striving to achieve mutual benefit and win-win results in resource acquisition, project development, energy services, and other aspects.

Inter Enterprise Cooperation

The Company strengthened the stability of the business and industrial chains by collaborating with upstream and downstream equipment manufacturers and suppliers and technology research and development institutions such as Goldwind, Chinese Academy of Sciences, and China Institute of Water Resources and Hydropower Research, with a total of 5 strategic cooperation agreements signed, and by regular follow-up visits and mutual visits.

Took the Lead in Organizing the Centralized Signing of Cooperation Agreements on New Energy Smart Operation and Maintenance Services of Central SOEs



Case 2

In January 2023, the Company held a centralized signing ceremony for cooperation agreements in new energy intelligent operation and maintenance services among central SOEs, involving a total capacity of 288 MW of photovoltaic and wind power projects. 13 central SOEs including the Company signed a total of 21 project agreements. This centralized signing is a specialized integration involving a wide range of projects in the new energy field. All parties will carry out smart operation and maintenance service cooperation through various channels such as resource sharing, business collaboration, online services, and management improvement, to promote the improvement of the quality and efficiency of the new energy industry.

This cooperation marks the transformation of central SOEs' new energy integration from single coordination to overall promotion, new energy management from decentralized to lean, new energy operation from respective exploring to win-win cooperation, and new energy development from scale expansion to specialization and intensification. We need to take this signing as an opportunity to promote the new energy industry development of central SOEs as a "highlight" and form a "coordinated approach", and contribute to building the new energy industry into a new engine of China's economic growth.

—Weng Jieming, Member of the Party Committee and Deputy Director of the SASAC, Attended the Ceremony and Delivered a Speech



The Centralized Signing of Cooperation Agreements on New Energy Smart Operation and Maintenance Services of Central SOEs

Promoting Internationalized Development

Actively integrating into the new development pattern of domestic and international dual circulation, with the "two overall situations" in mind, aiming at building itself into a world-class company, and focusing on the "three lines and one zone", the Company has established 7 overseas representative offices in the UK, Pakistan, Myanmar, Cambodia, Singapore, Australia, and Kazakhstan to promote coordination between the headquarters and overseas representative offices, focused on strengthening the platform of "one body and two wings", and continuously deepen international development.

Strengthen International Exchanges

The Company always adheres to the concept of "international exchange of enterprises is subject to and serve China's diplomatic policy", maintains the enthusiasm of foreign exchanges and strengthens international exchanges and cooperation. In 2022, the Company actively participated in the activities of Global Sustainable Electricity Partnership (GSEP), hosted the International Standardization Conference, attended home diplomatic events like the China-Japan Entrepreneurs Dialogue, IEC Conference, China International Import Expo, China ASEAN Expo, China Development Forum, ASEAN CEO Summit, BRICS Energy Cooperation Forum, spreading Huaneng voice and showing Huaneng image.

The Company's Participating in the 5th China International Import Expo



Case

In November 2022, the Company participated in the China International Import Expo for the fifth consecutive time and held a procurement and signing activity for intelligent high-end equipment and services. The 166-person trading group of 7 secondary organizations under the Company signed procurement agreements or contracts with partners such as Hitachi Energy, Schaeffler, SKF, and ExxonMobil, with a total amount of nearly RMB 2.9 billion yuan. The intelligent high-end equipment purchased this time will be used for the Company's project construction in Yunnan, Sichuan, Gansu, Inner Mongolia and other places, further optimizing the power structure, improving power generation efficiency, and promoting green transformation and development.



China International Import Expo (CIE) Intelligent High-end Equipment and Services Procurement Signing Activities

Overseas Project Construction

The Company adheres to the principle of giving priority to green development and greenfield project, seizes the important opportunity of "the Belt and Road" green development, and builds an overseas industrial system focusing on clean energy investment, construction and technical services in Southeast Asia, South Asia, Central Asia, and some developed countries and regions; International Engineering Technology and Services Company has signed 4 general contracts and 2 management service contracts, all of which are for new energy projects; Continued to promote the construction of seawater desalination in Jurong Island, Singapore and battery energy storage in Rock Mountain, UK.

The Jurong Island Seawater Desalination Project in Singapore is designed with the capacity of desalinating 30 million gallons of seawater per day, with a total investment of RMB 990 million yuan. It commenced for construction in 2018 and was officially put into operation in 2022. The daily drinking water production is approximately 7% of Singapore's daily water demand. By using the unique technological innovation solutions such as sharing existing facilities with the Tembusu Power Plant, its energy cost is significantly reduced, the efficiency is increased by 5% compared with that of the traditional seawater desalination plant, and the average annual electricity consumption can be saved by 5 million kWh.

Overseas Total Installed Capacity of

8,944.2 MW

Total Overseas Assets of RMB

98.556 Billion Yuan

The Stone Mountain Battery Energy Storage Project is located in Wiltshire, UK, with a planned installed capacity of 49.9 MW, energy storage capacity 99.8 MWh and a total investment of RMB 280 million yuan. After completion of the project, it will be operated and managed in an integrated manner with Huaneng Minety Battery Energy Storage Project, and participate in peak shaving, frequency regulation, and other auxiliary services of the UK power grid. The project was commenced for construction in 2021. In 2022, the Company focused on the maintenance and related work of the project development zone to ensure that the investment risks are under control.

By the end of 2022, the Company has invested and managed overseas projects with a total installed capacity of 8,944.2MW, an equity installed capacity of 3,023.3MW, total assets of RMB 98.556 billion yuan, and investment income of RMB 4.85 billion yuan, a year-on-year increase of 223%. The total operating income and profit of overseas projects reached the best level in history.

The Company tracked and advanced 10 overseas projects, of which 2 are key projects, mainly in Laos, Vietnam, Cambodia, Myanmar, Bosnia and Herzegovina and other countries. The wind power project in Bosnia and Herzegovina was approved for initiation, the feasibility study was carried out for the wind power project in Vietnam, and the feasibility study and due diligence were carried out for the hydropower project in Laos.

Building a Responsible Supply Chain

Standardizing Procurement Management

The Company revised the *Non-bidding Procurement Management Measures, Implementation Measures for Procurement Management Assessment and Implementation Measures for Material Management Assessment*, and issued the guidance document for *Further Standardizing the Work Related to Inquiry Procurement*, so as to realize the single-track submission of the procurement plan platform system, give full play to the guiding and leading function of planning, and effectively improve the quality of procurement work. In 2022, the Company's centralized procurement rate, the on-line procurement rate, the public procurement rate, the electronic bidding rate, the suppliers' dynamic quantitative assessment rate and the rate of procurement quality control covering procurement amount all reached 100%. All indicators continued to be maintained at the "advanced level" of the SASAC, and were in a leading position among similar enterprises.

The Company focused on optimizing the business environment, clarifying the main responsibilities of supplier management, counting the performance of the suppliers winning the bids in projects above designated size, and evaluating 17,040 suppliers in total throughout the year to guide suppliers to improve their service capabilities and performance level.

Fine Supplier Management Conducted by Fuzhou Branch



Case

The Fuzhou Branch actively carried out fine supplier management and established a mutually beneficial and win-win partnership.

The Company actively sought enterprises with good reputation, advanced technology, excellent product performance, and strong contractual ability in the industry to join its supplier database by strict audit, and minimized the collaboration risk in the early stage; Throughout the year, a total of 9 suppliers were identified for misconduct and suggestions were put forward for disposal to realize effective control of suppliers in the process of cooperation.

The Company implements a supplier evaluation incentive mechanism, publishes supplier evaluation results every year and conducts excellent long-term supplier selection. Based on assessment and evaluation, it encourages and assists supplier enterprises to improve their capabilities in safety production, quality control, contract performance, green and civilized production, etc.

Deepening the Procurement System

The Company has established a "1+N" procurement system nationwide, led by the Beijing Procurement and Operation Center, supported by procurement sub-centers of 5 clean energy development bases, and guaranteed by N remote bid evaluation sub-centers covering various provincial-level regions across the country, forming a new "centralized + remote" bidding and evaluation management model of "unified platform, online concentration, hierarchical dispersion, and controllable full process", effectively ensuring the normal operation of procurement work. In 2022, 29 remote bid evaluation sub-centers were built.

The Company completed a cumulative procurement amount of RMB 206.9 billion yuan throughout the year, saving RMB 36.2 billion yuan compared to the estimated budget, with a capital saving rate of 14.91%. The Company improved its level of large-scale procurement through material framework agreement procurement. The annual framework agreement procurement of materials amounted to RMB 21.4 billion yuan, saving RMB 4.7 billion yuan compared to the estimated budget, with a resource saving rate of 17.89%. Vigorously promoted the e-commerce materials service, and realized putting all the available framework agreement materials on the shelves in Huaneng Mall. In 2022, under the "Framework Agreement + Huaneng Mall" material service model, the Company independently placed a total of 13,420 orders of RMB 18.6 billion yuan, with the procurement cycle shortened by 45 days compared to the traditional model.

Focusing on Smart Empowerment

By deeply integrating overall resources, the Company created an integrated platform for smart material supply chain, integrating smart procurement, smart materials, smart logistics, smart warehousing, and smart collaboration, and connected key links of the energy and electricity supply chain such as "purchase, warehouse, sales, transportation, and financing". In 2022, Shanghai Huaneng E-business Co., Ltd. won the Green Supply Chain Management Innovation Award, and the Energy Industry Smart Supply Chain Service Platform Based on Blockchain Technology was listed in the National Blockchain Innovation Application Pilot List and selected as a pilot project in the characteristic field of blockchain + energy.

The Company used standardized, structured, digital and intelligent technical means to build "four major systems" of intelligent bidding system, intelligent auxiliary bid evaluation & decision system, intelligent remote bid evaluation supervision system and procurement big data platform, effectively promoting the digital transformation of procurement work and improving procurement quality and efficiency in all aspects. In 2022, the research achievement of the Company's Application of Intelligent Remote Bid Evaluation Supervision Platform in Huaneng's Centralized + Remote Bidding and Procurement System won the Special Prize of Innovative Achievements in Material Management in the National Power Industry.

Intelligent Bidding System

It is an innovative solution that is interconnected with 17 other systems, enabling full process digitization and intelligent bidding, automatic flow of business processes, automatic transmission of related data, effective collection of business data, and deep integration of multiple scenarios. This system facilitates intelligent upgrading and transformation of the Company's procurement process.

Intelligent Remote Bid Evaluation Supervision Platform

It offers comprehensive functionality, integrating four major features: video conference, video monitoring integration, intelligent recognition, and intelligent warning. By leveraging cutting-edge technologies such as artificial intelligence and computer vision intelligent analysis, the system provides real-time monitoring of the entire "centralized+remote" bidding procurement process.

Intelligent Assisted Bid Evaluation Decision-Making System

It offers five module functions which cover wind turbines, property services, thermal power plant's three major equipment, new energy construction, and photovoltaic modules. By providing fast and objective decision-making assistance to bid evaluation experts, the system significantly improves the Company's procurement guarantee capabilities.

Procurement Big Data Platform

It is a platform that enables the convergence of data related to the entire procurement process, promoting data interconnection, intercommunication, and sharing across multiple systems. The platform constructs a company's procurement big data center, providing data support for procurement decision-making, auxiliary evaluation, risk prevention and control, among others. By leveraging the platform, the procurement process is transformed into a more intelligent, data-driven business.

Serving and Driving Local Development



Supporting Regional Development

The Company continues to provide services and support major strategic work plans and action plans for "three clusters, two basins, and one port" (including Beijing-Tianjin-Hebei region, Yangtze River Delta, Guangdong-Hong Kong-Macao Greater Bay Area, Yangtze River Basin, Yellow River Basin, and Hainan Free Trade Port). Through strengthening partnerships with various regions, the Company's strategic layout is aligned with local development, resulting in mutual reinforcement in resource acquisition, project development, energy services, and investment effectiveness.

In the Beijing-Tianjin-Hebei Region, the Company has established the Xiong'an Project Department, bringing together a team of backbone professionals. The Company promotes the orderly construction of the Huaneng Xiong'an Headquarters and supporting comprehensive energy projects. By promoting new industries that are deeply integrated with the construction of supporting industries in the new area, the Company is contributing to relocating non-essential functions from Beijing as the capital, creating a benchmark model for central SOEs.

In the Yangtze River Delta Region, as part of its commitment to the High-Quality Development Plan for the Region's Integration, the Company has reviewed and revised its services to align with the Development Action Plan for the Region's Integration. Specifically, the Company is working to promote green transformation and development. This includes establishing a safe, stable, clean, and efficient energy supply system across the region.

In the Guangdong-Hong Kong-Macao Greater Bay Area, the Company has initiated the construction of projects such as the Wind-Solar-Hydro-Thermal-Storage Integrated Energy Base and Qingyuan Gas Turbine Project in eastern Guangdong, with a total investment of RMB 2.1 billion yuan throughout the year, contributing to the continuous development of the Greater Bay Area. The Company achieved a significant milestone in December 2022 with the successful construction of its first photovoltaic base in the Greater Bay Area. The Guangdong Huadu Chini Solar Farm Integrated with Fishing was connected to the grid, generating 1st kWh of "green electricity". This project is the first of its kind in a first-tier city, which is a comprehensive demonstration project of "carbon neutrality" and fishery-photovoltaic integration. It is also the first key project launched in the "Carbon Valley Town" of Chini, serving as a Huaneng sample for rural revitalization and integrated development of "carbon peak and carbon neutrality".

In the Hainan Free Trade Port, the Company has comprehensively performed the construction of Huaneng Yangpu Natural Gas Cogeneration Project and Changjiang Nuclear Power Plant Project, with a total investment of RMB 5.6 billion yuan. This provides strong support for the development of the Hainan Free Trade Port. Once the Huaneng Yangpu Natural Gas Cogeneration Project is completed, it will serve as the comprehensive energy supply center for the Hainan Yangpu Economic Development Zone that integrates heating, electricity, cooling, demineralized water, compressed air, etc.

Invest RMB

6.6 Billion Yuan

to Support for the Development of the Hainan Free Trade Port

Public Welfare Service Community

The Company set up a youth volunteer platform, and formulated Measures for the Administration of Three-color Salts Youth Volunteer Activities, and carried out in-depth brand public welfare activities of "Three-color Salts" youth volunteers. Activities involved caring for children, emergency rescue, voluntary blood donation, charitable donations and other public welfare fields to convey the Company's love and warmth to the society. In 2022, the volunteer service project "Mother River Protection" of Jinghong Power Plant was awarded the bronze medal in the 6th China Youth Volunteer Service Project Competition.

