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2021

Sustainability Report

Striving for High-quality Development



This report, the 16th consecutive sustainability report released to the public by CHNG since 2006, presents corporate social responsibility (CSR) and environmental, social and governance (ESG) related information in an integrated way. Based on the principles of objectivity, standardization and comprehensiveness, this report conveys CHNG's concept of sustainable development, delves into and presents its CSR performance highlights, systematically sorts out and discloses information concerning its fulfillment of ESG indicators, and shapes a good image of corporate citizen that pushes the high-quality development of CHNG, industry and society.



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, 2021 to December 31, 2021. 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 2021 in economic, environmental, CSR 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)
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
Environmental, Social and Governance Reporting Guidelines issued by Hong Kong Exchanges and Clearing Limited
Guidelines on Corporate Social Responsibility Reporting for Chinese Enterprises (CASS-CSR 4.0) issued by Chinese Academy of Social Sciences

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 <http://www.chng.com.cn>, or call 010-63228777 to request for the Report.
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Scan the QR code to access the video version of the Report



The Communist Party of China ("CPC" or the "Party") traveled over 100 years from 1921 to 2021 and ushered in the centennial of the founding of the Party with continued struggle. To celebrate the centenary of the Party, CHNG launched a variety of celebrations. Party members visited sacred places of the Chinese revolution to review the history of the Party and learn from the spirit of the ancestors. They sang with a passion for the Party, and danced with a respect for the Party.

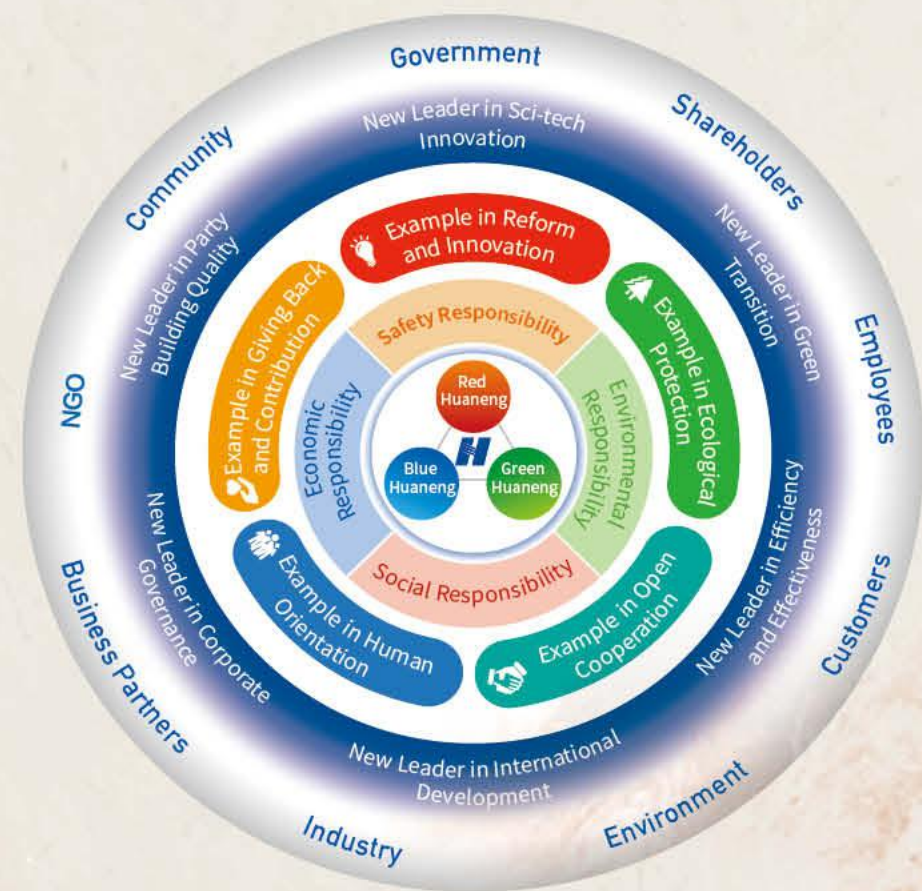
Firm faith is carried forward. Under the leadership of the Party, 130,000 diligent Huaneng employees with loyalty to the CPC worked hard to speed up the building into a world-class modern clean energy company and offered the most sincere greetings for the centenary of the Party.

Within a wider context of the once-in-a-century changes taking place in the world, CHNG keeps the requirements of President Xi Jinping firmly in mind, vigorously promotes the CPC's tradition, and always maintains the revolutionary spirit of fearless struggle, while marching toward a brand new journey to fully build a modern socialist country and fulfill the Chinese Dream of national rejuvenation.



Celebrating the Centenary of the Founding of the Party and Sustaining the Party's Revolutionary Legacy

CHNG in Sustainable Development



Responsibility as the Driving Force

- 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

Overall Planning



Strategic Improvement

Corporate Mission

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

Strategic Orientation

Power as the core business, synergy among various energy sectors, innovation as the leading force, finance as the supporting business, global layout

Strategic Vision

To speed up the building of a world-class modern clean energy company featuring "Three Colors, Three Stronges and Three Excellents"

- Three Colors:** Always adhere to the "three-color company" corporate mission
- Three Stronges:** Strong innovation capability, strong value creation capability and strong global competitiveness
- Three Excellents:** Excellent assets, excellent management, excellent performance
- Modern:** Digital, intensive, lean, standardized and international

Board of Directors



Secretary of the Party Leading Group and Chairman of the Board of Directors



Board Director, President, and Deputy Secretary of the Party Leading Group



Board Director and Deputy Secretary of the Party Leading Group



External Board Director



External Board Director



External Board Director



External Board Director



External Board Director



Employee Director

Management Team



Secretary of the Party Leading Group and Chairman of the Board of Directors



Board Director, President, and Deputy Secretary of the Party Leading Group



Board Director and Deputy Secretary of the Party Leading Group



Member of the Party Leading Group and Vice President



Member of the Party Leading Group and Chief Financial Officer



Member of the Party Leading Group and Vice President



Member of the Party Leading Group and Chief Compliance Officer



Member of the Party Leading Group and Vice President

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Deeply Implementing the Belt and Road Initiative and Daring to be an Energy Role Model Guided by International Standards 18

To better serve national strategies, we will make plans on where to advance and where to withdraw, what to do and what not to do, accelerate layout improvement, structural adjustment, and strategic restructuring for the state-owned economic sector and enhance its competitiveness, innovation, control, influence, and risk resistance capacity. We will also work to strengthen, expand, and increase the returns on state capital and enhance the strength, quality, and size of state-owned enterprises.

— Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China

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High-quality development will remain the theme for China's economic and social development in the 14th Five-Year Plan (2021-2025) period and beyond, and it concerns the overall situation of the country's socialist modernization drive. High-quality development is the general requirement for all aspects of economic and social development. It will not only be the requirement for developed regions, but will also be the requirement that entails implementation by all regions. Besides, it will not just be a requirement in a certain period of time or for a single incident, but will be a requirement that must be adhered to for a long time.

— Xi Jinping stressed when attending the deliberation of the Qinghai Delegation to the Fourth Session of the 13th National People's Congress

Message from the Chairman



Secretary of the Party Leading Group and Chairman of the Board of Directors: Shu Yinbiao

The year of 2021, a milestone for the Party and the country, saw the centenary of the CPC and the launch of the 14th Five-Year Plan. As a key state-owned enterprise, guided by Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, CHNG implemented the spirit of the important instructions and official replies of General Secretary Xi Jinping as well as the decisions and deployment of the CPC Central Committee, brought together the strength of all the staff full of vigor. Major headway has been made to become a leader in six fields, including scientific and technological innovations, green transition, efficiency and effectiveness, international development, corporate governance and Party building quality. We got the 14th Five-Year Plan off to a good start.

As CHNG started a new undertaking over the past year, 2021 was extremely special and extraordinary in the corporate development process. Facing once-in-a-century changes, COVID-19 global pandemic, and energy and electricity shortage, under the firm leadership of the CPC Central Committee with Comrade Xi Jinping as the core, CHNG has risen to challenges and taken the initiative to make outstanding accomplishments. CHNG launched a campaign on Party history learning and education, held a grand celebration of the Party's centenary, and devoted great energy to the continuous improvement of Party building. **Enhancing Management and Shaping New Development Advantages of Huaneng.** All industrial sectors of CHNG have made concerted efforts to achieve steady growth, with profitability at an all-time high. The operating revenue was RMB 385.5 billion yuan, an increase of 23% year-on-year, and the profit was RMB 13.3 billion yuan, indicating the maintenance and appreciation of state-owned assets. CHNG has been constantly strengthening the top-level design of sustainable development work, and promoting the integration of social responsibility into production and operation. Besides, CHNG has always been people-oriented to solve the most pressing difficulties of great concern to the people, to move forward together with employees. **Improving Main Businesses and Shaping a New Pattern of Power Development.** CHNG gave full play to the role of central SOE as the backbone or ballast stone, resolutely shouldered the political responsibility of ensuring energy supply, and completed a domestic power generation of 774.4TWh throughout the year, hitting the best level in history. Moreover, CHNG effectively responded to extreme weather and natural disasters, without major safety accidents occurred, and there were zero casualties and accidents in the field of engineering and construction. The independent innovation competency has been significantly enhanced: Shidao Bay HTR-PM Demonstration Project has achieved major breakthroughs, and new achievements have been made in the research of key technologies such as domestically produced DCS/DEH/SIS integrated smart units. CHNG accelerated the pace of green transition, implementing "two-lines" and "two-integrations" strategies and fully developing new energy, nuclear power and hydropower, and made breakthroughs in key projects such as The Energy Base in Eastern Gansu. **Taking More Responsibilities**

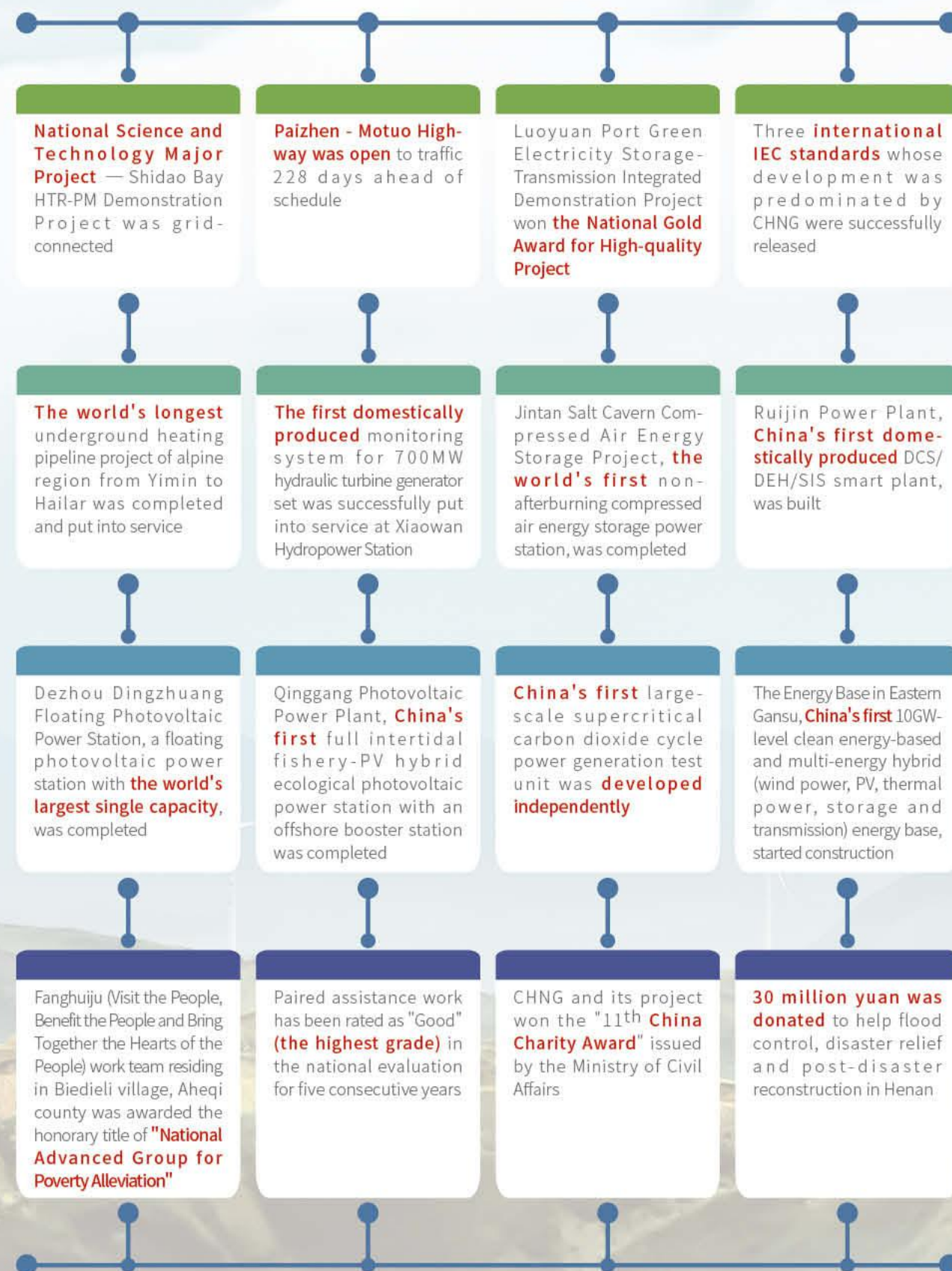
and Embarking on a New Journey of China's Development. CHNG implemented the national and regional development requirements, enhanced cooperation with governments and enterprises, and achieved mutual benefit and win-win results. Furthermore, CHNG has been cultivating the "Belt and Road" to promote the international development steadily. The UK Minety Battery Storage Project Phase I was successfully put into operation and profitable, and received favorable reviews from the country where the project is located. CHNG actively carried out public charity activities, and created the volunteer activity brand of "Three-color Sails". What's more, CHNG fully implemented the requirements of the Party and the state on "Consolidating the Effectiveness of Poverty Eradication Initiatives and Continuing Rural Revitalization", delivered a solid performance in poverty-assistance in the new development stage, and paired assistance work has been rated as "Good" (the highest grade) in the national evaluation for five consecutive years.