Conducting the "Three-color Sail" Brand Public Welfare Activity



Caring for Children

In March 2022, Huaneng Properties Co., Ltd. upheld its leading brand of the "Three-color Sail Rainbow Plan Public Welfare Tour" and mobilizing volunteers to carry out the "Growth Service, Emotional Protection" Autism Children's Love Assistance Action. The project provided funding services, emotional care, and publicity to raise awareness and show warmth towards children with autism in rehabilitation centers.



"Three-color Sail Rainbow Plan Public Welfare Tour" Brand Activity

In June 2022, Guizhou Clean Energy Branch conducted a "Three-color Sail" volunteer service activity at Fale Primary School, which is situated in a remote area. The initiative involved providing learning supplies to the students and encouraging them to follow the instructions and guidance of the Party and have a sense of gratitude towards the Party.

We extend our heartfelt gratitude to Huaneng Guizhou Clean Energy Branch for generously donating school uniforms, stationery, and other materials. Through the one-day activity, we truly experienced Huaneng's contribution to the region, and its responsibility and undertakings as a central SOE.

—Principal of Fale Primary School

Emergency Rescue

In June 2022, a sudden rainstorm caused severe waterlogging in Huanjiang Maonan Autonomous County, Guangxi. In response to the disaster, Guangxi Branch acted swiftly by promptly delivering material funds to the government's special account. This contribution helped to ensure the safety of the flood relief personnel and protected the community's well-being and property.

During times of crisis, an enterprise's sense of responsibility is revealed. Huaneng's assistance in critical moments truly reflects the company's sense of responsibility as a central SOE.

—Longyan Township People's Government of
Huanjiang Maonan Autonomous County

In June 2022, Lushan County in Ya'an City experienced an earthquake. In response, Sichuan Company demonstrated its compassion for the affected people by renovating some of storerooms and employee dormitories to construct a Huaneng centralized resettlement site, providing essential supplies, logistical support to promptly address the difficulties faced by residents of the resettlement site, and making the residents feel the warmth of "home".



Huaneng Resettlement Site

Voluntary Blood Donation

In July 2022, Liaowu Power Plant actively participated in the voluntary blood donation cause of Ji'an City. It organized and carried out an voluntary blood donation public welfare activity with a theme of "Celebrating the 20th National Congress and Practicing the Original Aspiration with Passion", with a total of 55 donors donating 18,800 milliliters of blood.

Charitable Donations

Suzhou Thermal Power Plant has demonstrated their innovative approach by launching the "Love+1" Program. This program has accumulated a "365 Love Fund" by donating 1 yuan per person per day for 12 consecutive years. Through paired assistance, the program aims to deliver practical and meaningful assistance to the people.

Promoting Harmony between the Company and Local Regions

Sahiwal Coal-fired Power Plant
has Achieved a Total Annual Power
Generation of

5,100 GWh

The Company is committed to the concept of "building a power station to drive the development of the local area". The Company actively integrates into the economic and social development of the project location while ensuring a stable energy supply, promoting harmony between the enterprise and local regions, benefiting the local people and creating a model project that promote development and improve wellbeing.

In Pakistan, Huaneng Sahiwal Coal-fired Power Plant has achieved a total annual power generation of 5,100 GWh, as well as 2,052 days of continuous safe production. Its efforts have successfully met the annual target, and have effectively addressed the local electricity shortage. The plant has made significant efforts towards the development of an internationalized talent team. It has established a market-oriented recruitment process, contractual management, and differentiated remuneration and talent management operation mechanism. It treated all talents equally, regardless of their nationality. Through open competition, 15 Chinese employees and 19 Pakistani employees were promoted to higher job positions throughout the year. In June 2022, Pakistan experienced a catastrophic flood, which was said to be a once-in-a-century disaster. The plant responded proactively to the situation and organized its employees to donate over 1.06 million rupees to support the local disaster-stricken people in rebuilding their homes. Their efforts demonstrate the caring and responsible nature of Huaneng employees.



Sahiwal Coal-fired Power Plant



Pakistani Employees Working at the
Sahiwal Power Plant

In the UK, Huaneng Mincety Battery Storage Project is a significant milestone for the Company, as it marks its first independently constructed power project in a developed country. The project's first phase was put into operation in 2021, and the second phase started construction in 2022. The project is recognized as one of the 18 projects supporting green and low-carbon development in the UK. Upon completion, it will play a crucial role in providing reliable support for the stable operation of UK's western power grid.

Battery storage technology has become an essential solution for meeting the urgent energy security needs in the UK. The project in the UK plays a crucial role in enhancing the safety and stability of the local power grids, while also boosting the capacity of power grids to absorb electricity generated from renewable energy sources. This project is a successful example of energy cooperation between China and the UK, and demonstrates the benefits of mutually beneficial collaboration in the energy sector.

—Zheng Zeguang, Chinese Ambassador to the UK



Actively Engaging in Rural Revitalization



Lower Sesan II Hydropower Station has Supplied Approximately

8,100 GWh

of Electricity to Cambodia in Total

In Cambodia, Huaneng Lower Sesan II Hydropower Station is the largest hydropower project in the country, with an installed capacity of 400 MW, accounting for over one-fifth of the total installed power generation capacity in Cambodia. The station has played a significant role in addressing the local power shortage by providing approximately 8,100 GWh of electricity to Cambodia as of the end of 2022. It is widely acclaimed as a model project for China-Cambodia energy cooperation.

Lower Sesan II Hydropower Station has successfully implemented an innovative poverty alleviation model, which has directly contributed to the overall relocation and prosperity of 840 households and 3,690 impoverished individuals in the surrounding area. The project has resulted in constructing domestic water wells, roads, and power transmission lines for the resettlement sites of relocated villages, and has provided public infrastructure such as schools and hospitals. The Company has regularly provided relevant skills training and assistance to local villagers, introduced the "company-farmer" model to help them sell their agricultural products, and developed relocated villages into "friendly villages" between China and Cambodia. The project has continuously improved school facilities in relocated villages, creating better educational conditions for the local area. The Company has established the "Huaneng Scholarship" program, which distributes scholarships and donates school supplies to poverty-stricken students who excel in both character and education in relocated villages every year. This program has made a positive impact on the development of local education.



Lower Sesan II Hydropower Station



Resettlement Village of Lower Sesan II Hydropower Station

Shweli River I Hydropower Station has Provided

35,500 GWh

of Electricity to Myanmar in Total

In Myanmar, Huaneng Shweli River I Hydropower Station is a remarkable hydropower project that serves as China's first successful "going global" hydropower BOT project, with an installed capacity of 600 MW. The hydropower station's electricity generation is uniquely dispatched by the power grids of both China and Myanmar, using a production and operation management model that involves "one plant, two grids, dual-country dispatch, and large user direct supply." As of the end of 2022, the station has supplied a total of 33,600 GWh to the Yunnan power grid in China, 28,500 GWh to the Myanmar power grid, and 7,000 GWh to the Tagaung Taung Nickel Mine Project in Myanmar. The electricity delivered to Myanmar accounts for approximately one-third of the country's total national power grid, which is a significant contribution to meeting the annual electricity demand of 5.5 million Burmese people.



Myanmar Shweli River I Hydropower Station

The Company has made significant contributions to rural revitalization and poverty alleviation efforts, through the implementation of the *Opinions on Consolidating and Expanding the Achievements of Poverty Alleviation to Assist Rural Revitalization* in the *New Development Stage* and the establishment of a leadership group dedicated to this task. The Chairman of the Company serves as the group leader, while the President, and the Full-time Deputy Party Secretary serve as deputy group leaders. To coordinate and carry out this important work, the Company has established a leadership group office under the Planning and Development Department. The Company's targeted assistance work has been consistently recognized and rated as "excellent" for six consecutive years, achieving the **highest national assessment level**. Compared to other energy enterprises of the same type, the Company's frequency of receiving such a high rating is the **highest**.

The Company has undertaken numerous on-site surveys and in-depth investigations to assess the effectiveness of its assistance measures. Furthermore, the Company has demonstrated its appreciation for the work of frontline cadres at provincial posts by expressing sincere condolences to them. The Company has also actively communicated and exchanged ideas with local party committees and governments, facilitating the smooth implementation of assistance projects.

The functional departments of the Company have provided necessary supervision and guidance. In addition, the Company has proactively engaged in discussions with relevant departments to address the difficulties and problems in promoting rural revitalization, and has made timely improvements to its assistance measures.

Throughout the year, the Company has generously donated a total of RMB 216.87 million yuan to external sources, including RMB 149.5 million yuan in assistance. The Company has directly invested RMB 42.12 million yuan in grant assistance funds in the targeted assistance areas. Furthermore, the Company has invested RMB 3.2 million yuan in paid assistance funds to construct new energy projects. The Company has introduced RMB 2.84 million yuan in grant assistance funds to implement educational assistance projects. Additionally, the Company has introduced RMB 5 million yuan in paid assistance funds to invest in the construction of agricultural product processing projects.

The Company has selected 8 outstanding cadres to serve as first secretaries in targeted assistance areas, either at provincial or permanent posts. Among them, 3 are located in Yulin City and Hengshan District, Shaanxi Province, while the remaining 5 are in Kezhou and Aheji County, Xinjiang.

The Company has developed and implemented an *Assistance Action Work Plan for Purchasing Products from Poverty-Stricken Areas*. This plan includes opening an assistance zone at the Huaneng Electronic Mall to purchase products from poverty-stricken areas, promoting 502 products sourced from poverty-stricken areas, and purchasing products worth RMB 109.57 million yuan from poverty-stricken areas. The Company has been supporting the establishment of franchise stores and experience centers for products from poverty-stricken areas, while also collaborating with e-commerce platforms such as *benli.com* and *LEAOING* to promote these products both online and offline. As a result, products worth RMB 107.26 million yuan have been purchased from poverty-stricken areas.

Guicheng Trust has taken the initiative to establish a charitable trust called "Huaneng Trust • ABC Private Banking • Muyuan Runze" with a total fund of RMB 120 million yuan. The trust aims to support various charitable undertakings, including rural revitalization and agricultural development. Lancang River Hydropower Inc. has launched an ambitious "Hundred-Thousand and Ten-Thousand Project" in the new era, with a primary focus on achieving the basic goal of "beautiful rural areas, rich farmers, and strong agriculture". The project has implemented "Five Measures for Poverty Eradication", which aim to promote agriculture with unique characteristics while improving ecological livability, cultural guidance, social governance, and the people's livelihood guarantee. Throughout the year, the company invested a total of RMB 25.43 million yuan and implemented 46 projects to address the most pressing difficulties of high concern to those living in poverty.

Strengthening Organizational Leadership

Providing Supervision and Guidance

Stepping up Input

Selecting Outstanding Cadres to Provisional Posts

Expanding Assistance through Purchasing Products from Poverty-Stricken Areas

Innovating Assistance Model

Industrial Vitalization

An Increase of RMB

168 Million Yuan

in the Output Value of the Goat Industry in the Entire Region

In Hengshan Area, Shaanxi Province, where targeted assistance is being provided, the company has been actively promoting the development of "goat industry". It has initiated the establishment of an industrial poverty alleviation fund and worked closely with universities to establish an innovative research center for the northern Shaanxi white cashmere goat industry. Additionally, the company has improved the function of the big data center for agricultural product traceability and conducted product certification, market planning, and product research and development for public brands in the "Northern Shaanxi Hengshan" region. The company was also actively promoting product grading standards and brand integrated packaging. The company has organized an operation team to open an online brand flagship store and invested in the construction of designated lamb slaughtering and deep processing projects. Through these efforts, the company is proud to announce that "Northern Shaanxi Hengshan Mutton" has become the most prominent business card in the area. Due to the efforts to promote brand awareness in the goat industry, an increase of RMB 168 million yuan has been created in the output value of this industry in the entire region, as well as a significant increase of RMB 290 yuan in the per capita net income of farmers.

In Aheqi County, Xinjiang, where targeted assistance is being provided, the company has collaborated with JD Group to implement a smart agriculture project aimed at supporting the construction of a standardized production system, product traceability system, and market promotion system for the seabuckthorn industry. Through these efforts, the company has successfully created a regional public brand of "Aheqi Tianshan Mountain Seabuckthorn". As a result of the efforts, the annual sales of seabuckthorn products has exceeded RMB 30 million yuan. As part of the commitment to the development of the seabuckthorn industry, the company has been guiding and driving local villagers to fully participate in various aspects of seabuckthorn production, including planting, management, picking, and processing, to ensure stable growth of labor income. In 2022, a total of 1,610 tons of seabuckthorn were harvested in Aheqi County, with the participation of 2,288 local farmers and herdsmen. This has resulted in an income of RMB 6.46 million yuan for picking labor, with an average per capita income of RMB 2,823 yuan.



Participation of Local Villagers in Seabuckthorn Picking

Shan'ao Village Completed the Processing and Sales of

1,785 Kilograms

of Tea

Zhejiang Company paired up to assist Shan'ao Village in Sanmen County. The company's efforts were focused on four crucial aspects of production, processing, channels, and brand. By doing so, the company aimed to establish a tea deep processing base and create a provincial-level agricultural industry pilot project called "Longjinggufucha Smart Ecological Tea Park". Furthermore, the company was actively organizing an annual tea culture festival to promote the region's tea industry and help Shan'ao Village's "tea" industry development enter a positive cycle. Shan'ao Village completed the processing and sales of 1,785 kilograms of tea in 2022, achieving a profit of RMB 120,000 yuan.

Mengdong Company Proactively Purchased

11,431 Kilograms

of Fungus

Mengdong Company has made great efforts to building the "fungus industry" in Xiaokoumo Village, Oroqen Autonomous Banner, making a donation of RMB 1.95 million yuan towards the construction of edible mushroom processing workshops. Moreover, the company coordinated with experts to provide training on fungus planting techniques for villagers to improve product quality. The "order-based" purchase and sales model was also a great strategy to expand the product sales channels. The company proactively purchased 11,431 kilograms of fungus, worth RMB 1.03 million yuan, generating a cumulative income of RMB 560,000 yuan for the rural collective economy. By taking practical actions, the company has built a solid foundation for the fungus industry in the village.

Help Xiapu County Sell Nearly RMB

1 Million Yuan

of Agricultural and Sideline Products

Nuclear Power Company has provided targeted assistance to Xiapu County. It established a "Rural Industry Revitalization Service Station", helped Guxian Village establish "Wenmachuantun Trading Co., Ltd.", and registered the public brand "Wenma Memory". In addition, the company has provided support to local agricultural and sideline products by opening an online shopping mall in Xiapu E-commerce Industrial Park and setting up a "Xiapu Specialty" counter in Huaneen Assistance Product Mall. Furthermore, the first secretary stationed in the village has participated in live streaming to promote product sales. The sales of local agricultural and sideline products reaching nearly RMB 1 million yuan in total.