In 2022, the whole country will celebrate the successful opening of the 20th National Congress of the CPC. It is of great significance for the Company to complete all goals and tasks with high quality. Guided by Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, CHNG will implement the decisions and deployment of the CPC Central Committee and the State Council resolutely, ensure full, accurate and comprehensive implementation of the new development philosophy, and adhere to the six "firm grasps". CHNG will highlight high-quality and stable growth, strengthen the guidance and guarantee of Party building, consolidate the safety foundation, and speed up low-carbon transition. CHNG will promote reform and innovation, ensure the full completion of the annual tasks, and strive for greater achievements to become a leader in six fields, including scientific and technological innovations, green transition, efficiency and effectiveness, international development, corporate governance and Party building quality, at a faster pace to build the Company into a world-class modern clean energy enterprise.

Our dream calls upon us, and our mission propels us to embark on a new journey. Only through vigorous and determined endeavor can we fulfill our responsibility, prove worthy of our times and live up to people's expectations. Being more closely united around the Central Committee of CPC with Comrade Xi Jinping as its core, CHNG will continue to strengthen its commitment to the Four Consciousnesses, the Four-sphere Confidence, and the Two Upholds. We still need to stay tenacious and down-to-earth, and embark on the new journey to start a new undertaking, creating new achievements worthy of the Party, the people and the new era, and celebrating the successful opening of the 20th National Congress of the CPC with outstanding achievements.

舒印彪

Hot Spots of CHNG's Responsibility



Voice of CHNG's Responsibility

CHNG stands ready to work with all parties to actively propel the construction of novel power systems, strengthen low-carbon technology research and development, innovate business models and financing methods, and improve industrial policies and technical standards, so as to make positive contributions to achieving goals of carbon peaking and carbon neutrality.

April 10
Carbon Capture,
Utilization & Storage Forum

The power system should actively respond to the challenges of new energy's rapid development, enhance its flexible regulation ability, build a diversified clean energy supply system, and improve the terminal electrification level, so as to realize digital empowerment and accelerate the transformation to a new power system with new energy as the mainstay.

May 25
Global Sustainable Electricity Partnership
(GSEP) Council Meeting and CEO Summit

IEC will be committed to reliable power supply and more sustainable development, as well as the development of new energy technologies (including new energy, smart grid, green transport), new industries and new business forms, and the goals of carbon peaking and carbon neutrality, making unremitting efforts for everyone to enjoy accessible, affordable, safe and reliable energy supply.

September 25
Global Energy Transition Forum

IEC has always been committed to promoting sustainable economic and social development, actively pushing the energy transformation with carbon neutrality as the goal, and provide high-quality solutions and collaborative services for the digitalization and full electrification of the society.

October 12
High-level Video Dialogue between the UK's
Prince Charles and Chinese Entrepreneurs

CHNG resolutely shouldered the mission of ensuring the safe supply of energy and power, and made every effort to improve the reliability of equipment, ensure the heating for people's livelihood, promote the increase of coal production and supply, and pay close attention to the financial guarantee, so as to ensure that all generating units can be regulated and started at any time, and generate electricity at full capacity.

March 20
2021 Annual Meeting of
China Development Forum

Further relying on China Technology Strategic Alliance for CO₂ Capture, Utilization and Storage Technology Innovation (CTSA-CCUS), CHNG will deepen cooperation and exchange in the low-carbon field, strive to promote the common development and prosperity of all countries in the world, and make new and greater contributions to building a community with a shared future for mankind.

May 22
2021 Power System — New Energy Joint
Academic Annual Conference of Chinese
Society for Electrical Engineering

CHNG is committed to green, low-carbon and digital development, accelerating the development of a clean and multi-energy hybrid energy base in an intensive, digitalized and standardized manner, and actively promoting the electrification process.

September 6
China International Fair for Trade in
Services—Forum on Certification for
Facilitating International Trade

CHNG will spare no effort to develop new energy, nuclear power and hydropower, accelerate the development of a clean and multi-energy hybrid energy base in an intensive, digitalized and standardized manner, give full play to the role of coal power in peak shaving and frequency regulation, and take the lead in achieving carbon peaking and carbon neutrality.

October 1
International Electrotechnical
Commission (IEC) General Meeting

In the process of achieving goals of carbon peaking and carbon neutrality, CHNG has continuously accelerated the development of clean energy and laid out technologies and industries such as CCUS, advanced energy storage, green hydrogen production, fuel cells. CHNG has invested in four gas-fired power projects in the UK and built Minety Battery Storage Station, the largest energy storage project in Europe.

November 12
Symposium on Power Industry Supply
Guarantee Work this Winter and Next
Spring and Chairman Meeting of China
Electricity Council

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At the important moment of the Party's centennial birthday and the key time node of the historical intersection of the "Two Centennial" goals, it is very necessary to launch a campaign on Party history learning and education among all of its members at the right time. Through tireless efforts over generations in the past one hundred years, the CPC has rallied and led the Chinese people in blazing a great path, scoring great accomplishments, and forging a great spirit, and has gained valuable experience and created great miracle in the history of development of the Chinese nation and progress of human society. Looking back at the journey of past struggle and ahead to the path of future endeavor, we must study and summarize the history of the Party, and inherit and carry forward the successful experience of the Party.

—— Xi Jinping's Speech at the Launch Meeting of Campaign on Party History Learning and Education

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The campaign on Party history learning and education among all of its members is a major strategic decision made by the CPC Central Committee with Comrade Xi Jinping as its core from a new starting point to open up new horizons for development. Our Party Leading Group implemented the spirit of the important instructions and official replies of General Secretary Xi Jinping as well as the decisions and deployment of the CPC Central Committee, ensured well-organized, coordinated implementation of all the tasks, and made notable progress, according to the goals of "studying the Party's history to be reasonable, confident, virtuous and practical" and "studying the Party's history, understanding its theories, doing practical work and making new advances". In 2021, Gao Shiwang, an employee of the Company, was awarded the title of "National Excellent Party Member" by the CPC Central Committee, and the Party building work of the Company was assessed as "Grade A" by the SASAC.

Facilitating Learning and Education

Adhering to the Main Task and Strengthening Ideological Guidance

Learning the Party's history systematically. Our Party Leading Group has established the learning mechanism of "weekly learning, joint learning of upper and lower levels, and learning under the guidance of leaders", and relevant experts and scholars were invited to give lectures. More than 11,000 special study activities and more than 1,300 centralized training activities were carried out and participated by more than 90,000 Party members and leading cadres, so as to ensure that the campaign on Party history learning and education is carried out across the Company.

Laying stress on the key points of Party history learning and comprehending the tremendous power of thought. We thoroughly studied and implemented the spirit of important speeches made by General Secretary Xi Jinping, guided Party members and cadres in in-depth study and good implementation based on the actual conditions of the Company and their posts.

Learning the Party's history in an innovative way to improve the effectiveness of learning and education. We held a session on "Carrying on the Party's Tradition and Listening to the Revolutionary Stories", used "CHNG e-learning" and other carriers for online learning, and carried out experiential learning such as reviewing the Party admission oath, recalling the application form, and reliving the original aspiration upon the Party admission.

Adhering to Leading by Example

Our Party Leading Group insisted on leading by example. We established a leading group and an operating organization, formulated the *Work Plan for the Party History Learning and Education*, and established a working mechanism of tour guidance, while ensuring the "synchronization" of the thought, work and implementation on the Party history learning and education.

Theoretical Learning Group studied hard to set an example. According to the mode of "Learning, Lecture, Research and Application", the Theoretical Learning Group under our Party Leading Group carried out 17 special study activities. The Theoretical Learning Group of Party committees at all levels developed more than 3,600 activities on Party history learning. The members of Theoretical Learning Groups reached more than 29,000 person-times. The implementation is thorough and consistent.

Party members in leadership positions took the lead. Members of the Party Leading Group took the lead in giving special lectures on Party history learning and education at the grassroots level, and more than 3,000 secretaries of grassroots Party organizations gave more than 5,800 lectures on the history of the Party, thus forming a good learning atmosphere at all levels.

Enhancing Management and Shaping New Development Advantages of Huaneng

Improving Main Businesses and Shaping a New Pattern of Power Development

Taking More Responsibilities and Embarking on a New Journey of China's Development

Upholding Overall Planning and Advancing in a Solid and Orderly Manner

Practicing the concept of serving the people and focusing on "doing practical work". More than 1,100 meetings on the "I Do Practical Work for the Masses" themed practical activities were held, a list of 396 people's livelihood projects were prepared, and more than 6,600 key tasks were clarified. The achievements of Party history learning were effectively transformed into specific measures to do practical work and solve problems.

Creating an atmosphere and focusing on publicity and guidance. According to the requirements of a series of activities (i.e. 100 revolutionary venues, 100 stories on the Party's tradition, 100 cultural and creative products on Party's tradition, 100 bases for Party history learning and education, 100 tourism lines with revolutionary history, 100 shows on Party's tradition, 100 characteristic villages with the history of revolution, and 100 docents introducing the Party's tradition) celebrating the centenary of the CPC, 100 videos of "Singing a Song of Praise to the Party" were shown, 9 "CHNG Patriotic Education Bases" were named, and HSNPC Science & Technology Museum and "753" Exhibition Hall of Yimin Coal & Power Company were rated as "Patriotic Education Bases of Central SOEs".

Sticking to hierarchical classification and concentrating on supervision and guidance. Eight patrol guidance groups supervised, guided and promoted the implementation, and guided the Party history learning and education for 332 times. The Party history learning and education were included in the annual assessment of the responsibility system for the Party building work, as well as inspection tour and other key tasks to advance the campaign on Party history learning and education in an orderly and efficient way.

Adhering to the Combination of Learning and Application to Achieve Tangible Results

We implemented the new development concept completely, accurately and comprehensively, in combination with the "14th Five-Year Plan". Besides, we persisted in combining the Party history learning and education with the implementation of the new energy security strategy of "Four Revolutions and One Cooperation" and the realization of carbon peaking and neutrality goals, studied the important observations of General Secretary Xi Jinping on grasping the new development stage, implementing the new development concept and building a new development pattern, and formulated the plan on developing original technologies and leading modern industrial chain.

Combined with the three-year action of state-owned enterprise reform, we continued to improve the modern enterprise system with Chinese characteristics. Moreover, we upheld the unity of strengthening the Party's leadership and improving corporate governance, continued to deepen the three-year action of state-owned enterprise reform, held 27 meetings of the leading group for deepening reform, and studied and deliberated on 54 reform topics, while promoting the continuous improvement of the modern enterprise system with Chinese characteristics, and taking new steps in the reform of power marketization.

We re-examined the implementation of the spirit of the meeting on national Party building in state-owned enterprises to constantly improve the quality of Party building. Besides, we held a session to deeply learn, understand and implement the important speeches made by General Secretary Xi Jinping at the meeting on national Party building in state-owned enterprises, and held an "Always Following the Party" themed exhibition on Party building work. And we deepened the "Led by Party Building and Gathering Strength to Overcome Difficulties" themed activity. We are the only central SOE that made a speech on "Promoting Independent Technological Innovation by Gathering Strength and Talents in Party Building" at the National Organization Department Head Meeting.

Achieving Outstanding Achievements

Studying the Party's history to be reasonable: We continued to study and implement Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, and the implementation awareness and ability were significantly improved.

Studying the Party's history to be confident: The spirit of taking on responsibilities has been continuously boosted, and the confidence and determination to enhance the strength, quality, and size of state-owned enterprises have become stronger.

Studying the Party's history to be virtuous: Party members' political thought and Party spirit cultivation have been improved deeply, and their awareness of "Electricity Industry for the People" has become stronger.

Studying the Party's history to be practical: The internal impetus to build the Company into a world-class modern clean energy enterprise continued to be released, and greater achievements were made to become a leader in six fields, including scientific and technological innovations, green transition, efficiency and effectiveness, international development, corporate governance and Party building quality.





To achieve carbon peaking and carbon neutrality, we must follow the principles of exercising nationwide planning, prioritizing conservation, leveraging the strengths of the government and the market, coordinating efforts on the domestic and international fronts, and guarding against risks, give better play to China's institutional advantages, resource conditions, technological potential, and market vitality, and accelerate the formation of an industrial structure, production mode, lifestyle, and spatial pattern that save resources and protect the environment. And we should promote the energy revolution, accelerate the development of new energy sources such as wind energy, solar energy, biomass energy, geothermal energy, marine energy and hydrogen energy with economies of scale, coordinate hydropower development and ecological protection, and actively develop nuclear power in a safe and orderly manner.

— Emphasized by Xi Jinping on the 36th Group Study Session of the Political Bureau of the Central Committee of the Communist Party of China



Since the Company entered the field of nuclear power in 2004, the Company, taking "Unswervingly Promoting the Development of Nuclear Power" as its strategy, the Company has established the development pattern of three coastal nuclear power bases, i.e. Shandong Shidao Bay, Hainan Changjiang and Fujian Xiapu.

The Company implemented the national innovation driven development strategy, strove to tackle stranglehold problems in the operation, maintenance, technological promotion and application as well as other critical core nuclear power technologies in relation to HTGR nuclear power stations, and established CHNG Research Institute of Nuclear Power Technology in December 2020. While taking nuclear power technology R&D and nuclear safety technology support as its core tasks, adhering to the national strategy, mobilizing the internal and external resources of CHNG, and concentrating on the development of nuclear power "design, construction, control and operation", CHNG Research Institute of Nuclear Power Technology built a technical support platform for nuclear power development, construction, operation and management, a supporting platform for technical innovation, and further promoted the normalization, standardization and high efficiency of the Company's nuclear power business, filled the "source" gap in the industrial chain and boosted the efficient and high-quality development of national nuclear power technology.

Based on design technology, packaged technology, control technology and operation technology systematically, CHNG Research Institute of Nuclear Power Technology planned the technical R&D layout from a high starting point, formulated the technical research route of "750 Optimization, 950 Pre-research, Multi-purpose Application and Genealogical Development", and formed four key research directions of "One Set of Standards, One Improvement, One New Reactor, One Transformation", and launched six major technological projects including "HTR-PM Standard System and Standard Development", while providing the technical support for the follow-up large-scale development of nuclear power. CHNG's nuclear power R&D layout has taken shape.

The establishment of the Research Institute of Nuclear Power Technology is a milestone in the development of CHNG's nuclear power business, marking a giant leap for CHNG's nuclear power technology innovation system. As an important technical support platform to help achieve the carbon peaking and carbon neutrality goals and serve to build a new development pattern, an innovation driven platform that creates national strategic technical strength in the field of nuclear power for high-level technical self-reliance, and a talent pool that improves intellectual support and boosts the high-quality development of nuclear power, the Research Institute of Nuclear Power Technology will concentrate the advantages of CHNG nuclear power technologies, provide strong technical support for the commercial promotion and application of HTR-PM and the large-scale development of PWR, further improve CHNG's nuclear power development capacity, and offer CHNG's "Nuclear Power" to achieve the carbon peaking and carbon neutrality goals.

— Shu Yinbiao, Secretary of the Party Leading Group and Chairman of the Board of Directors of CHNG



Unveiling Ceremony of Research Institute of Nuclear Power Technology

Enhancing Management and Shaping New
Development Advantages of Huaneng

Improving Main Businesses and Shaping
a New Pattern of Power Development

Taking More Responsibilities and Embarking
on a New Journey of China's Development

Generating CHNG's First Kilowatt-hour of Nuclear Electricity

The Company has made every effort to speed up the construction of Shidao Bay HTR-PM Nuclear Power Plant and the key technology research, and successively tackled major nodes such as cold and hot tests of dual reactors, loading of first reactor, criticality of first reactor. On December 20, 2021, after 17 years of hard work, National Science and Technology Major Project — Shidao Bay HTR-PM Demonstration Project was successfully connected to the grid and generated CHNG's first kilowatt-hour of nuclear electricity. With 93.4% of equipment domestically made, far beyond the target ratio of 75% set for major projects, the project is the first pebble-bed modular reactor plant in the world, the world's first demonstration project that commercializes HTR-PM nuclear power technology, and an important path for China to optimize the energy structure, ensure the security of energy supply, and achieve the carbon peaking and carbon neutrality goals, marking China's leading position in the world's fourth generation nuclear power technology.



Shidao Bay HTR-PM Nuclear Power Plant Demonstration Project



The Shidao Bay HTR-PM Nuclear Power Plant Demonstration Project, the world's first fourth-generation HTR-PM, appeared at the National Science and Technology Innovation Achievement Exhibition during the 13th Five-Year Plan period, and Xi Jinping visited our booth.

HTR-PM, lunar exploration project and large passenger aircraft are national science and technology major projects, and HTR-PM is one of the pillars in the energy field. The grid-connection of the project, marking a major breakthrough in China's independent innovation of nuclear power, will promote China's advanced nuclear energy technology to become a global leader.

—Zhang Yuzhuo, Secretary of the Party Leading Group of the China Association for Science and Technology, Academician of the Chinese Academy of Engineering

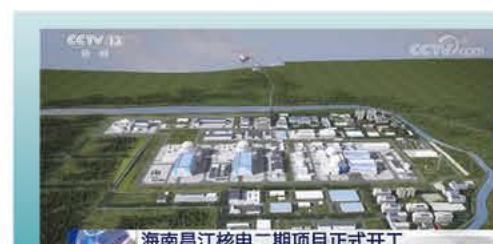


Please scan the QR code to watch CCTV report on *Grid-connected Power Generation of the World's First Commercial HTR-PM Nuclear Power Plant*

Two Units of Changjiang Nuclear Power Plant Started Construction

On December 28, 2021, the Company's first large-scale pressurized water reactor project, Changjiang Nuclear Power Station Phase II Project initiated the construction of two 1.2GW generating units. The project is the largest investment project in Hainan since the construction of Hainan Free Trade Zone (Port). After completion, it can supply 18TWh of clean electricity every year, equivalent to reducing the consumption of 5.5 million tons of standard coal and 13 million tons of carbon dioxide.

As the first nuclear power project starting construction during the "14th Five-Year Plan" period, Changjiang Nuclear Power Station Phase II Project is a major strategic project to help China achieve the carbon peaking and carbon neutrality goals and serve the new development pattern, a landmark project to serve Hainan to build a demonstration area for the prioritization of clean energy and comprehensively carry forward the development of "Clean Energy Island", a milestone project for CHNG to accelerate green transition and optimize and adjust energy structure.



Please scan the QR code to watch CCTV report on *Formal Commencement of Hainan Changjiang Nuclear Power Station Phase II Project*





We must adhere to the all-round rural revitalization, focus on priorities, address inadequacies, and shore up points of weakness. In this way, we will realize the vitalization of rural industries, talents, culture, ecology, and organizations, and push forward the all-round upgrading of agriculture, the all-round progress of rural areas, and the all-round development of farmers. We must respect the will of farmers, stimulate the enthusiasm, initiative and creativity of farmers, activate the internal impetus of rural revitalization, and make farmers have more sense of gain, happiness and security in rural revitalization. We must promote the vitalization through hard work. According to the law of rural development, priority is given to planning, and advancement is made by classification. With increase in investment and hard work, we will push forward rural revitalization and make new achievements.

—— Important Instructions Made by Xi Jinping on the Implementation of the Rural Revitalization Strategy



Since the strategic cooperation agreement in the field of energy economy was signed with the Tibet Autonomous Region for the first time in 2007, the Company has attached great importance to the development of its undertakings in Tibet, while providing strong economic and technical support for Tibet. According to the agreement of the project "Central SOE Helping to Bring Prosperity to Tibet and Its Residents" signed between both parties, Paizhen - Motuo Highway commenced construction in August 2014. All the staff made concerted efforts and tackled the impacts of rock bursts, faults, water inrush and other geological disasters for several times. After seven years of hard construction, the whole line was open to traffic on May 16, 2021, 228 days ahead of the original schedule, while winning high praise from all walks of life, and celebrating the centenary of the Party and the 70th anniversary of the peaceful liberation of Tibet.

As a key livelihood project in the Tibet Autonomous Region, after the completion of Paizhen - Motuo Highway, the travel time from Motuo county to Linzhi city is shortened from 12 hours to 4 hours, and the highway mileage is shortened from 352 kilometers through Bomi county to 180 kilometers through Paizhen. It forms a Motuo ring road with the existing Zhamu - Motuo Highway, breaks the traffic bottleneck in Motuo, changes the current situation of "traffic restrictions based on even- and odd-numbered license plates", and completely ends the history that the transportation of producer goods and daily necessities used by people in Motuo county and along the highway only rely on manpower and horses, which greatly alleviates the difficulty of getting in and out of Motuo. The highway also effectively improves the tourism and sales level of high-quality agricultural products in the Yarlung Zangbo Grand Canyon, promotes the rapid development of local tourism, commerce, agriculture and animal husbandry, helps the people along the highway raise income in an all-round way, while contributing to the consolidation and expansion of achievements in poverty alleviation, the implementation of rural revitalization strategy, and the leapfrog development of Motuo county.

The Road of Technology Innovation

During the excavation of Duoxiongla Tunnel, the main project of Paizhen - Motuo Highway, the Company proposed a new mode of "full-face double-shield hard-rock tunnel boring machine (TBM) + the owner's deep involvement in the tunneling construction", and completed the excavation task of 4,784 meters of Duoxiongla Tunnel in only 16 months.

"Linzhi-1" TBM, a large-section double-shield TBM, used in the highway construction is the first large-diameter TBM used on the Tibetan Plateau. Combined with TBM tunneling construction, the Company originated construction and management methods such as "TBM integrated management system", completed the research and field verification of five TBM key technology topics, obtained five invention patents and one utility model patent, and gained a total of 13 scientific research achievement awards. The Company has synchronously promoted the transformation of scientific research achievements to technical achievements. The TBM drive rate has gradually increased from 25% to 56%, and the monthly drifting footage has increased from 250 meters to 565 meters. The Company offered valuable experience to build a clean energy base in Southwest China.

The Road of Ecological Protection

In order to build the most beautiful highway and implement high-standard environmental protection measures, the total investment in environmental protection and soil and water conservation of Paizhen - Motuo Highway was up to RMB 110 million yuan, and the environmental protection improvement project of "One Corridor, Two Points and Three Belts" (Paizhen - Motuo ecological corridor; landscape point of industrial square, centralized transplanting point of rare plants; alpine landscape belt, forest landscape belt, ecological green center belt) was implemented in Paiba Gully and Duoxiong River Valley.

- **Maintaining the original road and reducing disturbance:** The route design of the highway was consistent with the footway to Motuo as much as possible to reduce the impact of the project construction on the ecology.
- **Fine-tuning the route and avoid ancient trees:** Linear adjustment and road narrowing were utilized to avoid big trees located on the original design route and maximize the protection of ancient trees.
- **Extending the tunnel to avoid steep slopes:** Laohuzui Tunnel was extended for more than 600 meters to avoid open-line excavation on high slopes and reduce vegetation damage.

The Company planted more than 20,000 shrubs and trees along the subgrade, road shoulder and slag yard of Paizhen - Motuo Highway, sowed the seeds of shrub, grass and flowers within an area of more than 200,000 square meters in total, retained more than 500 ancient trees such as fir, Tsuga chinensis and oriental white oak within the scope of subgrade construction, offered the listing protection for more than 200 ancient trees with a diameter greater than 80cm, and successfully implemented the net hanging, spray seeding and greening of side slopes and the restoration of construction site of nearly 550,000 square meters. The environmental protection experiment project of geocell slope projection was completed in very cold areas of a total of 8,000 square meters. Technical reference and practical verification were provided for maximum protection of the natural environment in the ecological fragile areas with high altitude and large temperature difference.

The Road of Rural Revitalization

From 2014 to 2021, in the construction of Paizhen - Motuo Highway, the Company paid more than RMB 12.16 million yuan of taxes to local financial departments, providing reliable support for local economic development. While proceeding with road construction, the Company insisted on driving the common development of surrounding villagers, and sent a total of 13 core employees in 5 batches to carry out resident work in Yadong village of Motuo town, Bangxin village and Bangguo village of Bangxin township, Xirang village and Jiangxin village of Beibeng township in Motuo county.