The company implemented the photovoltaic development concept of "comprehensive land use, coordinated development of PV panels and businesses below PV panels, and assistance in rural revitalization". The company has actively explored a new model of "PVA" project development, which integrates multiple scenarios of PV power generation projects based on local conditions. This approach has enabled technology to empower new energy sources, promote local industrial restructuring, and increase people's income.

- Shanxi Quwo PV Station has adopted a comprehensive land-use development model that supports "agriculture-PV complementarity". By using the land under the PV panels to plant crops such as wheat and corn, the PV plant has been able to promote farmers' income growth and assist in local industrial revitalization.
- Guizhou Branch has promoted the construction of a PV base that supports "tea industry-PV complementarity". This model has achieved the integration of PV panels power generation and tea businesses under the PV panels, improving the economic benefits of tea plantation land and promoting local economic development.
- Nanjing Gas Turbine Power Plant has developed and constructed a PV power station that supports "fishery-PV complementarity" in "Yangzhou Town, Yangzhou City. This station generates electricity with the PV panels while simultaneously supporting fish breeding activities under the PV panels. The combination of renewable energy production and breeding activities effectively improves land use efficiency.
- Huayuan Thermal Power Plant has developed and constructed 756 PV & agricultural greenhouses through a combination of "agriculture-PV complementarity" and "fishery-PV complementarity". By utilizing the land under the PV panels to plant vegetables and crops and breed poultry and fish, an average annual agricultural output value of over RMB 2 million yuan and fishery income of over RMB 500,000 yuan have been achieved.

Talent Vitalization

Provided Training Opportunities for a Total of

2,818 Cadres

at the Primary Level

In Hengshan Area in Shaanxi and Aheqi County in Xinjiang, where targeted assistance is being provided, the company has collaborated with universities to build a "goat industry" development training center in Hengshan Area and renovated an employment skills training base for farmers and herdsmen in Aheqi County. Furthermore, the company has introduced curriculum resources from the School of Continuing Education at Tsinghua University, and the company has also cooperated with local governments to establish rural revitalization workstations in the area and county. The company has donated 329 sets of remote teaching equipment. In 2022, the company has provided training opportunities for a total of 2,818 cadres at the primary level, 435 leaders of rural revitalization, 2,173 personnel in various specialized technologies, and 250 people in employment skills training.

Provided Training Opportunities for a Total of

2,173 Person-times

in Various Specialized Technologies

Sichuan Company has provided targeted assistance to Zhawa Village, Seka Township, DaoFu County, and established a night school for farmers and herdsmen. Throughout the year, the night school has conducted eight skill training sessions and 10 training sessions on policies, laws, and regulations that benefit the people. In addition, the company has invited professional training institutions to provide a specialized training. These training initiatives have effectively improved the employment skills of villagers and provided employment opportunities for 15 new migrant workers. As a result of these efforts, the income of the entire village has increased by over RMB 200,000 yuan. The company has provided scholarships to assist rural primary and secondary school students, and provided support to a total of 456 person-times, with funding of approximately RMB 610,000 yuan. Through these scholarship programs, the company has effectively helped local students to grow and develop their talents.



"Rural Revitalization Pillar Project" Scholarship and Student Assistance Activity

Hainan Company launched the "Rural Revitalization Pillar Project" scholarship and student assistance activity at Changbai Village Primary School, Tunchang County. Through this initiative, 33 students were awarded and financially aided, with a total amount of RMB 14,100 yuan. These scholarships and student assistance activities have encouraged students to work hard and develop their talents, paving the way for their future success and contribution to social development.

Culture Vitalization

In Hengshan Area, Shaanxi Province, where targeted assistance is being provided, the company has thoroughly delved into the loess culture of northern Shaanxi, grassland culture, frontier culture, and red culture in old revolutionary base areas. Building on the success of the Shaanxi Goat Culture Exhibition Hall, the company has established a new Hengshan Goat Culture Square to showcase local agricultural and pastoral culture, which serves as a new channel for promoting cultural branding.

In Aheqi County, Xinjiang, where targeted assistance is being provided, the company organized to produce a promotional brand video titled "Aheqi Tianshan Mountain Seabuckthorn", which explores and promotes traditional Kirgiz ethnic culture, including the local "Hometown of Manas" and "Hometown of Falcon".

North United Power Corporation has been actively promoting cultural revitalization in Bolawusu Village, Huade County by establishing a village dance team and inviting professional teachers to provide on-site artistic guidance. The team conducted regular rehearsals and arranged programs, attracting numerous cultural and sports enthusiasts to participate. The dance team has been the **top three** for six consecutive times in the county and township artistic performances. This has created a stage for rural civilization publicity, characterized by "mass design, mass performance, mass viewing, and mass enjoyment", enriching the cultural and leisure life of the local people. Furthermore, it has enhanced the sense of happiness and pride in rural culture.

Ecological Vitalization

In Hengshan Area, Shaanxi Province, where targeted assistance is being provided, the company has built feed processing bases, organic fertilizer processing projects, and distributed rooftop photovoltaic projects to address agricultural production challenges such as forage utilization, straw incineration, and livestock manure disposal. Through these initiatives, the company aimed to explore effective solutions for ecological breeding and sustainable development.

In Aheqi County, Xinjiang, where targeted assistance is being provided, the company has been promoting the cultivation of seabuckthorn fruit. Recently, the company has built a 6,000 mu digitalized base and planted nearly 70,000 mu of seabuckthorn forest. The seabuckthorn has not only become an ecological tree for improving the environment but also an economic tree for green industries, providing wealth for farmers and herdsman.

Yajiang Company has invested more than RMB 2.1 billion yuan to construct the Paizhen-Motuo Highway over the course of 8 years, spanning 67 kilometers. This project has significantly shortened the road length from Linzhi City to Motuo County from 346 kilometers to just 180 kilometers. As a result, the project has effectively addressed the challenge faced by Motuo residents in terms of transportation. The company has invested around RMB 120 million yuan in special environmental and water conservation expenses during the road construction process. The company has undertaken the "One Corridor, Two Points, and Three Belts" project which focuses on improving environmental protection (i.e. ecological corridor along the Paizhen-Motuo Highway; landscape point in the industrial square, protection point of rare animals and plants; high mountain landscape belt, forest landscape belt, and ecological green belt). As part of their efforts towards environmental protection, the company has successfully planted over 20,000 trees and shrubs, as well as sown over 200,000 square meters of shrub flowers. This has helped preserve over 500 ancient trees such as Abies, Tsuga, Aogang. The company has also completed an 8,000 square meter geo-grid slope protection and environmental pilot project in the alpine region. The project has been successful in implementing net covering, spray seeding, greening on slope, and land restoration over a total area of nearly 550,000 square meters. These efforts have resulted in the creation of what is now considered the "most beautiful ecological and environmental protection highway in China".

Invested Over RMB

6 million yuan

to the Improvement of the Living Environment in Xikeng Village

Fujian Branch has prioritized the improvement of the living environment in Xikeng Village, Jinjiang City. It has invested RMB 2.02 million yuan to construct waste transfer stations and wastewater treatment facilities. This has helped improve the environment and hygiene conditions for residents and has also guided villagers towards forming good environment and hygiene habits. Moreover, the branch has invested over RMB 4 million yuan in the road hardening and renovation of bare-shell housings along the line. These initiatives have laid a solid foundation for the creation of a livable, business-friendly, and tourist-friendly environment in the rural areas with revolution history.

The branch has actively leveraged its advantages in the power industry and has been committing to a characteristic development model that combines new energy and rural revitalization. This included advancing the implementation of photovoltaic (PV) projects in various villages, assisting in regional industrial transformation and upgrading, and promoting sustainable growth of collective income in the villages.

- Gansu Branch has completed three rooftop photovoltaic power generation projects in Zhuanjiang County. These projects are expected to increase the annual collective income in the villages by RMB 80,000 yuan.
- Fujian Branch has constructed about 250 MW household photovoltaic projects in 9 counties. These projects serve to enhance the beauty of rural landscapes, stabilize employment in rural areas, drive regional development, and upgrade energy structure.
- Shanxi Branch has completed an assistance project in Yushu County through the development of 10 MW centralized photovoltaic project. This project has provided benefits to 500 households in Getatan Village and Yun'an Village, resulting in an annual increase of RMB 3,000 yuan per household.



Assistance Project in Yushu County through PV Project Development

Organizational Vitalization

In Hengshan Area, Shaanxi Province, where targeted assistance is being provided, the party branch of the Administration Department of the Company's Headquarters, along with the Majialiang Village party branch, has conducted branch joint building activities. The first secretary dispatched by the company led the village party branch to strictly implement the system of holding Party branch general meetings, meetings of Party branch committees, Party group meetings, and Party lectures, and organized activities such as centralized theoretical learning. Majialiang Village has been honored with several titles from 2021 to 2022, including Provincial Standardization Demonstration Village, Municipal Five Star Party Organization, and Area-level Five-Excellence Village Branch.

In Aheqi County, Xinjiang, where targeted assistance is being provided, the company's resident work team and members of the "two committees" in Biedeli Village have worked together in one-on-one pairs to provide assistance. Primary-level Party organizations have played a major role, and the rules of procedure have been revised and improved. The company has established a "three-center" working mechanism, which comprises a party and mass service center, a stability safeguard and comprehensive governance center, and an economic development center, standardized regular Party organization activities, carried out education in the Party spirit for party members, and strengthened their sense of responsibility. In 2022, the company's resident work team was awarded the title of "Outstanding Group" of "Understanding People's Needs, Improving People's Wellbeings, and Rallying People's Support" for their work in villages in the Xinjiang Uyghur Autonomous Region.

Planted Nearly

70,000 mu

of Seabuckthorn Forest in Aheqi County

Invested RMB

2.1 Billion Yuan

to Construct the Paizhen-Motuo Highway

To select and cultivate a team of highly skilled talents, the Company encouraged employees to focus on their job responsibilities, conduct technology research and development, achieve proficiency in essential skills, and strive for excellence, thereby improving the overall vocational skills level of the workforce. To this end, the Company has actively participated in 5 national and industry-level vocational skills competitions for employees and organized 6 "Huaneng Craftsman Cup" group-level competitions. As a result of these efforts, the Company has identified and recognized 25 Huaneng craftsmen and 105 technical experts. Guided by the spirit of Huaneng Craftsman, the Company has continued to build the Huaneng brand and make significant contributions to the high-quality development of the Group and the goal of becoming a world-class enterprise.

National and Industry-Level Vocational Skills Competitions

The Power Industry Vocational Skills Competition (Power Trader) Competition



The Company won 2 first prizes and 2 third prizes in the group category. 6 participants were awarded the Title of Industry Technical Expert, while 11 others were recognized as Excellent Skilled Participants.

The National Teaching Skills Competition for Power Industry Youth Trainers



The Company won the first prize in the comprehensive group category. Additionally, participants also won 2 first prizes, 2 second prizes, and 2 third prizes as individuals. All of the participants were awarded, making the best performance in the company's history.

The National Industrial and Information Technology Skills Competition



A team of three employees, from Shandong Branch, Chongqing Branch, and Huaneng Yangtze River Environmental Protection Technology Co., Ltd. represented the Company and accomplished excellent results in the national competition for industrial big data algorithm. They were awarded the third prize in recognition of their outstanding performance.

The National Coal Industry Employee Vocational Skills Demonstration Competition Professional Competition for Coal Mining Machine Drivers



The representative team from Jilainur Coal Company and the representative team from Huating Coal Industry, both dispatched by the Company, achieved success in the group category, earning the Excellent Award. Additionally, the participants also won 1 silver award and 3 bronze awards as individuals.

Finals of the National Trade Union Financial Knowledge Competition with a Theme of Celebrating the 20th National Congress of the Communist Party of China and Making Greater Contributions in the New Era



Two employees from Shandong Branch and Great Wall Securities Co. excelled at the Central State-owned Enterprise Labor Union Group individual competition, with one employee from each company winning the first and second prizes, respectively.

The "Huaneng Craftsman Cup" Vocational Skills Competition

The "Huaneng Craftsman Cup" Fuel Analyst (Tester) Skills Competition



This is the first time the Company has held a fuel analyst (tester) skills competition, with a total of 64 participants from 24 regional branches and 46 enterprises at the primary-level competing.

The "Huaneng Craftsman Cup" Gas Turbine Operation and Maintenance Skills Competition



This is the first time the Company has held a gas turbine operation and maintenance skills competition, with a total of 62 participants from 10 regional branches and 14 enterprises at the primary-level competing.

The "Huaneng Craftsman Cup" Coal Industry Employee Vocational Skills Competition



A total of 66 participants from 6 representative teams in the coal industry took part in this competition, making it the largest event of its kind to date with the highest number of professions and participants.

The "Huaneng Craftsman Cup" Electricity Market Trading Skills Competition



This is the first time the Company has held an electricity market trading skills competition, with 126 participants from 31 regional branches and new energy companies competing. This competition aimed to enhance the technical expertise of trading skills professionals.

The "Huaneng Craftsman Cup" CCR Personnel On-duty Skills Competition



The competition aimed to build a team of highly skilled thermal power production professionals, and saw 58 participants from 22 regional branches and 35 companies at the primary-level competing.

The "Huaneng Craftsman Cup" Unit Condition Maintenance Skills Competition



The competition saw 62 participants from 26 regional branches and 49 companies at the primary-level taking part, with relevant leaders from China Electricity Council attending the opening ceremony.

Offering Huaneng Strength for Modern Corporate Governance



ESG

Directional Navigation

Building a high-standard socialist market economy. We must uphold and improve China's basic socialist economic systems. We must unwaveringly consolidate and develop the public sector and encourage, support, and guide the development of the non-public sector. We should give full play to the market as the decisive role in resource allocation, so that the government could better plays its role. We will deepen reform of state-owned capital and state-owned enterprises (SOEs); accelerate the optimization of layout of the state-owned sector and structure adjustment; boost the development of state-owned capital and enterprises and enhance the core competitiveness of SOEs. We will improve the modern corporate system with distinctive Chinese characteristics, encourage entrepreneurship, and accelerate the building of world-class Chinese enterprises.