- **Driving industrial revitalization:** The Company promoted the construction of 547 mu of tea gardens and 250 mu of loquat gardens in Bangxin village, which earned an income of more than RMB 500,000 yuan, and assisted in the establishment of Shiguo cooperative that earned a total income of more than RMB 3.7 million yuan since 2018. The average household income of local people was increased from more than RMB 7,000 yuan in 2018 to more than RMB 30,000 yuan in 2021.
- **Employing local people:** A total of 110 jobs have been provided, attracting nearly a thousand local people to participate in the project construction and management services. Under the coordination of the Company, about 1,500,000 m³ of sand and gravel aggregate were purchased from the nearby village collective yards, 14 local vehicles meeting the construction safety requirements were hired, and more than 500 jobs were offered.
- **Educational and medical assistance:** 1.22 million yuan was invested in the "Project Pillars", an activity to assist the impoverished students, benefiting 247 students. A special fund for medical assistance was set up to help 33 local people through healthcare difficulties.



Please scan the QR code to watch CCTV report on Paizhen - Motuo Highway Open to Traffic





The green, low-carbon circular development has become a common goal of mankind. The deeply integrated development of new technologies such as artificial intelligence, big data and 5G with sectors including new energy power generation and electric vehicles etc. calls for immediate formulation and application of international standards in related fields as well as strengthened international cooperation. China attaches great importance to standardization, advocates the application of international standards, supports high-tech innovations with high standards, so as to promote high-level opening-up and drive high-quality development. China will continue to actively support and participate in international standardization activities, and stands ready to work with other countries to constantly improve the system and governance structure of international standards, to give better play to the role of international standards in international trade and global governance.

—— President Xi Jinping Sent a Congratulatory Letter to the 83rd IEC General Meeting



The International Electrotechnical Commission (IEC) is a globally recognized organization for the international standard setting and conformity assessment for all electrical, electronic and related technologies. As one of the world's three most authoritative international standardization organizations including the International Organization for Standardization (ISO) and the International Telecommunication Union (ITU), it is the world's earliest and most influential international standardization organization in the fields of electrical, electronics and others, and enjoys the reputation of "United Nations in the field of electrotechnology". IEC has 212 technical committees, and has issued more than 10,000 international standards.

In October 2018, Shu Yinbiao, Secretary of the Party Leading Group and Chairman of China Huaneng Group, was elected the 36th IEC President. Since its establishment more than 100 years ago, IEC has for the first time a Chinese expert serving as its president, which is an important milestone for China to participate in the international standardization, and another important achievement for electric power enterprises to implement the concept of "a community with a shared future for mankind" and actively promote the Belt & Road Initiative".

The Company promoted international standardization in an all-round way, deeply participated in major IEC decisions, led the continuous progress of China's power industry, while providing Chinese wisdom and Huaneng strength to standardization and sustainable development of the power sector.

Carving out Our Role in Foreign Exchange

The Company strengthened organization and coordination, actively participated in IEC conferences, the 4th China Quality Conference, the 2nd China-ASEAN International Standardization Forum, Qingdao Forum on International Standardization and other activities, and provided good service support. Moreover, the Company further strengthened communication with national ministries and commissions including SASAC, Standardization Administration, Ministry of Water Resources, and reported the progress of the Company's international standardization work. And the Company strengthened the connection with the Secretariat of the Standardization Technical Committees (TCs), industry associations and societies to carry out research and exchange, explore cooperation channels, and lay a solid foundation for the further development of international standardization.



The 85th IEC General Meeting was Held

In October 2021, the 85th IEC General Meeting was held in Dubai, United Arab Emirates, with more than 600 delegates from 172 countries attending the general meeting.

With the theme of "Leading Industry 4.0 through Standardization", the general meeting conducted discussions based on IEC's three future strategies (digital transformation of energy, promoting sustainable development, building an inclusive and cooperative global organization) and four key fields (artificial intelligence, biological digital integration, digital standards, and sustainable development goals). During this period, the proposal proposed by China to establish a standardization evaluation group of electrical equipment in extreme environments was officially approved by the IEC.



Shu Yinbiao, IEC President, Secretary of the Party Leading Group, Chairman of China Huaneng Group Made a Speech at the Meeting

Improving International Standard Management

While striving to establish an international standardization system, the Company released five corporate policies including the *Management Measures for International Standardization*, further standardized the management system, workflow, reward standards and talent training channels of international standardization work, and provided a strong institutional guarantee for the smooth implementation of follow-up work.

The Company held quarterly supervision meetings for international standard projects, international standardization work promotion meetings, special technical work meetings and seminars to supervise key projects and tap further potential. Xi'an Thermal Power Research Institute, Huaneng Renewables and other subsidiary units have become the backbone of the Company's international standardization work. The experience in international standard management was summarized constantly, to ensure the approval and preparation of international standards in an orderly manner.

Optimizing the Layout for Personnel Development

The Company attached great importance to the development of international standardization talents, organized three international standard training activities participated by a total of more than 220 people, and held two seminars to guide the employees to prepare and revise international standards, participated by a total of more than 900 people. Besides, more technical experts were encouraged to join international standardization organizations, and a total of 36 persons have become registered experts, out of which 4 persons work at key positions, and 1 person won two "IEC1906 awards" of IEC/TC8 and TC82. The international standardization talent team continued to expand.

Driving the Formulation of International Standards

The Company continued to invest more funds, and set up special funds for international standard projects. 3 international standards were issued successfully throughout the year, 11 international standard projects were approved, and 32 international standard projects were in preparation.

11 International Standard Projects Approved



The First IEC International Standard Developed by the Company was Released and Implemented

In November 2021, IEC/TS63217:2021 *Code for High Voltage Ride Through Test of Grid-connected Photovoltaic Inverter* prepared predominantly by the Company was released and implemented. It is the first IEC international standard developed, released and implemented by the Company on behalf of China, and a major breakthrough in the field of international standardization work of the Company.

Grid-connected photovoltaic high voltage ride through refers to that in photovoltaic power stations, when the grid-connected voltage rises abruptly due to power system accidents or disturbances, within a range and time interval of voltage rise, photovoltaic power stations can operate continuously without grid disconnection.

The standard puts forward the high voltage ride through test method of photovoltaic inverter for the first time at the international standard level, provides a unified and complete test basis for high voltage ride through of photovoltaic inverter for all countries in the world, further improves the stability of photovoltaic grid connection, and fills the worldwide gaps in the field of high voltage ride through standards of photovoltaic inverter.



The Company's First IEC Standard on Renewable Energy Access to the Grid was Approved

The IEC standard proposal *Generic RMS Simulation Models of Converter-based Generating Units for Power System Dynamic Analysis* jointly initiated by the Company and Tsinghua University was approved, which is the Company's first IEC standard approved in the field of renewable energy access to the grid.

The generic model proposed in the standard adapts to different types of primary energy access, and accurately describes the main dynamic behavior of generating units through parameterization and model verification, which will help renewable energy access to the grid on a large scale and with high penetration in the future. In order to better prepare subsequent standards, the Secretariat of IEC "Renewable Energy Access To Grid" SCBA has specially established a renewable energy power generation modeling working group.

The approval of the standard and the establishment of the working group mark that China has more of a say in the field of renewable energy access to the grid, and are of great importance to make China's products and services go global based on international standards and enhance China's international competitiveness in this field.

Enhancing Management and Shaping New Development Advantages of Huaneng

High-quality Development of the Enterprise

If one wants trees to grow tall, he must deepen the roots.

—Quoted from A Memorial to Tai Zong on Ten Aspects of Self-discipline by Wei Zheng, Tang Dynasty

We will promote state-owned enterprises to improve the modern enterprise system with Chinese characteristics, adhere to the Party's overall leadership over state-owned enterprises, promote the unity of strengthening the Party's leadership and improving corporate governance, and accelerate the establishment of a corporate governance mechanism with legal rights and responsibilities, transparent rights and responsibilities, coordinated operation, and effective check and balance. We will enhance the state asset supervision system that focuses on capital management, adhere to the combination of authorization and supervision, and the combination of decentralization and appropriate control, and vigorously promote the multi-dimensional transformation of the concept, priorities, and methods of state asset supervision.

— Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China



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Releasing Industrial Synergies



A successful enterprise must concentrate on its main business before reaching the summit of its development. Mixed operation goes with the development of main business, rather than speculation for profit.

— Xi Jinping



CHNG took power sector as its core business, adhered to the green development philosophy, and continued to speed up structural adjustment. CHNG strove to vigorously develop hydropower, actively develop wind power, solar power and other forms of new energy, endeavored to develop nuclear power gas-fired power, so as to increase the proportion of low-carbon and clean installed capacity, and constantly enhance the efficient and clean utilization of conventional energy. In 2021, CHNG's total power generation reached 774.4TWh domestically, with a year-on-year growth rate of 9.33%; hydropower, wind power, solar energy and thermal power generation were 110.6TWh, 62.4TWh, 11.1TWh and 590.4TWh respectively; the installed capacity of wholly-owned and majority-owned power plants at home and abroad reached 200GW, with a year-on-year growth rate of 4.83%.

Focusing on the Development of Power Sector

CHNG strengthened innovations in science and technology with increased capital input, fully leveraged its strength in technology and talents, and strove to grasp the core technologies with proprietary intellectual property rights. CHNG played a leading role in various major national technological projects in the energy sector, and explored a unique development path with Huaneng characteristics in development of science and technology. CHNG continues to improve its technology innovation system, which gives prominence to its culture, cooperates internally and externally, and covers the main business sectors. Besides, it has established Hydropower Technology R&D Center and Nuclear Technology Institute, and led the establishment of the Offshore Wind Power Technology Professional Committee of Chinese Society for Electrical Engineering to explore a new mode featuring the coordinated efforts of enterprises, universities, research institutions and consumers.

In 2021, the operating revenue of CHNG's technology sector reached RMB 3.33 billion yuan, up 16.3% year-on-year, and the income from commercialization of scientific research findings reached RMB 2.5 billion yuan, up 17.9% year-on-year.

Vigorously Developing Science and Technology Sector

Optimizing the Development of Coal Sector

CHNG has formulated 20 measures for the "carbon peaking and carbon neutrality" reform of the coal industry. The first batch of national demonstration intelligent coal mines, such as Yimin Open Pit Mine, Hetaoyu Mine and Weijiamao Mine, met the acceptance standards, Chicheng Mine completed final acceptance, Mijiagou Washery and special railway line were completed. In 2021, CHNG's coal production was 86.64 million tons, up 10.57 million tons on a year-on-year basis, with a profit of RMB 7.34 billion yuan, setting a record high.

CHNG has continuously strengthened the synergy between coal and electricity. The internal coal supply was 53.69 million tons, an increase of 9.21 million tons year-on-year. The fulfillment rate of medium and long-term coal contracts under key government supervision reached 104%, the synergy rate was 62%, and the synergy supply was increased by 15.19%. CHNG's coal production capacity was increased by 19.3 million tons per year, and the overall coal production capacity exceeded 100 million tons per year. With a production capacity of 35 million tons per year, Yimin Open Pit Mine is the largest of its kind in China; the production capacity of Weijiamao Mine and Gaotouyao Mine exceeded 10 million tons per year.

Effectively Developing Financial Sector

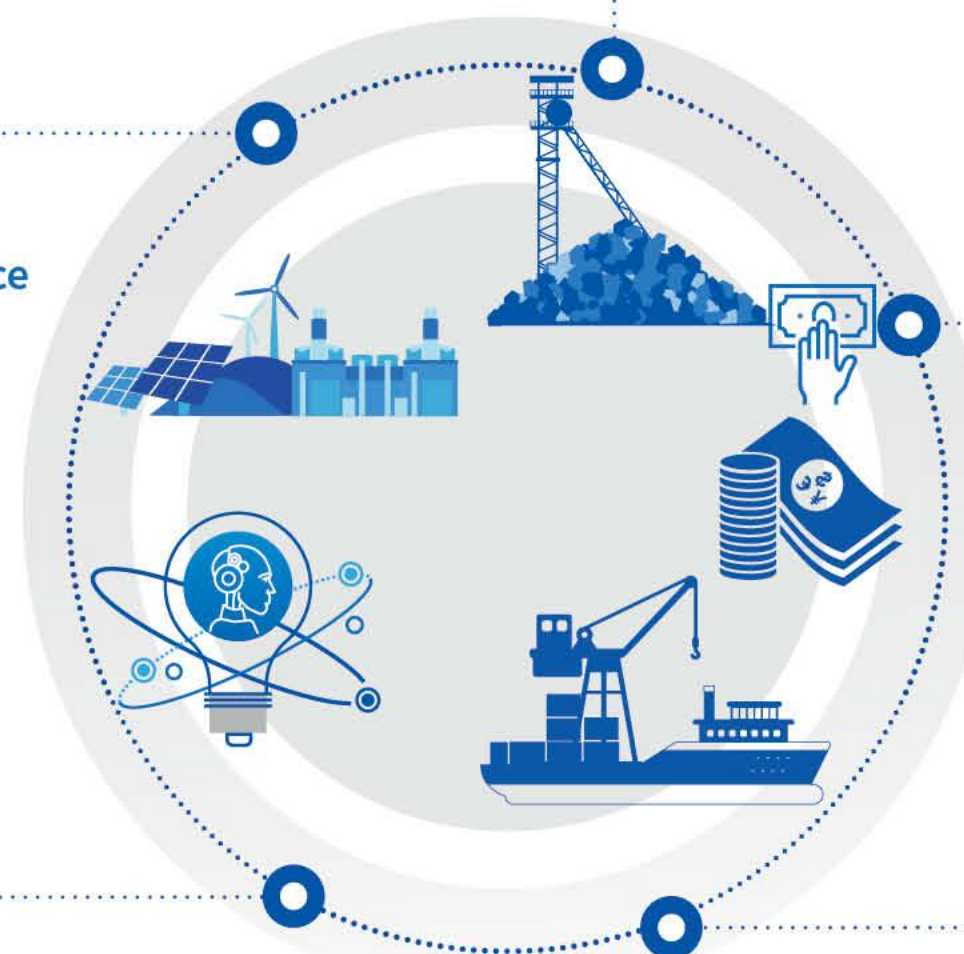
CHNG prepared the *Key Points of Combination between Industry and Finance to Promote Industry by Finance during the 14th Five-Year Plan Period of the Financial Business Sector*, enhanced the strength and quality of the financial business sector around core business sectors, and constantly reinforced the financial business sector's function of providing services to main businesses. The profit of the sector was RMB 9.82 billion yuan, an increase of 8.4% year-on-year, setting a new record.

- China Great Wall Securities was rated as a **Class A Securities Company** by CSRC.
- Yuncheng Financial Services helped the Company play the role of the "head" of modern industrial chain and provided RMB 12 billion yuan of upstream and downstream supply chain financing.
- Huaneng Invesco, Huaneng Investment, Tiancheng Financial Leasing, Treasury Management (Hong Kong) and other financial subsidiaries boosted energy transition and helped secure 6GW of new energy resources.
- iDeal underwriting and distribution right was awarded to Huaneng Guicheng Trust by China Foreign Exchange Trade System. Huaneng Guicheng Trust became the first organization using iDeal distribution confirmation form in the trust industry, realizing the full-process electronic operation of primary investment in bonds.

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 2021, CHNG's shipping sector reaped a revenue of RMB 6.449 billion yuan, an increase of 75.6% year-on-year; CHNG completed 91.26 million tons of freight transport, up 12.5% year-on-year, 89.53 million tons of port handling capacity, a year-on-year increase of 36%, and 59.54 million tons of internal thermal coal transportation, a year-on-year increase of 32.7%, and the subsidy for Huaneng power plants exceeded RMB 570 million yuan.

CHNG actively advanced the development of smart supply chain and improved the core ability of supply chain to reduce costs and increase efficiency. CHNG strove to speed up the implementation of logistics strategy, promoted the logistics link of the upstream supply chain enabled on online platforms in a digital and intelligent way. The annual logistics income exceeded RMB 2 billion yuan, and the full scene operation capacity was further enhanced. CHNG won more than 20 national, provincial and ministerial-level awards, including the first batch of "Supply Chain Innovation and Application Demonstration Enterprises".



Consolidating the Foundation for Enduring and Steady Growth



Party committees and governments at all levels should fulfill the great responsibility of running SOEs well and unswervingly consolidating and developing state-owned economy, strengthen the organization and leadership of SOE reform, and make new achievements in important areas and key links of SOE reform as soon as possible.

— Xi Jinping



Value Maintenance and Appreciation of Assets

CHNG fully leveraged synergy advantage of all industrial sectors. The operating revenue was RMB 385.5 billion yuan, an increase of 23% year-on-year, the highest level in history, despite the soaring coal price. The profit was RMB 13.3 billion yuan, ranking first in benchmarking with comparable enterprise. The profit of new energy sector was increased by 88% year-on-year, and the profit of the hydropower sector was increased by 52% year-on-year. The net profit was RMB 9.08 billion yuan, and the risk resistance capacity and profitability were significantly enhanced, further consolidating the industry leadership position.

Carrying out Reform of State-owned Enterprises

CHNG continued to improve the system of the board of directors, adhered to fully strengthening the leadership of the Party in improving governance, drew a clear line between the rights and responsibilities of governance bodies in determining responsibilities, improved the system of board of directors with CHNG's characteristics in standardized operation, and established and improved the authorization mechanism of the board of directors in standardized authorization and decentralization. By innovating the communication mechanism, enlarging the functions of the special committee and ensuring the decision-making rights, CHNG constantly optimized the decision-making process of the board of directors, ensuring that the members of the board of directors perform their duties. In the evaluation of the board of directors of central SOEs in 2020, CHNG was rated as "Excellent".

Completed

93.3 %

of SOE Reform Tasks

Deepening SOE reform is our important political task. CHNG implemented the *Three-year Action Plan for Reform* steadily. A total of 93.3% of reform tasks were completed, 23.3% ahead of schedule. CHNG was rated as **Grade A enterprise in the assessment of the key tasks of the three-year action for the reform of central SOEs in 2021**. CHNG performed well in this "difficult test" of SASAC's special task, disposed of 119 loss-making subsidiaries, turned 55 enterprises from loss to profit, and canceled 20 enterprises, exceeding the goal of reducing losses by 50% compared with 2018.

CHNG implemented the tenure system and contractual management for managers in an orderly manner, and 100% of subsidiaries signed contracts. CHNG overfulfilled the reform task. CHNG further promoted and implemented the "double-hundred action". As a "double-hundred enterprise", Huaneng Renewables actively improved the construction of professional committees of the board of directors, deepened the development of market-oriented operation mechanism. The market-oriented employment rate and contract signing rate of Huaneng Xiongfei (subordinate to Huaneng Renewables) reached 100%.

Promoting Corporate Governance According to Law

CHNG continued to deepen Huaneng rule of law, formulated the *Five-Year Work Plan for Huaneng Rule of Law*, improved the risk prevention and control system throughout the whole process and whole value chain, achieved full coverage of online legal management and closed-loop management, optimized and upgraded the legal system, promoted the effective supervision including discipline inspection and supervision, patrol inspection and audit, and improved the long-term working mechanism of early detection, early warning and early disposal of risks. CHNG continued to improve publicity and communication on the rule of law. Through SASAC lecture

Dealing with

1,292

Areas of Concern Regarding
Internal Audit

hall on the rule of law, the online training of the Civil Code, and others, CHNG improved all employees' awareness of laws, and won **Grade A in the acceptance test of central SOEs under the rule of law**, ranking in the forefront among central SOEs.

China Huaneng remains committed to the top-level design for audit to advance thorough updating of the internal audit system. As a result, a 3-level audit system was established, in which *the Internal Audit Work Rules* played a leading role in conjunction with the audit discipline management system and audit basic management system to guide the audit practical work. In 2021, China Huaneng reclaimed funds of RMB 2.8 billion yuan from audit dealing with 1292 areas of concern, and avoided economic losses of RMB 180 million yuan.

Recovering or Avoiding
Economic Losses of

RMB 180 million yuan

Amid construction of HQ Legal Compliance Management Center in a faster pace, the Company has assigned the legal compliance operators in some department on a trial basis to make sure the compliance management duties at the front line were adequately delivered. The development of the integrity and compliance management system was progressing well, as demonstrated by completion in preparation of the Compliance Management Rules (trial) and compliance management manual, etc. The Company performed well in the corporate credit rating in 2021.



Huaneng Lancang River Hydropower Inc. Conducted Compliance Management Training

In 2021, Huaneng Lancang River Hydropower Inc. carried out training on compliance management (integrity and compliance) in overseas business-related enterprises, plus course evaluation and quiz, which was attended by 150 people to learn *the Compliance Management System Development and Case Study* as well as achievements on anti-corruption work development released in the website of the Central Commission for Discipline Inspection and the State Supervision Commission via on-site lectures, remote videos, etc. The training has facilitated employees' access to the compliance management knowledge, thus further promoting their integrity awareness.

Intensifying Risk Prevention and Control

The Company continued improvement of its internal control system by optimizing the internal control process and intensifying the control measures. We spared no efforts to deliver a well-structured and workable internal control system following its 297 revisions across the year. Given active participation in major risk prevention and identification, we arranged the comprehensive risk assessment twice in the year, which was attended by over 270 enterprises. These campaigns totally identified 10,553 areas of concern in HSE, globalization business operation, etc., and defined 67,963 risk mitigation measures.

Legal Risk Prevention & Control

We delivered a standardized legal compliance as part of the enterprise's operation and development process, in which the legal review was intensified so that it can play a guaranteeing and supporting roles. Furthermore, we attached great importance to contract management in pursuit of contract standardization so as to ensure our activities at home and abroad are performed lawfully.

Financial Risk Prevention & Control

We spared no efforts to monitor the high-risk financial activities. For this purpose, we established a daily reporting mechanism for financial derivatives business, and carried out "Look-back Inspection" on trust and financial leasing business, thus contributing to prevention and mitigation of financial risks.

Capital and Debt Risk Prevention & Control

We strengthened the capital risk management by adhering to the "Three Guarantees" debt risk prevention bottom line. Furthermore, we pushed ahead implementation of 295 key tasks in accordance with the *Work Plan on Leverage Stability in 2021*, thus ensuring no debt default cases.

Accounting Quality Risk Prevention & Control

We carried out the first massive accounting information quality self-check to improve the accounting standardization awareness and foster the accounting fundamentals. To address findings from the audit, we developed a well-structured prevention mechanism to boost the Company's steady development.



Reducing Cost, Improving Quality and Increasing Efficiency

Given the Company's vow to deliver the better-quality, more efficient and upgraded work, we have formulated a work system on 13 key indicators and 172 key tasks under the Two profits and four rates strategy (i.e. total profit and net profit, asset liability ratio, operating profit ratio, labor productivity and R&D investment intensity). All the affiliated enterprises were adequately classified by the industrial type and functional orientation to facilitate the target-to-action breakdown, thereby ensuring action implementation and target fulfillment.

Entitlement to Tax Incentives of
RMB **2.25** billion yuan

Reduction in Project Investment of
RMB **4.8** billion yuan
as Approved by the Engineering Technical
Economics Center

Cost Reduction of
RMB **200** million yuan
from Self-maintenance and Condition-
based Maintenance

Profit Increase of
RMB **10** billion yuan
from New Energy, Coal and Finance
Sectors on a Year-on-year Basis

Continuous Reduction in Unit Production
Cost on a Year-on-year Basis, Saving of
RMB **4.5** billion yuan
Compared with the Budget in Administrative,
Sales and Financing Expenses

Deficit Coverage of
RMB **14** billion yuan
Via Utilization of Related Favorable Policies
and Proactive Measures in the Coal-fired
Power Industry

Purchase Saving of
RMB **3.14** billion yuan
in New Energy Via Packaged
Bidding, Framework Agreement
Purchase, etc.

Successful Launching of the First Carbon Neutrality Bonds and the First Sustainable Development
Bonds in the Country, Raising RMB **28** billion yuan of Green Development Fund, Introducing
RMB **20** billion yuan of Low-cost Replacement Funds, Thus Leading to **0.2** percentage
point decrease in the Average Financing Cost, and Saving of RMB **1.5** billion yuan of
Financing Expenses

Building an Intelligent Huaneng

We kept on with improvement of the top-level design of IT work by means of formulation and release of the "14th Five-Year Plan" for Digitalization, thereby defining the overall objective and construction guidance system of digitalization development. By doing so, the strategic development of IT and digital transformation have been properly assured.

- The localization move was progressed in a coordinated way to establish the *OA System Localization Option*. Installation, deployment and commissioning of the cloud desktop devices have been completed in 13 trial enterprises.
- More than 1700 enterprise cloud virtual machines were deployed to enable coordinated construction, overall deployment and centralized management of enterprise cloud resources.
- The IT work management system construction project was initiated to facilitate the whole process management of IT project initiation, budget, construction, operation and maintenance, technology, security, etc.
- The function utilization rate of unified and self-built application systems is more than 90%, and that of core and important systems is basically up to 100%.

Intensified Top-level Design for Duty Execution



“

An enterprise should act as a good "corporate citizen" amid pursuit for its own development. It should serve the society with returns to demonstrate execution of its due responsibilities, which is an important part of building a harmonious society.

— Xi Jinping

”

Responsibility Organization

Responsibility Governance

The Company has established a Social Responsibility Management Committee, takes the lead in the deliberation and decision-making of major issues, forming a mechanism for organizing social responsibility management in a top-down manner with clear division of labor. A Social Responsibility Division was set up under the Planning & Development Department. In every other Headquarters department, an employee is appointed to take charge of social responsibility issues, and in each subordinate unit, a social responsibility contact person is assigned. Thus, a social responsibility work system has taken shape from the upper to lower levels, promoting the fulfillment of social responsibilities in the HQ departments and subordinate units.