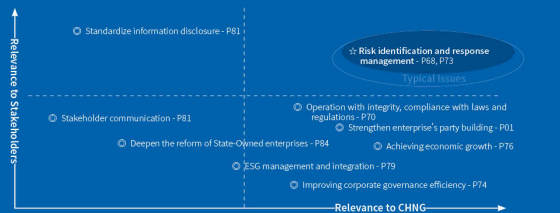
—Report to the 20th National Congress of the Communist Party of China by Xi Jinping

Hands-on Practice

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Governance

WHAT Identification of Core Governance Issues



WHY Background Analysis of Typical Issues

The 1997 Asian Financial Crisis brought corporate governance issues to global attention. In response, the Organization for Economic Cooperation and Development (OECD) published the *OECD Principles of Corporate Governance* in 1999, which were later revised in 2004. According to the Principles, the board of directors of a company has crucial responsibility to review and guide risk policies. The company must implement adequate control systems, including risk management systems, to ensure compliance with laws and relevant standards and avoid any legal or ethical violations during operation. Moreover, the company must also disclose significant risk factors in a timely and accurate manner.

Preventing and defusing significant risks is China's first major strategic task among the three critical tasks, which is relevant to national security, overall development, and the security of people's property, and is a key threshold that the country must cross to achieve high-quality growth.

The SASAC has established a working group for risk control in central SOEs to develop and improve a long-term mechanism to detect, warn, and address risks in central SOEs at an early stage. Furthermore, it has rigorously implemented risk prevention and defusing protocols in areas such as debt management, investment, financial operations, safety, and environmental protection. As a result, the risk resistance ability of central SOEs has been significantly enhanced.

Guided by the spirit of General Secretary Xi Jinping's series of important speeches on preventing and defusing significant risks, the Company has made considerable efforts to implement the SASAC's deployment of significant risk prevention and control work, improve risk identification and analysis, response, monitoring, disposal, and other related management mechanisms. The Company has established a three-level management system along with "three lines of defense." These measures have contributed significantly to the steady enhancement of targeted risk prevention and control work and the improvement of its quality.

HOW Management and Response to Typical Issues

To address integrity risks, the Company has actively promoted the development of a "broad oversight" system. It emphasized oversight of the top leaders and the leadership team. The Company has established 28 work priorities for the commissions for discipline inspection at all levels. These have been implemented through quarterly inspections and supervision. These measures have significantly improved the quality and efficiency of oversight.

To address tax risks, the Company has been conducting regular investigations into tax risks. It has identified 96 key points to be checked for self-inspection and has implemented 523 specific work measures. As a result, it has addressed 158 issues involving a total amount of RMB 156 million yuan.

To address financial risks, the Company conducted a thorough risk investigation covering six main aspects. These included the implementation of financial regulatory regulations, financial enterprise control, fund operation, trust business, futures business, and financial business conducted by non-financial enterprises. Through this investigation, the Company identified 18 issues that required attention, and these issues were subsequently addressed and resolved.

To address funds risks, the Company has conducted a comprehensive sorting and investigation of debt risks. Through this process, the Company identified 52 risk points that were associated with 79 entities, and 45 enterprises were identified and screened for key monitoring to ensure the safety of their capital chain.

To address overseas risks, the Company has organized and conducted a thorough investigation of compliance risks in all relevant fields, levels, and directions. Through this investigation, the Company has been able to keep abreast of the risk landscape of entities with overseas operations and develop targeted avoidance plans accordingly.

PERFORMANCE Huaneng Strength

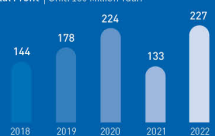
Total Assets | Unit: 100 Million Yuan



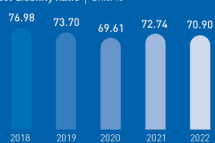
Total Operating Income | Unit: 100 Million Yuan



Total Profit | Unit: 100 Million Yuan



Asset-Liability Ratio | Unit: %



PRACTICE Huaneng Strength

By implementing the "Year of Strengthening Compliance Management" program, the Company has established a dual line of work that prioritizes full coverage and key areas and developed "three lists" to take a proactive approach to compliance management.

The Company initiated special actions for risk elimination and control at all levels. Pursuant to the targeted risk control principle, we focused on 25 major risks in 6 areas, i.e., HSE, stability, capital and financial business, transformation and development, international business operation, and law.

The Company has formulated the *Guiding Opinions on Accelerating the Construction of World-class Enterprises and the Improvement Plan of Benchmarking the World-class Management*, initiated the normal benchmarking improvement work, fully completing 26 key tasks and 89 specific measures.

The Company has built wind power base for popular science education, actively strengthened communication with government agencies, school students, and the general public. Total 5000+ visitors have visited the wind power base for popular science education.

The Company has formulated the *Implementation Plan for the Three-Year Action to Reform (2020-2022)*, established "1+3+3" Working Mechanism and completed 27 reform tasks and 105 specific reform measures in 6 reform areas.

The Company has adjusted the functional positioning of its headquarters, focusing on the "four centers" positioning for strategic decision-making, resource allocation, performance control, and risk prevention and control, striving to foster a "top two", "two high", and "first-class headquarters" system, thus giving impetus to the comprehensive improvement of corporate governance efficiency.

PRIZE Huaneng Strength

The Company's assistance practice case was recognized by the Global Compact Network China as the "Best Practices for Enterprises in Achieving Sustainable Development Goals (Poverty Alleviation and Prosperity Promotion)".

Xi'an Thermal Power Research Institute, Clean Energy Research Institute, Lancang River Hydropower Inc. have been included in SASAC's list of building the world-class demonstration enterprises and specialized, refined, and innovative demonstration enterprises.

The ESG practice cases of Huaneng Power International has been included in the "Best Practice Cases List of A-share Listed Companies" by the China Association for Public Companies.

The Company was awarded the title of "Excellent Unit in Central SOEs Information Work".

The 4 listed subsidiaries (namely, Huaneng Power International Inc., Inner Mongolia Mengshou Huaneng Thermal Power Corp. Ltd., Huaneng Lancang River Hydropower Inc. and China Great Wall Securities Co., Ltd.) have all been rated at Grade A information disclosure evaluations by the respective Exchanges.

The Company has been rated as Grade A in the assessment of SASAC key tasks.

The Company's BOD has been awarded the "Excellent" rating by the SASAC for two consecutive years.

Prudent Operation with Integrity and Compliance with Laws

Sticking to the Bottom Line of Compliance

Improving Compliance Management System

Compliance Management Organization System: The Company has established a compliance management committee, which is composed of 128 full-time and part-time compliance administrators. This committee covers all secondary units of the Company. In addition, the Company has implemented a compliance management work system, with the Chief Legal Advisor (Chief Compliance Officer) acting as the leader, legal affairs agencies taking the lead and business departments taking main responsibility.

Compliance Management System: The Company has prepared a compliance manual and specialized compliance guidelines for 15 key areas, and sorted out compliance risks, bottom line lists, and business compliance risk behaviors across the 18 departments and directly affiliated institutions of the headquarters. In addition, the Company has effectively integrated compliance management into its institutional standards and business processes.

The company has taken a proactive approach to compliance management by conscientiously implementing the "Year of Strengthening Compliance Management" program. This program has involved the participation of headquarters, secondary units, and enterprises at the primary level, with a focus on covering all levels and areas. The Company has established a dual line of work that prioritizes full coverage and key areas. This approach involves targeted management of issues related to investment, early expenses, and other compliance matters. The Company has also conducted deep analyses to identify the root causes of problems and developed "Three Lists" of issues, measures, and deadlines to address them. In 2022, the Company identified 260 compliance risks in its business operations, of which 250 corrective actions were completed, and 10 ongoing corrective actions were currently being taken. There were no major violations or resulting liability issues caused by non-compliance during this period.

Implementing Targeted Management in Compliance

Actively Cultivating a Compliance Culture

The Company has taken a proactive approach to build a compliance culture system by organizing training courses aimed at enhancing compliance management awareness and abilities for business management personnel, compliance practitioners, and ordinary employees in three shifts. In addition, the Company issued a proposal on corporate compliance, all employees signed a compliance commitment, and various forms of training and cultural publicity were implemented to create a strong compliance atmosphere. As a result, the compliance awareness of all employees has been continuously enhanced.

Fujian Port Company Organizing a Compliance Management Training Program

In November 2022, Fujian Port Company organized a compliance management training program. Professional lawyers provided explanations of typical compliance cases and the *Central SOEs Compliance Management Measures*, elaborating on the necessity and practical value of conducting compliance management and establishing and implementing effective compliance management systems in central SOEs. The program also interpreted the latest requirements of the SASAC for the construction of compliance management in central SOEs to further enhance employees' compliance awareness and create a compliance management atmosphere.



Fujian Port Company

China Huaneng's Proposal on Compliance

Law-based governance is important for the Party's success in governing and rejuvenating the country. General Secretary Xi Jinping stressed that in governing a country and society, "The important keys are to establish rules, understand them, and abide by them". He further stated that the law is the most significant and crucial rule for governance.

As a pacesetter in China's power industry, CHNG has consistently followed the guidance of Xi Jinping Thought on the rule of law. We have implemented a strategic plan for comprehensive rule of law, which involves further enhancing the legal framework of CHNG, improving our ability to govern according to law, and being firm in becoming a practitioner and an advocate of socialist rule of law with Chinese characteristics.

As we enter the new era, it is imperative that all CHNG employees demonstrate their respect for the law and contribute to building a strong foundation for the rule of law. We must adopt a firm stance towards compliance and consistently cultivate a culture of compliance. Furthermore, we must adhere to the solemn commitment of governing in accordance with law and strictly abide by legal regulations. We must devote substantial effort to strengthen our compliance capabilities, maintain unwavering determination in fulfilling our compliance duties, and consistently match our actions with our words to cultivate a compliance culture within CHNG. Additionally, we should remain committed to personal compliance with laws and regulations, which will support the company's dedication to achieving high-quality development.

As we embark on our new journey, it is imperative that we work together and uphold the "Two Development Strategies". We must remain mindful of the country's fundamental interests and continue to consolidate reform consensus through the rule of law. In addition, we must remain committed to the six "new leading" strategic tasks and ensure that decision-making, operation, and management are conducted in accordance with law. It is important that we unite in the construction of compliance management organizations, institutional systems, and operation and guarantee mechanisms. By doing so, we can use governance to cultivate our core competitiveness, fulfill our mission and responsibility as a central SOE in compliance, and safeguard the construction of a world-class modern clean energy enterprise.

Building Huaneng's Rule of Law

Establishing the Well-Structured Top-Level Design on Huaneng's Rule of Law

Huaneng's Five-Year Work Plan for Huaneng's Rule of Law (2021-2025) has clearly defined the leadership responsibility, legal governance, rules and regulations, compliance management, and work organization systems, aimed to enhance the five major capabilities and tasks of leadership support, risk control, foreign-related guarantee, proactive rights protection and digital management. The Work Plan has revised the governance performance evaluation methods on 36 indicators in 5 dimensions with a bid to build the Huaneng's Rule of Law featuring the improved governance system, standardized management and demonstrating Huaneng's law-abiding and integrity commitment.

Reinforcing the Responsibility of the Chief Responsible Person

Huaneng has put more efforts to run the enterprise with its principal as the chief responsible person for governance fulfillment. For this purpose, we will refine the work measures, enhance assessment and incentives, and see responsibilities are fulfilled by all the stakeholders. Huaneng Headquarters has established a scheduled meeting system on the governance reporting mechanism briefed by the Party Leading Group, principals and BOD to incorporate Xi Jinping Thought on the Rule of Law and study of laws and regulations into the Party Leading Group's regular study. The secondary units have formulated and revised their Articles of Association to improve the system of general legal advisor, and enable the principals to effectively fulfill the responsibilities that they should do as the persons of chief responsibility.

Strengthening Publicity and Communication on the Rule of Law

We endeavored to improve the awareness of the rule of law among all employees through all possible means, such as implementation of the *Eighth Five Year Plan of the Propaganda Department of Central Committee (2021-2025)* and the *Ministry of Justice on Carrying out Rule of Law Propaganda and Education*, enhancement of publicity and education on the rule of law, access and communication to Xi Jinping Thought on the Rule of Law, *Constitution*, the *Civil Code*, the *Work Safety Law*, and other relevant laws and regulations on business operation in an online and offline approaches.

We have attached great importance to the talent team construction and publicity and communication on the rule of law, conducted regular training on professional knowledge and management knowledge at different levels, encouraged legal personnel to gain eligibility for company lawyers, thus creating a group of high-quality and professional legal talent teams.

"Zero Distance" Rule of Law Education in Huaiyin Power Plant



Case

In August 2022, Huaiyin Power Plant arranged several employees to attend as audience the trial of a sale contract dispute case by the Huaifan Intermediate People's Court in accordance with the dedication to building the Huazheng Rule of Law. By attending the court trial as audience, using this contract dispute case as a chance of access to legal popularization, the court hearing scene served as an educational classroom, enabling all audiences to truly get access to the legal education by themselves, so that they could experience the "Sunshine justice", thus enhancing their awareness of business risks and legal awareness.

Enhancing Legal Compliance Review

We have continued to consolidate the foundation of legal compliance review work, optimized the work process, incorporated the legal compliance review into the management processes and digital systems, thus achieving the 100% coverage on legal compliance review of economic contracts, rules and regulations, and important decisions.

By fully utilizing the important role of legal compliance review, we endeavored to advance the Company's green and low-carbon transition. Strictly control the legal risks of new energy projects by having full understanding of the four-step review method for new energy projects.

Fully Review Normative Documents Correctly Understand the Project Process
Accurately Define Key Points on Review Appropriately Keep Risks under Control

Improving the Internal Control System

In accordance with the applicable mechanisms on "Dynamic revision of internal control system, regular self-inspection of internal control evaluation, and rectification of internal control defects", we have promoted the standardization of internal control systems in fields such as funds, finance, and procurement bidding, including revision of 30 professional systems, and 153 attempts to revise and release the internal control manuals made by 92 enterprises. As a result, the "1+N" internal control standardization system has been continuously improved; We have continuously advanced the daily evaluation of internal control by using the approach of "unified deployment by headquarters, self-evaluation by enterprises at all levels, and hierarchical supervision and evaluation" to ensure the full coverage and normalization of internal control evaluation. Therefore, we have identified a total of 97 internal control defects within our 24 affiliated enterprises, down 30 defects on a year-on-year basis. All these defects are classified the general defects, and have been completely addressed.

Reinforcing Audit Supervision

We stress on the building of internal audit system and mechanism to build an audit supervision system operating in a centralized, unified, comprehensive coverage approach. We aim to integrate the audit forces within the HQ, secondary units, and grassroots enterprises to deliver the coordinated audit plans, audit resources, audit projects, and audit quality, promoting the implementation of project plan and construction, and fully leveraging the effectiveness of audit supervision.