Governing Body	Centralized Planning	Integration & Implementation	Main Responsibility Issues
The Company's Board of Directors	Planning and Development Department (Social Responsibility, Rural Revitalization and High-quality Development)	Finance and Assets Management Department	Quality and Efficiency Improvement
		Enterprise Management and Legal Compliance Department	Risk Control, Law-based Corporate Governance
		Marketing Department	Fair Competition, Fair Trade
		Safety Supervision Department	Safe Production
		Production Management and Environmental Protection Department	Guaranteeing Supply, Energy Saving and Environmental Protection
		Technology Innovation and Digitalization Department	Scientific and Technological Innovation
		Material and Procurement Management Department	Responsible Procurement, Supply Chain Management
		New Energy Business Unit	Energy Structure Adjustment
		International Cooperation Department	Partnership, Belt and Road Initiative
		Organization Department of the Party Leading Group (Human Resources Department)	Employees' Career Development
		Party Building Department (Publicity Department of the Party Leading Group)	Strengthening Party Leadership
		Labor Union	Assistance for Employees in Need, Enriching Cultural Life
		News and Brand Management Center	Responsibility Communication, Brand Building

Responsibility Concepts

We actively promoted the construction of corporate culture, revised the *Outline of Corporate Culture Development and the Corporate Culture Manual*. Nine achievements won the **national excellent achievement award of corporate culture**, taking a leading position in the quality and quantity of awards among generating enterprises. *Leading the High-quality Development with "Three color culture" in Huaneng* won the special prize. The Company deepened work on spiritual civilization, 9 units won the **title of the national civilized units**, 27 units passed the review of national civilized units, and 109 units were labeled as Huaneng civilized units.

The Company integrated the concept of social responsibility with the corporate brand construction, developed and implemented the Brand Strategy Outlines of China Huaneng Group Co., Ltd., in which the brand slogan of "Energy of China" was set forth for the first time and the image positioning of "industry leader obliged to actively promote energy revolution, safeguard energy security, lead the industry, empower a better life" was defined, so as to foster a brand of social responsibility. We promoted all management and staff of the Company to seek unity in thinking and work together, show a strong sense of mission and responsibility as a key state-owned enterprise, and advance the high-quality development of the Company in the new era.

Corporate Mission	• A "red" company that serves national strategy, safeguards energy security, and serves the need of Socialism with Chinese characteristics • A "green" company that undertakes 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
Strategic Objectives	• Speed up the building of a world-class modern clean energy company featuring "Three Colors, Three Strongs and Three Excellents"
Core Value	• Adhere to Integrity, and Focus on Cooperation • Constantly Innovate, and be Proactive and Enterprising • Create Performance, and Serve the Nation
Strategic Orientation	• Power as the Core Business, Synergy Among Various Energy Sectors, Innovation as the Leading Force, Finance as the Supporting Business, Global Layout
Enterprise Spirit	• Professional Dedication Despite Hardship • Pioneering Spirit to Overcome Challenges • Entrepreneurial Spirit in Pursuit of Excellence • Initiative Spirit of Daring to be the First
Enterprise Style	• Entrepreneurship, Efficiency, Trustworthiness, Frugality

Responsibility Planning

Social Responsibility Planning of Huaneng (2021-2025)

	Within the Company		Outside the Company	
Goals	Advancement of Responsibility Management	Promotion of Responsibility Integration	Creation of Communication Platform	Improvement of Responsibility Image
Path of Implementation	System Betterment Enhancement of Capability Development Promotion of Responsibility Appraisal	Execution of Responsibility Study and Survey Construction of Demonstration Base Advocation of Report Release	Establishment of Reporting System Implementation of Topic Survey Regular Information Disclosure	Participation of Industry Activities Communication Arrangement Make the Voice of CSR

Responsibility Regulations

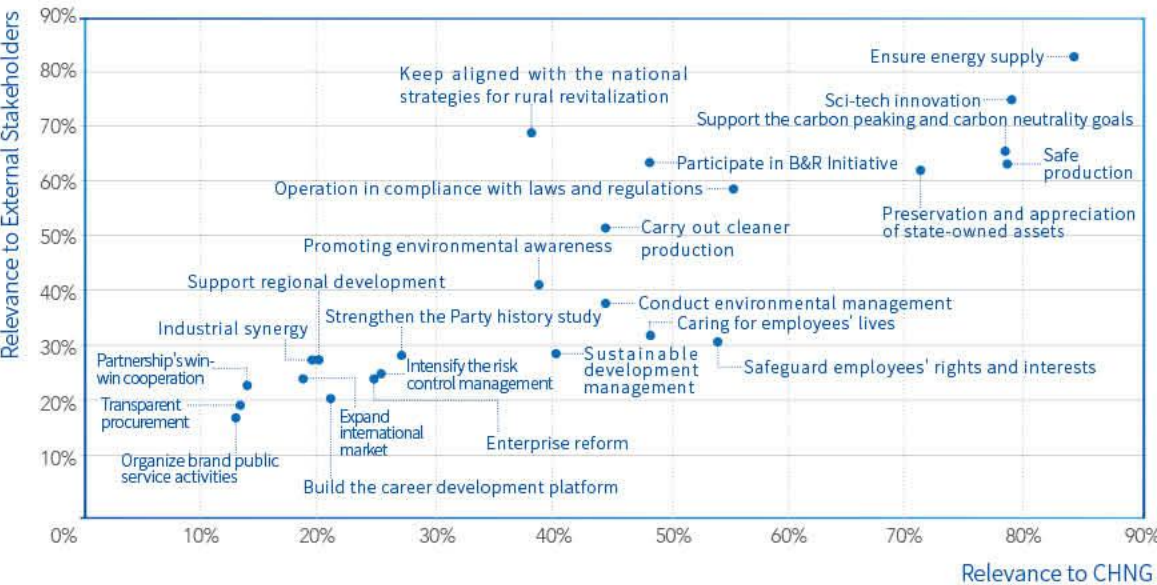
Classification of Regulations	Main Regulations
Basic Management Regulations	<i>Assessment and Evaluation Measures for the Party Building Work Responsibility System, Opinions on Consolidation and Expansion of Achievements in Poverty Alleviation to Advance Rural Revitalization in Providing Aids in a New 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>

Responsibility Integration

Core Responsibility Topics

The Company actively responds to the *Unified Sustainability Reporting Standard* of Global Reporting Initiative (GRI), *ESG Reporting Guide* of HKEX, *Guidelines on Corporate Social Responsibility Reporting for Chinese Enterprises (CASS-CSR4.0)* of Chinese Academy of Social Sciences and other standard initiatives, conducts internal and external stakeholder surveys in conjunction with actual conditions of the industry and enterprise, clarifies the core issues of corporate social responsibility, defines the boundaries of the Report, and effectively responds to the concerns of stakeholders.

CHNG's Key Social Responsibility Topics 2021



Scan the QR code to view more information about "CHNG's Survey on Internal and External Stakeholders"

Responsibility Process

The Company attaches great importance to the integration of social responsibilities, encourages subsidiaries to publish social responsibility reports, focuses on promoting listed companies to disclose social responsibility related information in strict accordance with the requirements of the stock exchanges, and actively carries out social responsibility communications. As of the end of 2021, a number of secondary companies including Huaneng Power International and Huaneng Lancang River Hydropower have released CSR 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 (GSEP), Global Energy Interconnection Development and Cooperation Organization (GEIDCO), Chinese Society for Electrical Engineering, China Electricity Council, etc. to effectively interact with the stakeholders, and actively promote the fulfillment of social responsibilities in China's power industry.

Responsibility Performances

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

The Company held the 5th Selection & Appraisal of Excellent Cases and the 3rd Selection Event of the Most Beautiful Responsibility Performance Pictures, with cases and pictures submitted by subsidiaries. Through online voting and expert scoring, ultimately, the "2021 Annual Excellent Responsibility Cases and the Most Beautiful Responsibility Pictures" were selected, with the list of award winners included in the Company's sustainability report for public disclosure, promoting subordinate units to better fulfill their social responsibilities.

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

CHNG - Responsibility Performance in 2021

- Huaneng won the Global Compact Network China **"Fulfillment of sustainable development goal 2021 enterprise best practice (poverty elimination and prosperity promotion)"**.
- Huaneng's 6 social responsibility cases were listed in the *2021 Excellent Cases of Corporate Social Responsibility in the Power Industry* of China Electricity Council.
- Pakistan Sahiwal coal-fired power station won 4 **social responsibility awards** for COVID-19 epidemic prevention, sustainable development, high-quality projects and moral publicity.
- Huaneng won the **"Green Environmental Protection Award"** at the "Golden Bull Award for Social Responsibility" ceremony sponsored by China Social Responsibility 100 Forum.
- Sustainability Report 2020 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 ten consecutive years.
- Huaneng Power International Inc. won the title of **"Best Listed Company" of the China Securities Golden Bauhinia Award**.



Responsibility-assuming Capability

We have attached importance to the improvement of the enterprise's responsibility ability by grasping the key to preparation of sustainable development report. From 2018 to 2022, we have carried out special social responsibility training in the Group company for five consecutive years to enhance the awareness of social responsibility management and report preparation personnel, enhance their understanding of relevant theories and report preparation standards and methods, and further promote the responsibility performance practice of all departments and units of the Company and improve the quality of reports.

The Company actively participated in social responsibility related research projects led by the Ministry of Finance, SASAC and other national ministries and commissions, worked with relevant domestic and foreign research institutions to boost completion of "Sustainable Reporting Standards Research", "Blue Book on Social Responsibility of Central SOEs" and other topics, thus boosting the booming development of corporate social responsibility in China.

Responsibility Communication

CSR Report

The Company has innovated in communication methods, expanded communication channels, deepened communications with stakeholders, built a mechanism for social responsibility communication, 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 2021, Huaneng Power International Inc. and Huaneng Lancang River Hydropower Inc. were awarded **Grade A rating on information disclosure** by Shanghai Stock Exchange.

Communication Category	Communication Methods
Daily Communication	- Open a Social Responsibility Column on the Company's Official Website - Open the WeChat Public Account "Responsible Huaneng"
Regular Communication	- Prepare the Annual Sustainability Report - Participate in the Report Issuance Conference of Central SOEs Organized by SASAC - Organize Internal and External Stakeholders to Participate in Power Plants' Open Day Activities
Special Communication	- Founding the Sino-Cambodia Cultural Exchange Network - Preparing and Releasing Overseas Social Responsibility Report - Organize Internal and External Stakeholders' Special Social Responsibility Surveys in the Company



Promoted Sino-Cambodia Culture Exchange

We promoted the cross-cultural integration and communication work in Cambodia by establishing the Sino-Cambodia Cultural Exchange Network, organizing the Lower Sesan II Hydropower Station "Cloud Open Day" event in Cambodia, formulating and releasing the *China Huaneng Social Responsibility Report 2021 in Cambodia*, the first *Cambodia Development Research Report* in the country and *Research on Enterprise Localized Communication Strategy (Cambodia)*. Our communication campaigns were labeled as key projects of cross-cultural integration of central SOEs by the SASAC, and were accessible to nearly 2.45 million readers on the Internet. Therefore, they were highly praised by all sectors of society. In 2021, the *International Communication Management of Central Government-owned Energy Enterprises to Enhance Brand Values* won the **first prize of the management innovation award** of the China Electricity Council, and the film themed "Fundamental Changes in the Resettlement Village of Cambodia's Largest Hydropower Station" won the **social welfare award** of the Belt and Road Initiative Short Video Competition.

Nanshan Power Plant Held the Public Open Activity of Environmental Protection Facilities

The public open activity of environmental protection facilities was held by Nanshan Power Plant in October 2021, which was attended by visitors from all walks of life, including Sanya Environmental Protection Association. The environmental protection head of the power plant briefed visitors on the principle, process and equipment of natural gas generation, particularly introducing how the generating unit is operating in an environmentally-friendly way, and how the water injection denitration technology is working and denitration devices are running as well as flue gas emission complying with the relevant national standards.

We feel relaxed when we take a look at the environmental protection devices in the power plant! Nanshan Power Plant indeed fulfills the duties of a central SOE as it adequately addresses the power shortage and delivers a proper ecological condition as well in Hainan province.

— Visitor's Representative



Nanshan Power Plant Held the Public Open Activity of Environmental Protection Facilities

Stakeholder Participation

Stakeholders	Expectations for the Company	The Response of the Company
Government	Responding to National Strategies Conducting Operation in Compliance with Laws and Regulations Securing Power Security	Serving the National Strategies Persisting in Steady Operation Securing Power Supply
Shareholders	Preserving and Increasing the Value of Assets Avoiding Economic Risks Keeping Smooth Communication	Increasing Economic Benefits Strengthening Risk Prevention and Control Conducting Regular Communications
Employees	Increasing Welfare Benefits Guaranteeing Personnel Safety Promoting Employees' Career Development Balancing Work and Life	Guaranteeing Basic Rights and Interests Ensuring Production Safety Carrying out Employee Training Caring for Employees' Lives
Customers	Guaranteeing Project Quality Improving Customer Services Innovating Engineering Technology	Strengthening Quality Management Improving Service Systems Encouraging All-involvement Innovation
Environment	Supplying Clean Energy Building Green Plants Tackling Climate Change Spreading Green Philosophy	Adjusting Energy Structure Carrying out Clean Production Mitigating Greenhouse Gas Emission Carrying out Environmental Public Welfare Campaign
Industry	Carrying out Technical Exchanges Sharing Professional Experience	Attending Industry Conferences Strengthening Regular Liaison
Business Partners	Complying with Business Ethics Achieving Mutual Benefits and Win-Win Result	Implementing Transparent Procurement Building Cooperation Platforms
NGO	Participating in Social Groups Abiding by Association Charters	Actively Participating in Activities Offering Advice and Suggestions
Community	Supporting Community Building Carrying out Public Welfare Activities	Promoting Rural Revitalization Building Public Welfare Brand Image

Building the Platform for Employees' Career Development

“

As China's leading class, the working class represents China's advanced productive forces and relations, which is the most solid and reliable class foundation of our Party, and the main force in building a moderately prosperous society in all respects and upholding and developing socialism with Chinese characteristics.

— Xi Jinping

”

Guaranteeing Employees' Basic Rights and Interests

The Company strictly abides by the *Labor Law*, the *Labor Contract Law* and other laws and regulations, protecting employees' personal privacy, and constantly improving the basic management of labor and employment. By the end of 2021, on-the-job employees of the Company were 120,927, the overall labor productivity was 969,500 yuan per person, which enjoyed a year-on-year increase of 6.65%, and the employee turnover rate was 5%.

Guaranteeing Remuneration and Welfare	We constantly improved the management methods of total wages and established a well-structured salary growth mechanism; promoted the salary distribution system reform to enable its access to units with outstanding contributions, front-line technicians and high-level and high-tech skilled talents; kept updating the employee welfare security system on social insurance in accordance with the regulations to ensure that every employee is entitled to 10 days' paid leave.
Deepening Democratic Management	We ran the Workers' Congress in accordance with rules, witnessing that the comprehensive excellent rate of democratic appraisal of the Workers' Congress of the secondary leading group increased by 2.6% year-on-year. We promoted the "Three increases" in terms of the rate of establishing trade unions, the rate of establishing workers' congress, and the rate of opening factory affairs, which was up to 98.7%, 98.2% and 98% respectively for the secondary and tertiary companies. We improved the management of staff directors and staff supervisors, and 15 secondary companies have completed the election and re-election of staff directors and staff supervisors.
Ensuring Employment Equality	The Company strictly abode by the employment policy of gender and ethnic equality, with the male to female employees at a ratio of 3.5:1. We vowed to protect legal rights and interests of female employees and dispatched workers. We enhanced the graduate recruitment quality by conducting several management trainee plans. The number of recruited graduates increased by 17% on a year-on-year basis.
Building the "Home for Employee"	We encouraged enterprises at all levels to improve the level of home building of model workers, reviewed 119 model workers' homes, and collected 40 excellent trade union work projects; particularly cared for employees working in the small, distributed and remote wind power photovoltaic stations or western plateau regions, with RMB 2.185 million yuan allocated to support the home building of front-line trade union workers in 61 remote and difficult areas under 27 secondary companies, so as to enable them to work, live and learn under better conditions.
Caring for Employees' Health	We carried out regular physical examination for employees, and invited medical experts to provide consultation services; performed health management for overseas employees, organized the care campaign called "Love in Sahiwal, Fight Against COVID-19 Epidemic" in Pakistan, thus effectively promoting the building of overseas clinics via telemedicine platform.
Helping Employees with Difficulty	We facilitated the application for poor employees and took targeted assistance measures, forming backup force trusted by employees.
Caring for Female Employees	We established and improved the talent pool for female employees to identify, cultivate and select excellent female employees. Yan Shu, the Company's employee, won the National Women's Model for Meritorious Service ; 98 female employees taking active part in the online reading activity Happy sailing for Women's Day were commended; Through Women's Day reading activity, 1,223 works were selected and 89 works were awarded. Two female employees won the title of Excellent Reader , and the Company won the Special Organization Award for five consecutive years.
Showing Consideration for Special Talents	We have held several psychological counseling lectures for overseas employees, allocated funds of RMB 565,000 yuan to support overseas COVID-19 epidemic prevention and control, and distributed more than RMB 2.6 million yuan to express our care for families of employees.

Promoting Professional Skills

We attached great importance to the professional skills training of employees by completing 109 sessions of various education and training throughout the year, attended by 5025 trainees, including 5 sessions of key classes of the Party school, attended by 219 trainees, 25 sessions of management training, attended by 2014 trainees; 13 professional and technical training courses with 1110 trainees; 66 technical skills training sessions, attended by 1682 trainees.



109

Sessions of Various Education
Training were Completed in
the Year



5,025

Trainees Attended Different
Types of Education Training
in the Year

- Six sessions of cyber training were held and attended by over 62,000 trainees.
- Six online live training sessions were held and attended by 3,604 trainees.
- The training on international management talent was held and attended by 46 listed international talents.

The *Management Measures for Employee Skill Competition* was updated, and the Group-level and Regional-level wind power skill training bases were established. The Huaneng Craftsman Cup focusing on nuclear safety, wind power intelligent operation and maintenance, primary electrical, and coal industry skill competitions was held, yielding 24 Huaneng craftsmen and 67 technical experts, thereby improving the comprehensive quality and professional ability of participants in all respects. Huaneng Shandong branch won the **Outstanding Contribution Award for skilled talent cultivation of the power industry** in 2021.



First "Huaneng Craftsman Cup" Nuclear Safety Skill Competition Held

The first "Huaneng Craftsman Cup" nuclear safety skill competition was held in 2021. This competition, sticking to the principle of fairness and justice, was conducted at a high level of standard in terms of examination design and judgment arrangement so as to give accurate indication of the participants' operating skills and nuclear safety awareness. Two employees were eligible for the title of "Huaneng craftsmen". This competition played a role in building a platform for nuclear power front-line employees to promote exchange, cultivate the craftsman spirit featuring rigorousness, meticulousness and pursuit of excellence, thus fostering an atmosphere of nuclear safety.



First "Huaneng Craftsman Cup" Nuclear Safety Skill Competition

In 2021, we carried out 6 labor competitions themed by "Being a master, making contributions on the new pathway", namely, the nationwide labor competition on new energy and the construction project of Eastern Gansu multi-energy complementary comprehensive energy base with installed capacity of 80GW, as well as the patent improvement of both quality and quantity labor competition, the "Cohesion Cup" labor competition of Shidao Bay HTR-PM Nuclear Power Plant, labor competition on generating unit state maintenance and labor competition on electricity marketing. A total of 96 advanced collectives and 368 advanced individuals were commended, with the bonus amounting to nearly RMB 12 million yuan.

We mobilized employees to participate in nationwide skill competitions in the country and power industry, gaining considerable improvement in the level and number of prize so that employees greatly benefited from these competition.

- The first cyber security vocational skill competition of "Huaneng Ruiwo Cup" for the national energy chemical geological system: we won 19 prizes, including the enterprise-level **Excellent Organization Prize**, and the **Special Contribution Prize** for two units.
- Nationwide workers' vocational skills demonstration competition in the coal industry: we won 16 prizes, which was the best result we had achieved since we participated in the competition.
- Nationwide large hydropower unit maintenance skills competition in the power industry: we won 15 prizes, ranking the first in the total number of individual awards, including the enterprise-level **Excellent Organization Prize**.
- Nationwide skill competition in the power industry: we won 12 prizes, including the enterprise-level **Excellent Organization Prize**.
- Nationwide nuclear power system nuclear reactor operation crew skill competition in the nuclear sector: Huaneng's employee won the third prize in this competition for the first time.

Boosting Talent Development

We actively established a three-level technical talent management system, broadened the career development channels of employees, and improved the dual channel construction of technical competence and position promotion in front-line enterprises; completed the selection and employment of the second chief experts / technicians, broadened the professional scope, defined the selection standards, made clear the selection procedures, with 28 chief experts and 17 chief technicians being selected.

We made great efforts in selecting and setting of advanced labor models. In 2021, 6 employees were awarded the **National Labor Day medals**, 12 employees for the **Pioneer of National Workers**, 6 employees for the "Electric Craftsman" by the CEC, and 9 employees for the "Great Country Craftsman" in the China's energy chemogeological sector, reaching a record high and keeping a leading position among similar enterprises.

Enriching the Leisure Time

The Company actively organized and carried out various cultural and sports activities, such as literature and art, reading and sports, organized and participated in the national bridge tournament for employees of power enterprises, the calligraphy, photography, art and essay competition of China Electricity Council and the geological system of energy and chemistry. Furthermore, a variety of online activities, such as "brisk walking to celebrate the Chinese New Year", and calligraphy, painting and photography exhibition called "Following the Party's steps, and making new contributions in the new era", were held to provide employees with diversified entertainment, to demonstrate their elegant demeanor and to build a cultural home for employees. In the first micro film festival for nationwide employees and the fourth "Energy China" micro film festival, our 38 works won prizes and one employee won the **Award for Best Actor**.



Gansu Company's Arts Festival



Hainan Branch's Badminton Competition



Benchmarking with the World's First-class Enterprises and Creating the Benchmark for Demonstration

Given implementation of the "Three-year action for management improvement by benchmarking with the world first-class management", we have completed 92.3% of the tasks, 12 percentage points more than SASAC's expectation. We vowed to improve the management level in all respects via implementation of the *Action Plan on Benchmarking Improvement (work list)* in 8 areas, including 26 key measures and 89 actions; formulated the *Guide Manual for Development of Benchmarking Improvement Indicators System in Secondary Units and Front-line Enterprises* and the *Benchmarking Improvement Indicators Database*, covering 603 indicators in 10 industrial fields, such as thermal power, hydropower, wind power, photovoltaic, nuclear power, coal, transportation, supply chain, finance and globalization so as to strengthen the management ability of secondary units and front-line enterprises.

In 2021, the Company's management innovation achievements were awarded 2 first prizes and 10 second prizes of **national level enterprise management modernization innovation achievements**, 5 first prizes and 6 second prizes of **industry-level management innovation awards**. The Company took a leading position across the industry in terms of both quality and quantity of awards. Four achievements of the Company were included in the *List of Key State-owned Enterprises' Endeavor to Build Action Benchmarking Enterprises, Benchmarking Projects and Benchmarking Models over Their Management Benchmarking Campaign*. The Company was the only one power enterprise among the Top 10 benchmarking models. Lancang River Inc. and Tianjin IGCC demonstration power station were labeled as benchmark projects; Jiangsu Company was selected as the benchmark enterprise. Therefore, the "Huaneng Experience" which can be duplicated, applied and promoted in a wider range has taken shape.