2022 witnessed our efforts in carrying out high-quality audit supervision in key areas. In the past year, we completed a total of 1,285 audits, plus identification of 6,270 findings, 3852 audit proposals, and saved the project settlement by RMB 851 million yuan. Thanks to audit rectification, we regained RMB 378 million yuan from the intensive adjustment of accounts and financial statements, reclaimed funds of RMB 4.096 billion yuan, improved 1,472 rules and regulations, and applied accountability investigation into 355 persons.

Targeted Risk Prevention and Control

Over
12,000
Risk Points were Identified

Risk Prevention and Control Measures
with a Completion Rate of

93.14%

Pursuant to the principles of targeted risk prevention and control, we focused on 25 major risks in 6 areas, i.e., HSE, stability, capital and financial business, transformation and development, international business operation, and law. We initiated special actions for risk elimination and control at all levels, achieving full coverage of risk prevention work and assigning duties to all the relevant persons within the enterprises. In 2022, a total of over 12,000 risk points were identified and over 68000 measures were made.

We continuously strengthened oversight of major risk every month, monitored the implementation of 102 risk prevention and control measures, monitored changes in 24 key indicators in 16 risk areas. We completed 95 risk prevention and control measures throughout the year, with a completion rate of 93.14%.

The *Implementation Rules for Reporting Major Risk Events* was revised to strengthen risk event control. In 2022, 11 out of 18 new events (hazards) were addressed while the rest was effectively controlled. No major risk events emerged during the year.



Improving Management Efficiency through Various Measures

BOD Management

In accordance with the spirit of the *Opinions on Strengthening Party Leadership in Improving Corporate Governance by Central SOEs and Work Rules of the Board of Directors of Central SOEs (Trial)*, the Company took up in a proactive way to figure out the way of strengthening the Party leadership and improving corporate governance so as to continuously improve the relevant system and operating mechanism of the BODs, effectively play the role of external directors, and ensure the orderly operation of the BODs.

Promoting the Building of Standardized and Efficient BODs

Continuous Improvement of the Institutional System: Established a well-structured "1+N" institutional system to ensure the standardized and efficient operation of the board of directors, comprehensively strengthened the leadership of the Party in corporate governance, dynamically optimized the list of decision-making powers and responsibilities for major matters, and formed a complete set of board of directors' institutional system and working mechanism with Huaneng's characteristics.

Continuous Optimization of the Operating Mechanism: Established a mechanism for soliciting opinions from external directors before major decision-making matters of the Party Leading Group meeting, optimized the mechanism for external director communication meetings, held 7 external director communication meetings throughout the year to carry out deliberation of 45 proposals, held 12 special committee meetings to carry out deliberation of 33 proposals; Established a standardized and efficient decision-making mechanism that separately focused on meeting communication, pre-meeting communication, special committee inspection, and BOD decision-making.

Diligent Performance of Duties of External Directors: upheld the theoretical and business learning, including two collective workshops attended by external directors; Developed key work points for external directors and refined 20 specific work measures; Established a multi-level communication mechanism, including communication between the chairman and external directors 4 times, and that between external directors and the management team 7 times; Conducted four collective surveys throughout the year, fully leveraging the role of external directors as decision experts and business advisors.

Reinforcing Information Support: monthly published the *Director's Work Newsletter* to allow external directors' access to the Company's production and operation situation; Established a regular reading mechanism, through which external directors may get access to important documents on a quarterly basis.

Reinforcing Decision-Making Support: Established a BOD decision-making communication mechanism before, during and after meetings to strictly submit BOD meeting notices and proposal materials in accordance with relevant procedures, and ensure decisions were made in a scientific and prudent manner.

Reinforcing Organizational Support: Established a dedicated BOD office and its director to deal with daily liaison work of the BODs, effectively improving the BOD's role in providing support and services.

To further the building of the subsidiary's BODs, we have formulated the *Guidelines for the Work of the Subsidiary's Board of Directors* through revision of the existing systems, and thus created a comprehensive system covering the establishment, operation, guarantee, and evaluation of the subsidiary's BODs. We have advanced the building of the BODs to a higher level. All the 26 enterprises that are included in the scope of the BOD construction have formed a BOD mechanism with a majority of external directors, plus its support organization in place, so as to improve the management system for the board of directors to delegate authority to managers. We have promoted the comprehensive implementation of the powers of the board of directors within 11 important subsidiaries. We have established a well-structured performance evaluation system, and comprehensively completed the performance evaluation of the annual "three meetings" and the performance evaluation of full-time directors.

Reinforcing the Role of External Directors in Fulfilling Their Duties

Building of the Subsidiary's BODs

Information Building

Steady Improvement of Information Security

- We completed development of normative documents, such as the *Key Information Infrastructure Network Security Work Plan* and *Data Security Management Measures*, etc., to promote the construction of network security supervision, inspection and network security notification and early warning mechanisms, and grow the capacity of the normal and effective network security supervision
- The comprehensive network security management and control platform has covered the three-level organizations across the entire Group, thus enabling task assignment, defect identification and repair in a closed-loop way
- We implemented the cyber security responsibilities step by step, strictly implemented full-time and global on-duty monitoring and emergency response, ensuring no cyber security incidents during major events
- We completed the convergence of 29 internet exits under the "One Province, One Exit" policy, and comprehensively controlled the security situation of internet exit and applications in the jurisdiction area

Further Advancing the Digital Transformation

- We developed and implemented the *Overall Plan for Digital Transformation* to build a business-led and innovation-driven digital transformation model in the industrial sector
- We initiated the building of a unified smart energy management platform and regional operation center project
- The unified digital platform has been built to a level able to allow the construction of information technology projects
- We promoted the "IHHS" mobile portal platform, with 104,000 registered users and 90+ connected applications
- The R&D achievements of the home-made OA system project have passed the review
- The development of unstructured data management platform functions has been completed

Remarkable Information R&D Achievements

- We established a standardized technical committee for information technology, prepared the *Guidelines for the Collection and Reporting of Investment in Information Technology Project Research and Development*, and gradually standardized the information technology project R&D management
- We made clear the application needs of artificial intelligence in 6 major business areas, defined 30 key application scenarios, and continuously add new technology application scenarios
- We conducted research on semantic recognition assisted plagiarism detection, conducted testing on Huawei Ascend ecological prototype AI training platform, and actively participated in the three-year action program for central SOEs' Beidou development
- 6 projects including intelligent operation management platform in the energy industry have won awards
- The network situational awareness platform under independent development has been put into trial operation
- Huaneng Cloud was approved and recognized as the "Intelligent Industrial Cloud in the Power Generation Industry" by the SASAC (State-owned Assets Supervision and Administration Commission)

Advancing the Pace of Building the World-class Enterprise

According to the instructions of the Central Committee of the Communist Party of China and the State Council to accelerate the construction of world-class enterprises, the Company has taken measures to build a world-class enterprise. For this end, we have formulated the *Guiding Opinions on Accelerating the Construction of World-class Enterprises* and the *Improvement Plan of Benchmarking the World-class Management*, which has been recognized as the "Top Ten Central SOE Plans" by the SASAC (State-owned Assets Supervision and Administration Commission). The Company has initiated the normal benchmarking improvement work by focusing on the strategy, organization, operation, finance, technology, risk prevention and control, human resources, and information management, fully completing 26 key tasks and 89 specific measures.

The fact that Xi'an Thermal Power Research Institute, Clean Energy Research Institute, Lancang River Hydropower Inc. have been included in SASAC's list of building the world-class demonstration enterprises and specialized, refined, and innovative demonstration enterprises has placed Huanneng as one of the central SOEs with the most eligible enterprises.

Value Maintenance and Appreciation of Assets

We have made progress on the operating performance despite hardship, with the operating revenue of RMB 424.5 billion yuan, up 10% on a year-on-year basis, and a total profit of RMB 22.7 billion yuan, up 71% on a year-on-year basis; net profits of RMB 16.1 billion yuan, 78% up on a year-on-year basis. By the end of 2022, the Company operated with the total assets of RMB 1,415.2 billion yuan, with a debt ratio controlled at 70.90%, a year-on-year decrease of 1.84 percentage points, fully achieving the "Two profits and four ratios" assessment target as set by SASAC.

Reducing Cost, Improving Quality and Increasing Efficiency

The Company has initiated the specific action to improve quality and increase efficiency. By focusing on the development of the main industries, we vow to work by following the "5+N" roadmap for improving quality and efficiency in accordance with the general principle of "Each policy corresponding to each industry or enterprise, different policies corresponding to different classifications". For this purpose, we have identified 234 key tasks in 17 critical areas so as to forge strengths and address weaknesses, increase incentives for key and difficult tasks. Moreover, we have conducted probe into some key enterprises to give instructions on solving the findings and ensure fulfillment of all key tasks.

In terms of cost control, the six production costs of the Company's power production were strictly controlled according to the principle of "No increase in total amount on a year-on-year basis". The production cost per kilowatt hour was RMB 16.92 yuan/MWh, a decrease of 1.33% against that in 2021; the production cost per unit capacity was RMB 66.28 yuan/kilowatt, a decrease of 1.67% against that in 2021, marking significant cost-saving effects.

- We strengthened coal price control. The proportion of medium to long-term contract coverage for electric coal has reached a historic high, with the annual signed volume accounting for 85.6% of the total demand, an increase of 10.6 percentage points on a year-on-year basis.
- We strictly controlled the procurement of high priced spot coal, carried out resource collaboration with coal enterprises, and effectively reduced fuel costs.
- New comprehensive interest rate for financing ranked first in the industry benchmark, contributing to saving of RMB 2.27 billion yuan in financial expenses.
- We reclaimed funds of RMB 22.5 billion yuan through implementation of the tax refund, tax reduction, and fee reduction policies.
- We reclaimed RMB 31.18 billion yuan of renewable energy subsidies.

Reclaiming Funds of RMB

22.5 Billion Yuan

Through Implementation of the Tax Refund, Tax Reduction, and Fee Reduction Policies

Intensified Top-Level Design for Duty Execution

ESG Governance

The Company has established an ESG management committee responsible for leading the review and decision-making of major issues, guiding the identification of key issues and risk analysis. The Social Responsibility Division under the Planning and Development Department is assigned to take care of ESG-related work. A person in charge of social responsibility is assigned under every functional department, and the social responsibility liaison person is assigned in every subsidiary. This mechanism forms a top-down, horizontally and vertically combined ESG work system with clear division of labor.



ESG Concepts

The Company has integrated ESG with the cultural concept of "Three-Color Huanneng" to create the enterprise's ESG brand image, promote all cadres and employees to perform their due responsibilities of being a great power, and promote the high-quality development of the Company in the new era. In 2022, our two achievements were selected as typical cases of state-owned enterprise brand construction, and the "Hongneng" Party building cultural brand of Shandong Branch Linzi Power Plant was among Top 30 Enterprises with cultural brand influence in the national power industry.

Core Value	<ul style="list-style-type: none"> Adhere to Integrity, and focus on cooperation Constantly innovate, and be proactive and enterprising Create performance, and serve the nation 	Safety Concept	<ul style="list-style-type: none"> Safety contributes to efficiency, safety serves as competitiveness
	Strategic Orientation	<ul style="list-style-type: none"> Power as the core business, synergy among various energy sectors, innovation as the leading force, finance as the supporting business, global layout 	Integrity Concept
Development Concept		<ul style="list-style-type: none"> Growing stronger, staying ahead 	Enterprise Spirit
Management Concept	<ul style="list-style-type: none"> People-oriented, pragmatic and efficient 	Enterprise Style	<ul style="list-style-type: none"> Entrepreneurship, Efficiency, Trustworthiness, Frugality

ESG Planning

ESG Planning of Huaneng (2021-2025)

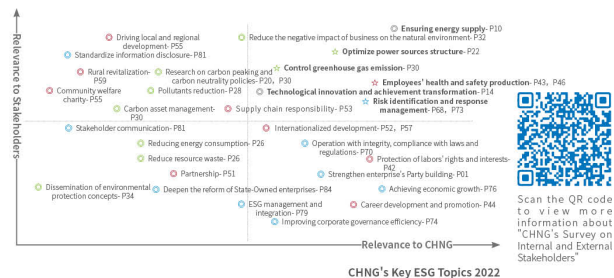
	Within the Company		Outside the Company	
Goals	Advancement of ESG management	Promotion of ESG integration	Creation of communication platform	Improvement of ESG image
Path of Implementation	System improvement Enhancement of capability development Promotion of ESG appraisal	Execution of ESG study and survey Construction of demonstration base Advocacy of report release	Establishment of reporting system Implementation of topic survey Regular information disclosure	Participation of industry activities Communication arrangement Make the voice of ESG

ESG Regulations

Classification of Regulations	Main Regulations
Basic Management Regulations	<i>Assessment and Evaluation Measures for the Party Building Work Responsibility System, Opinions on Consolidation and Expansion of Achievements in Poverty Alleviation to Advance Rural Revitalization in Providing Aids in a New Development Phase, Management Measures for the "Three-color Sail" Youth Volunteer Activity</i>
Regulations of Related Issues	<i>Measures on Staff Skill Competition, Special Emergency Plan on Work Safety, Site Tour Inspection Assessment Standard on Work Safety Responsibility, Work Plan for Promoting Ecological Protection and High-quality Development of the Yellow River Basin, etc.</i>

Imposing Responsibility Integrated with Business

Core ESG Topics



CHNG's Key ESG Topics 2022

ESG Process

The Company attached great importance to ESG integration, encouraged subsidiaries to release ESG related reports, and especially promoted listed companies to strictly disclose non-financial information in accordance with the requirements of the Exchange to facilitate engagement in stakeholder communication. All 5 listed companies affiliated to Huaneng Power International Inc., Huaneng Lancang River Hydropower Inc., Shandong Xinneng Taishan Power Generation Co., Ltd., Great Wall Securities Co., Ltd and Inner Mongolia Mengdian Huaneng Thermal Power Corporation Ltd. publicly released ESG related reports to the public.

As a major state-owned backbone energy company of China, the Company has joined the activities of a number of domestic and foreign industry organizations including the International Electrotechnical Commission (IEC), Global Sustainable Electricity Partnership (GSEEP), Global Energy Interconnection Development and Cooperation Organization (GIEDCO), Chinese Society for Electrical Engineering, China Electricity Council, etc. to effectively interact with the stakeholders, and actively promote the fulfillment of ESG management and practice in China's power industry.

ESG Performances

In order to effectively improve the integration of ESG into production and operation, the Company listed ESG work in the *Assessment and Evaluation Measures for the Party Building Work Responsibility System*, and urged secondary companies to strictly carry out ESG work.

The Company held the 1st Selection & Appraisal of Excellent ESG Cases and Selection Event of the Most Beautiful ESG Pictures, with cases and pictures submitted by subsidiaries. Through online voting and expert scoring, ultimately, the "2022 Annual Excellent ESG Cases and the Most Beautiful ESG Pictures" were selected, with the list of award winners included in the Company's ESG report for public disclosure, promoting subordinate units to better fulfill their ESG management and practice.

Outside the Company, Huaneng actively participated in different ESG-related selection & appraisal activities, with a lot of awards won for its outstanding performance in responsibility management and practices.

- Sustainability Report 2021 of China Huaneng Group Co., Ltd. was rated five-star (the highest level) by China Corporate Social Responsibility Report Rating Expert Committee, and thus the Company became the only domestic power generation company that has obtained five-star rating for eleven consecutive years.
- Company's help practice case *China Huaneng | Comprehensively Promoting Rural Revitalization to Help Achieve Common Prosperity* was recognized by the Global Compact Network China as the "Best Practices for Enterprises in Achieving Sustainable Development Goals [Poverty Alleviation and Prosperity Promotion]"
- Company's help practice case *Focusing on Infrastructure for People's Livelihood and Striving to Win the Battle against Poverty* was included in SASAC's topics on *Blue Book of Central SOEs Helping Rural Revitalization (2022)*.
- Company's overseas case on duty execution—*Empowering the Green Future* was included in SASAC's topics on *Blue Book of Overseas Social Responsibilities of Central SOEs (2022)*.
- Huaneng Power International's ESG practice was highly valued by regulatory agencies and industry associations, and has been included in the "Best Practice Cases List of A-share Listed Companies" by the China Association for Public Companies.

ESG Capability

The Company attached great importance to improving its ESG capabilities by taking appropriate measures in the preparation of ESG reports. It has been conducting special training on sustainable development for six consecutive years from 2018 to 2023. The Company has adjusted and updated the training content and scope in a timely manner to adapt to changes in the internal and external environment. Special training, attended by employees from the HQ as well as the secondary units and grassroots units, was conducted to focus on the ESG field. This training has effectively enhanced the ESG awareness among all employees, created an ESG work atmosphere, and further promoted the implementation of ESG management and practice in various departments and units across the organization.

In 2022, Huaneng Lancang River Hydropower Inc. carried out probe into the "ESG Indicator System and Evaluation Model Construction", creatively proposing the ESG Responsibility Value model. Furthermore, Lancang River Hydropower, operating as a central SOE, listed company and power enterprise, has established a set of ESG indicator system with its own characteristics and recognition incorporating the mainstream ESG guidance content at home and abroad. The first ESG special indicator system and evaluation model of Huaneng System was the research outcome, which is a forward-looking move featuring the beneficial attempt and exploration. Therefore, other companies in the sector, energy and power industries, and central SOE's listed companies will benefit from it.

Building an Information Communication Platform

ESG Report

The Company has innovated in communication methods, deepened communications with stakeholders, built a mechanism for ESG communication, expanded communication channels, and continuously improved the integrated system of "daily, regular, and special" communications to ensure comprehensive, timely and accurate disclosure of the Company's responsibility performance to the public.

In accordance with the relevant requirements of the SASAC, the Company has created a brand management and news publicity management system to continuously promote the construction of information disclosure system and mechanism, build the innovation information disclosure platform carriers, continuously improve corporate transparency, and push ahead the construction of a "Sunshine central SOEs". In 2022, the Company was awarded the title of "Excellent Unit in Central SOEs Information Work", demonstrating its information work in a leading position across the sector. The 4 listed subsidiaries (namely, Huaneng Power International Inc., Inner Mongolia Mengdian Huaneng Thermal Power Corp. Ltd., Huaneng Lancang River Hydropower Inc. and China Great Wall Securities Co., Ltd.) have all been rated at **Grade A Information disclosure evaluations** by the respective Exchanges.



Stakeholder Participation

The Company has continued to strengthen communication with stakeholders, actively built communication platforms, and regularly organized grassroots power plants to carry out "SOEs Open Day" activities. The employees' families, local students, the public, etc. were invited to visit the Company to fully demonstrate the Company's excellent ESG management and practice.

In 2022, the Company made continuous innovation in the mode of communication in some key business segments attracting the stakeholders' attention, such as new energy, nuclear power, overseas business, etc. For this end, we carried out various types of communication activities to listen to the expectations of stakeholders, and thus create a responsible corporate image.

The Company's First Wind Power Base for Popular Science Education was Constructed to the Public's Expectations



Case

New Energy Guangdong Branch has built Huaneng Group's first wind power base for popular science education, which combines traditional science popularization display with acoustic and optoelectronic interactive technology display to provide a live experience enabling access to wind energy knowledge in simple and profound terms. In August 2022, the base was recognized as the "Electric Power Base for Popular Science Education" by the Chinese Society for Electrical Engineering.



Wind Power Base for Popular Science Education

The Company has actively strengthened communication with relevant parties via the wind power base for popular science education, to systematically and comprehensively enable government agencies, social groups, and the general public to have a deeper understanding of wind power generation. Furthermore, we actively echo to the public's comments to continuously improve the influence of new energy projects so as to help the country achieve the "Carbon peaking and carbon neutrality goals" goal. Total 5000+ visitors have visited the wind power base for popular science education as of the end of 2022.

Shidao Bay Nuclear Power Plant Held the Open Day



Case

In November 2022, Shidao Bay Nuclear Power Plant adhered to the concept of "Bridge" nuclear power public communication and held a public open day event called "Exploring the Mysteries of Nuclear Energy and Understanding the Principles of Nuclear Power". Over 150 local students and parents were invited to visit the Shidao Bay Nuclear Power Science and Technology Museum, a national science and technology base, to gain a deeper understanding of the national key sci-tech project - HTR-PM Demonstration Project, showcasing a safe and transparent corporate culture and a good corporate image.



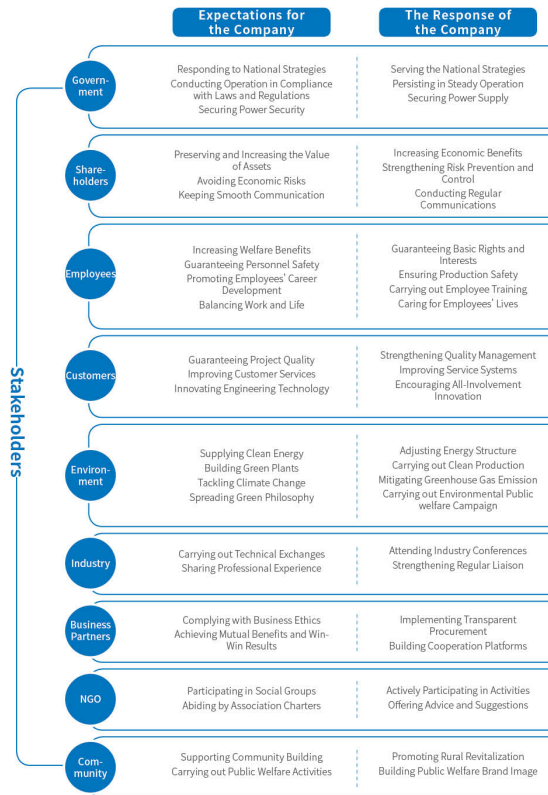
A Public Open Day of Shidao Bay Nuclear Power Plant

Inviting a Foreign Press Corps to Huaneng for the First Time



Case

In August 2022, the Company invited 27 foreign journalists from 24 countries including Cambodia and Pakistan to visit the New Energy Technology R&D Center, Offshore Wind Power Technology R&D Center, and Intellectual Property Center for the first time, and exchanged views with industry experts on the international development trends of energy technology. Visiting journalists wished that Huaneng may use these advanced technologies, equipment, and standards in their countries to make contribution to the achievement of the UN's sustainable development goals.



Contributing Huaneng Wisdom for Green and Low-carbon Transition
Providing Huaneng Solution for Building a Harmonious Society
Offering Huaneng Strength for Modern Corporate Governance

In the "Three Year Action of State-owned Enterprise Reform", the Company, by adhering to the principle of "Electricity as the core, multi-energy synergy, innovation guidance, financial support, and global presence", endeavored to make overall planning, mechanism building, model building, and problem-solving. Through the Party group's overall planning, the establishment of rules and systems to strengthen the foundation, provision of solutions to grass-roots problems, leading as an example, we have scored remarkable achievements in the reform work, forming a good situation of "Reform in place, all-rounded situation revitalized".

Given the reform measures in place, the Company has become more vitalized. Experience exchanges have been held in many occasions at the SASAC-led reform work meetings. Our reform practices have been selected as the 20 *Central SOEs Experience Measures*, and set as the "Great Model" of central SOEs reform, and have been rated as Grade A in the assessment of SASAC key tasks. The Company and Lancang River Hydropower Inc. have been awarded the "Demonstration Enterprise of Central SOEs Corporate Governance". As a result, the "Three Year Action of State-owned Enterprise Reform" has ended to yield good results.

Improvement of Reform Work Mechanism



"1-3-5" Working Mechanism

1 Implementing "One Priority" at a High Standing Point

We conducted 51 special studies for the Party Leading Group and 30 studies for the theoretical center group, to gain full understanding of the decisive significance of the "Two establishments", further enhancing the commitment to the "Four-consciousness", the "Four self-confidence", and the "Two maintenance" initiatives.

3 Preparing the High-quality "Three Plans"

Created a "roadmap" for the reform of the *Implementation Plan for the Three Year Action of Reform, Annual Key Tasks for the Three Year Action of Reform, and Work Plan for the Organization and Promotion of the Three Year Action of Reform*.

5 Implementing the "Five Mechanisms" to Standard

Learning Mechanism: Carried out 3 centralized lectures and 2 online trainings, and offered reform topics in Party school training classes

Leadership Mechanism: Convened 51 reform leadership group meetings to review 90 major issues

Implementation Mechanism: Held 13 regular reform meetings and 3 supervision and promotion meetings

Evaluation Mechanism: Scheduled the "mutual inspection and evaluation", covering 48 secondary units and 51 grassroots enterprises

Promotion and Implementation Mechanism: Carried out a series of activities such as essay competition, Q&A and training themed by the "Looking at Changes over the Three Years of Reform"

Remarkable Achievements in Reform Work



The Company has deeply implemented the SASAC's *Three-Year Action Plan for SOEs Reform*, formulated the *Implementation Plan for the Three Year Action of Reform (2020-2022)*, deeply promoted reform in key areas, and completed 17 reform tasks and 105 specific reform measures in 6 reform areas.

Increasing Improvement in Party's Leading Position

The Company has comprehensively revised the *Work Rules of the Party Leading Group (Party Committee)*, and the Company and 11 important subsidiaries have all formulated the *List of Major Business Management Matters for Advance Study and Discussion of the Party Leading Group (Party Committee)*, clarifying the scope, method, and path of major business operation for the Party Leading Group (Party Committee).

Efficient Operation of the BOD

The Company's BOD has been awarded the "Excellent" rating by the SASAC for two consecutive years. The entire management has been subject to the tenure and contract-based management system, with all 378 subsidiaries completing contracts, and all 1702 management team members achieving tenure and contract-based management.

Noticeable Improvement of HQ's Leading Role

The Company has adjusted the functional positioning of its headquarters, focusing on the "four centers" positioning for strategic decision-making, resource allocation, performance control, and risk prevention and control, striving to foster a "top two", "two high", and "first-class headquarters" system featuring excellent functions, capabilities, high standards, and high efficiency, thus giving impetus to the comprehensive improvement of corporate governance efficiency.

The Company has optimized the personnel structure of the headquarters, as demonstrated by staff streamlining up to 32%, 45%, and 43% for headquarters departments, departments and divisions, and manning 92 employees from grassroots units have been reassigned to work in the headquarters. 52 employees in the headquarters have been transferred to work in grassroots, market, critical regions, and key projects, continuously promoting the youth of cadres. The department directors and deputy directors in the "Pre-70s generation" in the headquarters has accounted for 0.4% of the total.

The Company has fully implemented the "Three-level management" system, with the goal of "yielding more benefits to share by the headquarters, optimizing business operation in the region-based units, and strengthening basic operation in the grassroots units". It has clarified management authority and decision-making matters, classified authorization and delegation, reduced approval and filing matters, implemented integrated management of new energy development, and fully delegated power to 34 secondary units, effectively stimulating the enthusiasm of grassroots enterprises.

Advancement of Reform on Three Institutional Systems

The Company comprehensively advanced the mechanism dealing with the market-oriented employment, promoted competition for management positions, lowlevel place elimination and incompetence exit, strengthened the application of performance evaluation results, and continuously improved the employment evaluation exit mechanism for enterprises with high marketization in finance, technology, e-commerce, logistics, and other fields.

Continuous Enhancement of Two Reform Actions

We have scored significant achievements in the "Double Hundred Action" and "Demonstration Action of Science and Technology Reform". The Capital Company and Shandong Xinneng Taishan Power Generation Co., Ltd. were rated as "Excellent" in the special assessment of "Double Hundred Action". Xi'an Thermal Power Research Institute has become the only one in the national power generation industry that has been rated as a benchmark enterprise in the special evaluation of the "Demonstration Action of Science and Technology Reform" for two consecutive years.

Adequate Disposal of Inefficient and Ineffective Assets

The Company has taken innovative measures to advance the disposal of idle assets under the "Dealing with idle assets" framework, addressing problems left over by history totally worth RMB 45 billion yuan, and completing the governance of 119 zombie enterprises, reducing losses by RMB 9.3 billion yuan compared to 2018, with a reduction rate of 66%. This has exceeded the SASAC's goal expected to reduce losses by 50%, thus leading to further improvement of the state-owned asset management. The Company has cut connection to four "Non-main business, non-dominant" enterprises included in the disposal scope, reduced two unprofitable enterprises, reclaimed funds of RMB 413 million yuan, completed resettlement of 101 employees, thus further improving the industrial structure and asset quality. The Company has continued to promote the cutoff work, reducing the management level to within 4 levels so that both the management level and the net increase in the number of legal entities has met the control requirements of the SASAC.

Looking Forward to 2023

The Blueprint Drawn, the Mission Echoed, "Top Priorities of the Country" Shouldered.

Standing at a new starting point, we must rely on tenacious efforts to open up a new field for Huaneng's cause. The Company has implemented the spirit of the 20th National Congress of the Communist Party of China to run the plant by taking into account the overall situation despite hardship. By following the principle of "Forging the new journey, speeding up construction of the world-class enterprise", we tried to address the two key points of "Transformation and development, quality and benefit", to achieve the goal of accelerating green development, improving quality and efficiency, promoting technological innovation, deepening internal reform, and ensuring safety and supply and improving the quality of party building. New achievements should be made in promoting high-quality development with attitudes and new ideas. On the new journey of "Leading China's power industry and striving for world-class excellence", the Company shall demonstrate the presence of **Huaneng wisdom, Huaneng solutions, and Huaneng power** in the process of comprehensively promoting the great rejuvenation of the Chinese nation with Chinese drive to modernization.

Performance Objectives

17 GW of New Energy Put into Operation

120,000 GWh of Power Generation from New Energy

Heat Supplied of 507 Million GJ

Min. 3% of R&D Investment

Eliminating Personal Fatality Accidents

Preventing Major HSE Accidents or More Serious

Maintaining Grade A in Central SOEs Party Building Evaluation

Appendixes

Selected Outstanding Corporate ESG Cases in 2022

In January 2023, the Company launched the 1st Selection and Appraisal of Excellent ESG Cases. All secondary companies and grassroots units actively participated and submitted a total of 88 cases, involving various issues such as excellence in main business, scientific and technological innovation, the Belt and Road, rural revitalization, green environmental protection, employee career development, health and safety, supply chain management, public welfare and charity, corporate governance. After the initial review and two rounds of expert scoring, 20 outstanding cases reached the final. In the final session, the Company made the "ESG Hall of China Huaneng" open to the public. After a week of fierce competition, the results were finally obtained via voting.



Scan the QR code to view more information about the 1st Excellent ESG Case Selection and Appraisal Event of CHNG

- No.1** Building the Wind Power Base for Popular Science Education, Promoting Fulfillment of the Country's "Carbon Peaking and Carbon Neutrality" Goal
Huaneng Renewables Corporation Limited



Wind Power Base for Popular Science Education



Scan the QR code, view the full text of the case

- No.2** Implementing the New Development Concept, Improving the ESG System
Huaneng Power International Inc.



Huaneng Edifice



Scan the QR code, view the full text of the case

- No.3** Perovskite Photovoltaic, an Accelerator for Achieving the "Carbon Peaking and Carbon Neutrality" Goal
China Huaneng Group Clean Energy Research Institute Co., Ltd.



Perovskite Photovoltaic Technology Innovation Alliance Established



Scan the QR code, view the full text of the case

- | | | |
|----|--|--|
| 4 | Shidao Bay Company Deeply Implemented an Innovation Driven Development Strategy, Releasing Vitality through Technological Innovation | Huaneng Nuclear Power Development Co., Ltd. |
| 5 | Gearing up to Promote the Development and Construction of Coal Resources, and Strengthening the Secured Fuel Supply to Longdong Energy Base | Huaneng Coal Industry Co., Ltd. |
| 6 | Innovative Practice of Integrated Operation Mode of Coal Port and Shipping | China Huaneng Group Fuel Co., Ltd. |
| 7 | Opening a New Path to Energy Transformation | China Huaneng Group Co., Ltd. Zhejiang Branch |
| 8 | Caring for Left-behind Children in Mountainous Areas, Assisting in the Revitalization of Rural Education | China Huaneng Group Co., Ltd. Jiangxi Branch |
| 9 | Setting Foot on Transformation and Development, Achieving Advanced Technology | China Huaneng Group Co., Ltd. Shanxi Branch |
| 10 | Building a Modern Governance System to Showcase the New Responsibilities of Inner Mongolia Mengdian Huaneng | Inner Mongolia Mengdian Huaneng Thermal Power Corporation Ltd. |
| 11 | Sticking to the Idea of Lucid Waters and Lush Mountains are Invaluable Assets in the Construction of Ecological Civilization, Achieving the Harmonious Coexistence of Humans and Nature | Huaneng Eastern Inner Mongolia Energy Co., Ltd. |
| 12 | Yielding Results in Preventing the Risk of Returning to Poverty due to Disasters, and Contributing to the Sustainable Development of Rural Revitalization | China Huaneng Group Co., Ltd. Henan Branch |
| 13 | Deeply Implementing the Strategy of Strengthening Enterprises with Talents in the New Era, and Continuously Promoting the Common Growth of Employees and Enterprises | Huaneng Jiangsu Energy Development Co., Ltd. |
| 14 | Leading Party Building and Mobilizing Together, taking Real Actions to Promote Safety - Nianling Ninghua Century Real Estate Co., Ltd. Actively Carrying out the Theme Activity of "Work Safety Month" | Shandong Xinneng Taishan Power Generation Co., Ltd. |
| 15 | Bidding Quality Management in the Power Generation Industry with Digital and Intelligent Transformation as the Core | Huaneng Tendering Co., Ltd. |
| 16 | Highlighting Huaneng's Responsibilities via Secured Energy Supply | China Huaneng Group Co., Ltd. Chongqing Branch |
| 17 | Strengthening Governance of Listed Companies via the "Seven Step Method" | Huaneng Lancang River Hydropower Inc. |
| 18 | Creating a New Model of Industrial Finance through Science and Technology Innovation Financial Smart Ecological Platform 2.0 Released by Great Wall Securities | Great Wall Securities Co., Ltd |
| 19 | Enabling Talent-driven and Technological Innovation to Progress in a Coordinated Manner, Enhancing the Endogenous Driving Force for Enterprise Growth | Huaneng Gansu Energy Development Co., Ltd. |
| 20 | Firmly holding the Bottom Line of Massive Return to Poverty, Actively Enhancing the Endogenous Driving Force of Poverty Alleviation Among the Masses | Huaneng Sichuan Hydropower Co., Ltd |

Excellent Works Selected in the Appraisal of the Company's Most Beautiful ESG Pictures in 2022

In January 2023, the Company launched the first selection and appraisal of the most beautiful ESG pictures. After the initial review and two rounds of expert scoring, 15 outstanding pictures reached the final. In the final session, the Company made the "ESG Poll of China Huaneng" open to the public. After a week of fierce competition, the results were finally obtained via voting.



Scan the QR code to view more information about the 1st Most Beautiful ESG Pictures Selection and Appraisal Event of China Huaneng.



No.4
Xi'an Thermal Power Research Institute Co., Ltd.
Learning (by Xu Mengchen)



No.5
China Huaneng Group Co., Ltd. East China Branch
Inheriting (by Wang Sheng)



No.6
North United Power Co., Ltd.
Night of PV (by Hao Zhigang)



No.7
China Huaneng Group Co., Ltd. Shanxi Branch
A Place Where the Sun Arises (by Li Qiong)



No.8
China Huaneng Group Co., Ltd. Zhejiang Branch
Harmonious Tongdang (by Fei Jianjun)



No.9
China Huaneng Group Co., Ltd. Shandong Branch
Toward the Sea for "Wind" (by Li Jianming)



No.10
China Huaneng Group Co., Ltd. Anhui Branch
Weaving the Blue Sky (by Hou Jiakai)



No.11
China Huaneng Group Co., Ltd. Guangxi Branch
Safeguarding the Lucid Waters and Lush Mountains (by Liu Xinyuan)



No.12
Huaneng Gansu Energy Development Co., Ltd.
Beautiful Power Plant (by Wang Qinyan)



No.13
China Huaneng Group Co., Ltd. Hainan Branch
Beautiful Windmill Coastline (by Zhang Li)



No.14
China Huaneng Group Co., Ltd. Fujian Branch
Dry Coal Shed (by Lin Zebin)



No.15
China Huaneng Group Co., Ltd. Chongqing Branch
The Western Pearl in the Brilliant Evening Glow (by Zhao Peiyue)



No.1

Huaneng Renewables Corporation Limited
Everything Looks Fresh (by Zhao Jie)



No.2

Huaneng Nuclear Power Development Co., Ltd.
Squirrel (by Hu Xinchun)



No.3

China Huaneng Group Fuel Co., Ltd.
Bird's Eye View of New Chaogang Harbor (by Li Rui)

About China Huaneng

China Huaneng Group Co., Ltd. (referred to as China Huaneng) is a key state-owned enterprise established with the approval of the State Council, established in 1985. China Huaneng has emerged and grown up amid the reform and opening up. It stands for a banner of China's power industry, continuously leading the progress of the power generation industry, and comprehensively embarking on a new journey of "Leading China's power industry and striving for world-class excellence" in the new era.

China Huaneng has a registered capital of 34.9 billion yuan, with the main business scope covering: power development, investment, construction, operation and management; electricity (heat) production and sales; development, investment, construction, production, sales of industries and products related to finance, coal, transportation, new energy, environmental protection; and industrial investment, operation and management.

Since the 18th National Congress of the Communist Party of China, China Huaneng has adhered to the guidance of Xi Jinping Thought on Socialism with Chinese Characteristics for the New Era, firmly shouldered the mission and responsibility of central SOEs, and continuously took solid steps on the path of high-quality development.

The Company owns 58 secondary units, more than 480 tertiary enterprises, and 5 listed enterprises (namely, Huaneng Power International Inc., Inner Mongolia Mengdian Huaneng Thermal Power Corp. Ltd., Shandong Xinneng Taishan Power Generation Co., Ltd., Huaneng Lancang River Hydropower Inc., and China Great Wall Securities Co., Ltd.).

At the end of 2022, the total installed capacity of wholly-owned and majority-owned power plants was 221.11GW, and the production capacity of coal was 113.3 million tons per year. The company's total asset was 1.4152 trillion yuan. The Company was ranked No. 209th among Fortune Global 500, up 6 places as compared to the previous year, refresh best results. SASAC has awarded the Company A-level performance assessment results for 18 times, among which 14 were awarded in consecutive years, and A-level tenure assessment results of the person-in-charge of central SOE for 6 times, being the top among comparable power generation enterprises in China.

Organizational Chart

Work Organs of the Party Organization		
Discipline Inspection and Supervision Team	Organization Department of the Party Leading Group (Human Resources Department) ● Retiree Affairs Office	Office of the Party Leading Group Inspection Work Leading Work Team
Party Building Department (Publicity Department of the Party Leading Group)	Labor Union	
Functional Departments		
General Office (Office of the Party Leading Group, Office of the Board of Directors)	Planning and Development Department	Finance and Assets Management Department
Enterprise Management and Legal Compliance Department	Marketing Department	Fuel Management Department
Safety Supervision Department	Production Management and Environmental Protection Department	Technology Innovation and Digitalization Department
Material and Procurement Management Department	International Cooperation Department ● International Standardization Office	
Audit Department	New Energy Business Unit	
Units Directly Affiliated to the Group		
China Huaneng Group Party School (Education and Training Center)	Energy Research Institute	
IT Center	News and Brand Management Center	Enterprise Management Shared Service Center
New Energy Intelligent Operation and Maintenance Center	China Huaneng Group Co., Ltd. Financial Sharing Center	

Industrial Companies

Huaneng International Power Development Corporation (Equity Management Center of the Group Company)	Huaneng Power International Inc. (Thermal Power Construction Center of the Group Company, Engineering Technological Economy Management Center)
Huaneng Renewables Corporation Limited	Huaneng Nuclear Power Development Co., Ltd. (Nuclear Power Business Unit)
Huaneng Energy & Communications Holding Co., Ltd. (Material Supply Center of the Group Company)	Huaneng Coal Industry Co., Ltd. (Coal Business Unit, Coal Chemical Management Office)
China Huaneng Group Fuel Co., Ltd.	Huaneng Capital Services Co., Ltd.
China Huaneng Finance Co., Ltd. (China Huaneng Group Co., Ltd. Fund Management Center, China Huaneng Group (Hong Kong) Treasury Management Holding Limited)	China Huaneng Group Clean Energy Research Institute Co., Ltd.
Huaneng Properties Co., Ltd. (Huaneng Integrated Industry Co., Ltd., Xiong'an Construction Infrastructure Office of the Group Company)	China Huaneng Group Hong Kong Limited (Huaneng Overseas Enterprises Management Co., Ltd., Overseas Business Unit)
Xi'an Thermal Power Research Institute Co., Ltd.	Huaneng Integrated Energy Services Co., Ltd.
Huaneng Yangtze River Environmental Technology Co., Ltd.	Huaneng Nuclear Energy Technology Research Institute Co., Ltd. (Huaneng High-temperature Reactor Technology Research Center, Nuclear Emergency Technical Support Center of the Group Company)

Regional Branch Companies

China Huaneng Group Co., Ltd. Xiong'an Branch	China Huaneng Group Co., Ltd. North China Branch (GreenGen Co., Ltd.)	China Huaneng Group Co., Ltd. Northeast Branch	China Huaneng Group Co., Ltd. East China Branch (China Huaneng Group Co., Ltd. Maintenance Center)
China Huaneng Group Co., Ltd. Central China Branch	China Huaneng Group Co., Ltd. Southern Branch	China Huaneng Group Co., Ltd. Hebei Branch	China Huaneng Group Co., Ltd. Shanxi Branch
China Huaneng Group Co., Ltd. Jilin Branch (Huaneng Jilin Power Generation Co., Ltd.)	China Huaneng Group Co., Ltd. Helongjiang Branch (Huaneng Helongjiang Power Generation Co., Ltd.)	China Huaneng Group Co., Ltd. Zhejiang Branch	China Huaneng Group Co., Ltd. Anhui Branch
China Huaneng Group Co., Ltd. Fujian Branch	China Huaneng Group Co., Ltd. Jiangxi Branch	China Huaneng Group Co., Ltd. Shandong Branch (Huaneng Shandong Power Generation Co., Ltd.)	China Huaneng Group Co., Ltd. Henan Branch
China Huaneng Group Co., Ltd. Hunan Branch	China Huaneng Group Co., Ltd. Guangxi Branch	China Huaneng Group Co., Ltd. Hainan Branch (Huaneng Hainan Power Generation Co., Ltd.)	China Huaneng Group Co., Ltd. Chongqing Branch
China Huaneng Group Co., Ltd. Guizhou Branch	China Huaneng Group Co., Ltd. Qinghai Branch	North United Power Co., Ltd.	Huaneng Jiangsu Energy Development Co., Ltd. (China Huaneng Group Co., Ltd. Jiangsu Branch)
Huaneng Lancang River Hydropower Inc. (Nunnan Branch, Huaneng Lancang River Upstream Hydropower Co., Ltd., Hydropower Technology Research and Development Center of the Group Company)	Huaneng Eastern Inner Mongolia Energy Co., Ltd.	Huaneng Sichuan Hydropower Co., Ltd.	Huaneng Shaanxi Power Generation Co., Ltd. (Northwest Branch)
Huaneng Ningxia Energy Co., Ltd.	Huaneng Gansu Energy Development Co., Ltd.	Huaneng Tibet Yarlung Zangbo River Hydropower Development Investment Co., Ltd. (Tibet Branch)	Huaneng Xinjiang Energy Development Co., Ltd.

Companies Directly Managed by China Huaneng Group

Huaneng Tendering Co., Ltd. (Group Company Tendering Branch / Procurement Center / Huaneng Procurement Technology Company)	Huaneng Information Technology Co., Ltd.
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As of December 31, 2022, the installed capacity of the Company's wholly-owned and controlled power plants amounted to

221.11 GW

including 217.38GW domestically and 3.73GW overseas

In 2022, the Company achieved a cumulative power generation of

810,700 GWh

including 791,100GWh domestically and 19,600GWh overseas

233 Xinjiang Uygur Autonomous Region
53

1,193 Gansu Province
455

131 Qinghai Province
20

94 Tibet Autonomous Region
32

383 Sichuan Province
138

2,835 Yunnan Province
1,101



■ Installed Capacity (10MW)
■ Power Generation (100 GWh)



Industrial Distribution Map

Contributing Huaren Wisdom for
Green and Low-carbon Transition
Providing Huaren Solution for
Building a Harmonious Society
Offering Huaren Strength for
Modern Corporate Governance

Key Performance

	Indicator Name	Unit	2018	2019	2020	2021	2022
Main Business and Main Responsibility	Installed Capacity	10 MW	17657	18278	19644	20592	22111
	Thermal Power Installed Capacity	10 MW	12869	13185	13712	14006	14224
	Power Generation	100 GWh	7026	7057	7083	7744	7911
	Coal Production Capacity	10,000 Tons/Year	7760	8260	8500	8770	11380
Scientific and Tech- nological Innovation	Coal Production	10,000 Tons	7086	7450	7607	8664	10108
	Total Number of Personnel in Science and Technology	People	1966	2388	1381	1493	1746
	National Authorized Patents	Item	648	777	1785	6307	11629
	Among Them: Patents for Invention	Item	163	121	135	251	1217
	Scientific and Technological Achievements Award at Provincial/Ministerial Level and above	Item	21	21	39	66	63
	Total Investment in Environmental Protection	100 Million Yuan	17.27	24.82	10.20	13.00	16.95
Environmental Responsibility	Total Investment in Energy-saving Technological Upgrading	100 Million Yuan	4.14	4.50	4.88	5.09	2.52
	Low Carbon Clean Energy Installed Capacity	10MW	5858	6163	7192	7849	9203
	Low Carbon Clean Energy Proportion	%	33.18	33.72	36.61	38.12	41.62
	Hydropower Installed Capacity	10MW	2607	2697	2756	2756	2759
	Wind Power Installed Capacity	10MW	1863	1996	2530	2917	3393
	Photovoltaic Installed Capacity	10MW	318	400	645	912	1735
	Coal Consumption for Power Supply	g/kWh	298.72	297.55	295.34	294.04	292.02
	Auxiliary Power Ratio	%	4.00	3.81	3.73	3.71	3.65
	Ash Comprehensive Utilization Rate	%	76.45	75.92	75.64	77.10	73.69
	Sulfur Dioxide Emission Performance for Thermal Power Generation	g/kWh	0.074	0.072	0.072	0.070	0.068
	Nitrogen Oxide Emission Performance for Thermal Power Generation	g/kWh	0.146	0.141	0.139	0.137	0.137
	Smoke and Dust Emission Performance for Thermal Power Generation	g/kWh	0.012	0.011	0.010	0.009	0.009
	Installed Capacity of Ultra-low Emission Units	10MW	11249	11526	11605	12300	12400
	Proportion of Ultra-low Emission Units	%	95	96	97	99	99.5
	Fresh Water Consumption for Power Generation	10,000 Tons	58597	57396	54021	59980	62847
	Unit Water Consumption for Power Generation	kg/kWh	1.04	1.06	1.00	1.02	1.08
	Carbon Emissions	10,000 Tons	47966	44798	47569	52436	52600
	Carbon Emission Intensity	g/kWh	661.29	650.00	634.99	635.35	623.00
	Wastewater Discharge Amount	10,000 Tons	3259.27	4561.37	4485.81	3655.84	3382.24
Total Coal Consumption	10,000 Tons of Standard Coal	17402	16734	16828	18404	18211	

	Indicator Name	Unit	2018	2019	2020	2021	2022
Social Responsibility	Paid Taxes	100 Million Yuan	255	267	297	278	356
	Number of In-Service Employees	People	135329	131579	124628	120927	121264
	Number of New Employment throughout the Year	People	4475	4222	4196	4366	5371
	Number of Female Employees	People	32415	30319	28783	27096	26054
	Female Manager Ratio	%	38	32	31	30	29
	Labor Contract Signing Rate	%	100	100	100	100	100
	Collective Contract Coverage	%	100	100	100	100	100
	Social Insurance Coverage	%	100	100	100	100	100
	Labor Union Membership Rate	%	100	100	100	100	100
	Employee Health Check and Health File Coverage	%	100	100	100	100	100
	Training Time per Employee	Hour	85	70	86	82	83
	Employee Training Coverage	%	78	79	80	76	79
	Total Amount of Donation	Ten Thousand Yuan	60377	73120	28205	16662	21687
	Employee Volunteers	Person-times	80843	80710	80055	78593	79012
	Number of Corruption Lawsuits Filed and Resolved Against Companies and Employees	Item	1	0	0	2	2
	Investment in Production Safety (Technological Upgrading)	100 Million Yuan	5.43	11.00	9.80	5.97	8.50
	Major Equipment Accident	Case	0	0	0	0	0
	General Equipment Accident	Case	0	0	0	1	0
	General Accidents of Personnel Injury and Casualties	Case	2	6	10	7	7
	Category 1 Obstacle	Case	17	14	9	4	2
	Number of Unplanned Outages (Hydro & Thermal Power)	Case	184	130	97	91	75
	Unit Equivalent Availability Factor (Hydro & Thermal Power)	%	94.21	94.22	94.49	93.90	93.93
	Number of People who Died due to Work	People	1	4	6	5	4
Proportion of People who Died due to Work	%	0.007	0.030	0.040	0.040	0.030	
Accumulated Lost Working Days due to Death on Duty	Workday: People	6000	24000	36000	30000	24000	
Per Capita Duration of Safety Production Training	Hour	40	40	40	40	40	
Number of People Covered by Safety Production Training	People	130241	125401	123710	120751	120056	
Economic Contract Performance Rate (Group Company)	%	100	100	100	100	100	
Corporate Governance	Total Assets	100 Million Yuan	10733	11261	11875	13399	14152
	Total Operating Income	100 Million Yuan	2786	3062	3142	3855	4245
	Total Profit	100 Million Yuan	144	178	224	133	227
	Asset-Liability Ratio	%	76.98	73.70	69.61	72.74	70.90

Indicator Index

CONTENTS	ESG Guide	GRI Standard(2021)	CASS-CSR5.0	Page	
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	Focusing on the Carbon Peaking & Carbon Neutrality Goals and Exploring the Blue Ocean of Energy Storage Technology	A3.1, A4.1			P36
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CONTENTS	ESG Guide	GRI Standard(2021)	CASS-CSR5.0	Page	
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Rating Report

Rating Report for 2022 Environmental, Social and Governance Report of China Huaneng Group Co., Ltd.

Entrusted by China Huaneng Group Co., Ltd., experts have been selected from China Corporate Social Responsibility Report Rating Expert Committee to form a rating group to rate *The 2022 Environmental, Social and Governance Report of China Huaneng Group Co., Ltd.* (hereinafter referred to as the *Report*).

I. Basis of Rating

Guidelines for Corporate Social Responsibility Reporting (CASS-CSR4.0) of the Chinese Academy of Social Sciences and *China CSR Report Rating Standards (2020)* of China Expert Committee on CSR Report Rating.

II. Rating Process

1. The rating team reviews and verifies the *Confirmation of Processes of the Corporate Social Responsibility Report* and relevant evidential documents submitted by the team that compiled the *Report*;
2. The rating team evaluates the process for writing the *Report* and the content of the *Report*, and drafts and finalizes this rating report;
3. The Vice Chairman of the Expert Committee, the leader and experts of the rating team jointly review and sign the rating report.

III. Conclusion

Process (★★★★★)

The Company set up ESG management committee with the President and Deputy Secretary of the Party Leading Group as the person-in-charge to coordinate the preparation of the *Report*. The Social Responsibility Division of the Planning and Development Department took control of the overall direction and key issues and the Company's Board of Directors was responsible for the final review. The *Report's* functional role and values were explicitly defined as an important instrument to disclose duty performance information in line with relevant requirements, improve ESG governance system, and build the corporate brand image. The substantive issues were identified according to international and domestic social responsibility standards, industry-wide benchmarking analysis, actual development of the company, stakeholder investigations, etc. The Company facilitated its subsidiaries including Huaneng Power International Inc., Huaneng Lancang River Hydropower Inc., China Great Wall Securities Co., Ltd., Inner Mongolia Mengdian Huaneng Thermal Power Corp. Ltd., and Shandong Xinneng Taishan Power Generation Co., Ltd. to publish their respective reports to promote vertical integration of ESG work. The *Report* will be published on the Company's official website and incorporated in the "Collective Issuance of Social Responsibility Reports of Central SOEs" and "Social Responsibility Report of 300 Excellent Enterprises" for several releases. It will be presented in different forms, including electronic file, printed version, Chinese and English versions, and new media video edition. All these prove its outstanding process performance.

Materiality (★★★★★)

The *Report* systematically discloses key topics for discussion in the power industry, such as implementing macro policies, ensuring energy supply, upgrade and adjust energy structure, protection of employee rights and interests, safety production management, building a Responsible Supply Chain, saving energy resources, developing circular economy, reducing "three wastes" emission, etc. with detailed narration and excellent materiality performance.

Integrity (★★★★☆)

From the perspectives of "Contributing Huaneng Wisdom for Green and Low-carbon Transition", "Providing Huaneng Solution for Building a Harmonious Society" and "Offering Huaneng Strength for Modern Corporate Governance", the main body of the *Report* discloses 85.29% of the core indicators of the power production industry with remarkable integrity performance.

Balance (★★★★★)

The *Report* discloses negative data including "number of corruption lawsuits filed and resolved against companies and employees", "number of major equipment accidents", "number of general equipment accidents", "number of safety production accidents", "number of employee casualties", "lost working days due to work-related injuries", etc. with respect of the causes and treatment measures of the fire accident of Qingyangguo Coal Mine affiliated to Shanxi Mining Branch, with excellent balance performance.

Comparability (★★★★★)

The *Report* discloses the comparative data for 5 consecutive years of 62 indicators, such as "total operating income", "total profit", "number of employed individuals during the reporting period", "female manager ratio", "total investment in environmental protection", and "annual fresh water consumption" etc., making an excellent comparability performance.

Readability (★★★★★)

The *Report* is themed on "Leading China's Power Industry and Striving for World-class Excellence", presents in three chapters a systematic display of CHNG's progress in fulfilling responsibility annually, responds to the expectations and demands of stakeholders. Cover design continues to use hand drawn illustration style, the cover creatively integrates the elements of main businesses such as wind power, PV, nuclear power and hydropower into special responsibility performing scenarios, highlighting industry characteristics, which contributes to an increased identification of the *Report*. QR codes are printed in the *Report* for extended reading of in-depth interpretation, third-parties' testimony is referred to as support of effective performance of corporate responsibilities, achieving better readability.

Innovativeness (★★★★★)

The *Report* is themed on two major topics including "Supporting Main Business in Becoming Stronger and Better, Leading China's Power Industry", "Stepping up Efforts on Technological Innovation, Striving for World-class Excellence", focusing on the responsibility practice of enterprises in their main business and technological innovation, which manifests CHNG's sense of responsibility as a centrally administered state-owned enterprise. Each chapter begins with a detailed disclosure of topic management methods using "What", "Why", and "How", to comprehensively showcase the action strategy, strategic objectives, and core performance through "Practice", "Performance", and "Prize", convenient for stakeholders to quickly grasp. These two features contribute to the *Report's* excellence in Innovativeness.

Overall Rating (★★★★★)

According to the rating team, the *2022 Environmental, Social and Governance Report of China Huaneng Group Co., Ltd.* was rated five-star as an excellent corporate social responsibility report.

IV. Suggestions for Improvement

Add more disclosure information about core industrial indicators to improve the *Report's* integrity.



China Huaneng's Environmental, Social and Governance Report Received Five-Star Rating for the Twelfth Consecutive Year

魏晓慧
Vice Chairman of the
Expert Committee

邵国栋
Leader of the
Rating Team

张彦
Expert of the
Rating Team



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Date of Issuance: September 25, 2023

Feedback

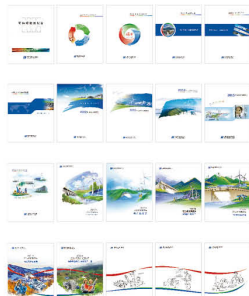
Dear Readers:



Thank you for reading the *2022 Environmental, Social and Governance Report of China Huaneng Group Co., Ltd.* We would like to improve the quality of both our ESG work and the CSR report. Scan the QR code below and send us any comments or suggestions you may have, which will be of great help for us. Thank you!



Sustainability (ESG) Report System



Interpretation of the Creativity of the Sustainability (ESG) Report 2021-2025

CHNG's five sustainability (ESG) reports to be released during the "14th Five-Year Plan" period are of continuous integrated design, with content presented with the aid of triple creative design techniques, i.e., "abstract vector lines + aerial photos of large scenes + warm hand-painted illustrations". As main elements running through the whole picture, the two ribbons in red, green and blue connect together five landforms, i.e. snow mountains, grasslands, fields, seas and cities. Besides, the picture also integrates elements such as wind power, PV, nuclear power, hydropower and electrical workers. These imply that CHNG, under the guidance of "Three-Color Culture", makes all-out efforts to develop renewable energy, nuclear power and hydropower. CHNG continuously creates high-quality power projects in China, turning energy into a "beacon of light", on a new journey of leading China's power industry and striving for world-class excellence. CHNG will continue moving forward on the road of high-quality and sustainable development, and devote wholeheartedly to the successful conclusion of the "14th Five-Year Plan".