28th Nationwide Innovation Achievements on Enterprise Management Modernization

National First Prize

- Lancang River Inc.: *Construction and Operation Management of River Basin Cascade Hydropower Projects Featuring Major Technological Breakthrough*
- Jiangxi Branch: *Smart and Lean Management-centered Daily Operation Accounting Management in Regional Power Enterprises*

National Second Prize

- Huaneng Party School: *Management of Staff Education and Training Centering on "One Quality, Two Efficiency" in Power Generation Enterprises*
- Jiangsu Clean Energy Branch: *Offshore Wind Power Construction and Operation Management to Promote Clean Energy Development*
- Suzhou Thermal Power Plant: *Transformation and Upgrading Management Centering on Urban Power Plants Expected to Become Integrated Energy Supply Service Providers*
- Yuhuan Power Plant: *DCS Upgrading Management of the First Million-kilowatt-class Thermal Power Units Centering Localization*
- Production & HSE Dept., Xi'an Thermal Power Research Institute Co., Ltd.: *Comprehensive Rating Management of Power Generation Equipment Centering on the "Five dimensions and four layers" Principle*
- Yajiang Company: *Client-led Innovation Management of Major Equipment for State Strategic Hydropower Projects*
- Luoyuan Power Plant: *"Three Parks"-oriented Enterprise Culture Development in Thermal Power Plants*
- Linyi Power Plant: *Green Development-oriented Intelligent Heating Control System Development in Heating Enterprises*
- Zhejiang Energy Sales Company: *Dynamic Quotation Management of Power Spot Market of Energy Sales Enterprises*
- Huangtai Power Plant: *Refined Service Management of Power Generation Enterprises Utilizing the "Heating housekeeper" Concept*

First Prize on Power Innovation Management Achievements in 2021

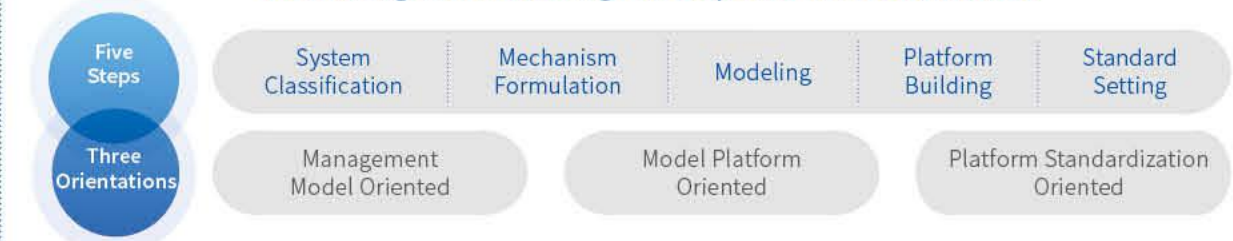
- Production & HSE Dept.: *Construction and Application of Power Generation Equipment Rating System Designed to Improve both Production Management and Technical Index*
- Tianjin IGCC Demonstration Power Plant: *Cross-field Integrated Sci-tech Innovation Management of First IGCC Demonstration Power Station in China*
- Press Center: *Development of International Communication System Designed to Enhance Energy SOEs' International Competitiveness*
- Suzhou Thermal Power Plant: *New Integrated Energy Management of Fulfilling the Low-carbon and High-efficiency Target in Urban Power Plants*
- Jiangsu Clean Energy Branch: *Establishment of Safety Management System in Offshore Wind Farms*

SASAC: List of Key State-owned Enterprises' Endeavor to Build Action Benchmarking Enterprises, Benchmarking Projects and Benchmarking Models over Their Management Benchmarking Campaign

HQ: Fine Management Featuring Five Steps and Three Orientations

The Fine Management Featuring Five Steps and Three Orientation has contributed to the improved competitiveness of the enterprise, thus significantly enhancing the risk prevention and control and excellent operation ability, enhancing the ability of independent innovation, boosting the green transition and development, and highlighting the gratitude and dedication culture embedded in the red gene. This mode of management has been applied in more than 20 regional companies and nearly 200 front-line enterprises.

Fine Management Featuring Five Steps and Three Orientations



Lancang River Inc.: Construction Management of Development Preservation Projects across the Entire Basin

Experience and Practice

- Creating the cluster management and control model across the entire basin, ensuring a coordinated approach
- Establishing a multi-layer ecological management system, and building the human community with a shared future
- Fostering a sci-tech innovation management chain, dedicating to climb the new highland
- Advancing the harmonious development of multi-ethnic enterprises and regions, delivering the "action power" of central SOE

Effects of Implementation

- Speeding up fulfillment of carbon peaking goal
- Setting an example of watershed protection integration

Tianjin IGCC Demonstration Power Station: IGCC Demonstration Engineering Technology Management

Experience and Practice

- Creating IGCC "Scientific research and business integration" operation management model conducive to tackling the cross-field integration management difficulty
- Focusing on "Party development leadership, fostering culture spirit and building a talent base" to provide intellectual support for the management of national clean coal power generation projects

Effects of Implementation

- Greatly enhancing China's discourse power and international influence in dealing with global climate change
- Figuring out solutions to the balance between the energy security and environmental protection in China
- Setting an empirical model of inter-disciplinary integration management

Jiangsu Company: Creating an Energy Transformation Example

Experience and Practice

- Strengthening the Party building leadership, bringing together dedication efforts
- Highlighting the quality benefit to ensure proper implementation of the "Two transformation example" process
- Advancing enterprise development in an efficient way by means of "Three-propeller driven" approach

Effects of Implementation

- Performing well in green transition highlights
- Yielding fruitful achievements in reform and innovation
- Receiving acclaim from local government on electric heating supply assurance

Improving Main Businesses and Shaping a New Pattern of Power Development

High-quality Development in the Industry

A river has to have a fully dredged source before it can flow unceasingly far.
— Quoted from *A Memorial to Tai Zong on Ten Aspects of Self-discipline* by Wei Zheng, Tang Dynasty

○ Securing Adequate Energy Supply	40
○ Firmly Holding the Bottom Line of Work Safety	42
○ Stimulating Sci-tech Innovation Potential	45
○ Pushing Forward the Ecological Progress	49
○ Rooting in Old Revolutionary Base Areas in Gansu Province and Exploring a Mode Applicable to Eastern Gansu	58

- Power Generation up to **774.4** TWh
- Heat Supplied of **454** million GJ
- Steam Supply of **35.90** million tons
- Technology R&D Funds of **10.16** billion yuan
- **66** Science and Technology Awards at the Provincial and Ministerial Levels

- Zero Major or Worse Work Safety Accidents
- Low-carbon Clean Energy Installed Capacity of **78.49** GW
- Annual Power Generation of New Energy up to **73.44** TWh

Build a modern energy system conducive to promoting the energy revolution, and meanwhile build a clean, low-carbon, safe and efficient energy system able to assure the energy supply. Accelerate the non-fossil energy development through a centralized and distributed approach, vigorously increase the capacity of wind power and photovoltaic power generation, and accelerate the development of distributed energy in the eastern and central areas apart from appropriate development of offshore wind power. Furthermore, accelerate the construction of hydropower bases in the southwest regions, safely and steadily promote the construction of coastal nuclear power, and build a number of multi-energy complementary clean energy bases.

— Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China

Securing Adequate Energy Supply



Doing business and operating an enterprise is more than making money. Those who engage themselves in real economy should concentrate on their main business earnestly and steadily, and this is what they should do.

— Xi Jinping



We remain committed to securing energy supply as a key political mission. To fulfill the essential responsibility of the power industry, we have established a leading group for power and heat supply guarantee at the first time, formulated a work plan for supply guarantee, and developed a daily scheduling, weekly supervision and monthly summary mechanism for the purpose of running all units as much as possible. We closely monitored the rain, flood and disaster forecasts in key areas, issued early warning information in time, and effectively responded to the "7.20" extremely heavy rainstorm and other natural disasters and extreme weather. All industrial divisions worked together to solidly carry out the "100-day battle to host the two festivals, the two sessions, and the "100-day safety actions to celebrate the 100th anniversary of the founding of the CPC". As a result, we successfully completed the task of ensuring electricity and heat supply during important periods, thus receiving acclaim from the relevant national ministries and commissions and local provincial Party committees and governments.

In 2021, we completed domestic power generation of 774.4TWh, heating supply of 454 million GJ, steam supply of 35.90 million tons, up 9.4%, 8.9%, 23.5% on a year-on-year basis, setting a record high; trading electricity of 448.47TWh, 0.95 percentage point higher than the capacity share; retail electricity of 197.74TWh, up 27% on a year-on-year basis, up 0.7 percentage points of the market share; comprehensive utilization of 4007h, up 126h on a year-on-year basis, ranking first among the similar enterprises. The Company has boasted over 1000 industrial steam users, and nearly 3million direct heat supply users, all ranking first in the number of users in the country. The total heating area has amounted to 940million square meters, up 100million square meters on a year-on-year basis. Now, we have emerged as the largest livelihood-oriented heating enterprise in the country.

The Company attached great importance to the quality of power engineering construction, and strengthened the fine management of construction process to ensure that the quality is controllable and under control, so as to build high-quality electric power projects. In 2021, Luoyuan Port power storage and transmission integration green construction demonstration project won the **National Gold Award for High-quality Projects**; Zhongxiang Hujiawan wind farm project and Anyang Tangyin wind farm project (Phase I) won the **National High-quality Project Award**; Dafeng 400MW offshore wind power generation project, Rudong 300MW offshore wind farm project and Daguzhai wind farm project won **China Power High-quality Engineering Award**.



The World's Longest Underground Heating Pipeline in the Alpine Region Completed

Despite the severe cold and the COVID-19 epidemic, we spent investment totaling RMB 1.57 billion yuan in building the world's longest underground heating pipeline in the alpine region that ran from Yimin to Hailar with a length of 70km. Through repeated demonstration of the scheme and on-site supervision of important nodes, the project was finally built after over 5 months' construction, which greatly alleviated the heating tension in the urban areas of Hailar.

To cope with freezing and cold weather, the Company had strengthened the maintenance, operation and defect management of heating sources and heating network equipment since the heating project was put into operation. Meanwhile, we adjusted heating parameters in response to climate change, defined the emergency plan for heating interruption to improve the emergency response capability, ensuring that residents lived a warm winter with secured heat supply, thus setting an example of delivering clean heating in China's northern regions.

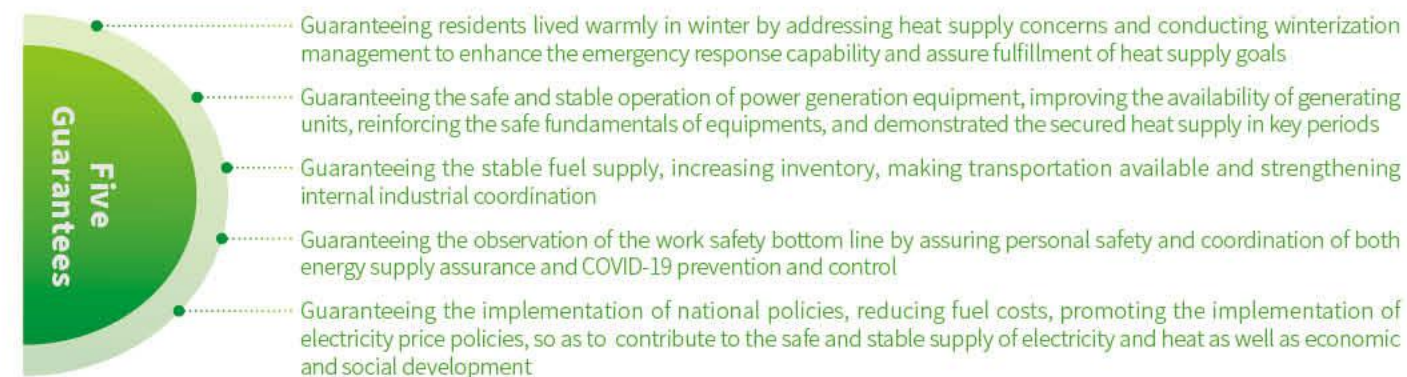


The World's Longest Yimin-to-Hailar Underground Heating Pipeline in the Alpine Region



Measures Taken to Ensure Power and Heating Supply as Part of Our Political Missions

The Company implemented the decisions and arrangements of the Party Central Committee and the State Council, firmed up the people-centered development ideology, gave full play to the pillar role of central SOE as the main force and backbone. We gave priority to inventory increase, safe and stable operation of power generation equipments, and heating supply readiness, etc. To achieve these tasks, we made accurate decisions, accelerated the implementation of measures, guaranteed energy supply in accordance with "Five Guarantees" approach, thus making contributions to energy security.



As an important state-owned backbone power generation group, Huaneng should bear in mind Huaneng's most fundamental interests in meeting the need of the people and the society for secured power supply, practicing the concept of "serving the people with electricity", resolutely assuming the political responsibility for the safe supply of electricity and heat, advancing the work of safe supply and operation development reform in a coordinated way so as to yield satisfactory results to the people.

— Shu Yinbiao, Secretary of the Party Leading Group and Chairman of the Board of Directors of CHNG

• Production Assurance

Formed a team designed for restart of generating units after unscheduled shutdown and elimination of output constraints so as to promote the implementation of supply guarantee measures

Strengthened routine monitoring of operation status of thermal power generating unit to tackle equipment concerns not favoring work safety

Further enhanced the heat supply security management, improved the service awareness, arranged 84 front-line enterprises to carry out risk investigation and ensure residents to live warmly in winter

Conducted formulation and implementation of the Special Reward and Punishment Measures for Energy and Power Supply Guarantee, gave full play to the role of performance assessment as the baton, and ensured to win the battle of energy and power supply guarantee

• Fuel Supply Assurance

Increased amount of electricity and coal procurement from different sources, which totally amounted to 302.63 million tons over the year, up 14.5% on a year-on-year basis

Assumed the political responsibility to win the battle of secured supply and keep the electricity and coal inventory at a reasonable level

Maintained the secured electricity and coal resources of 205.83 million tons by means of the long-term agreement, accounting for 75% of the total. The number of long-term agreements ranks first among the similar enterprises, up 15% on a year-on-year basis

• Marketing Assurance

Carried out special supervision through daily marketing monitoring and management, monthly electricity plan assessment and non-regular regional marketing meetings, the growth rate of power generation surpassed that of the overall market

Closely monitored the development of the national macro-economy, power supply and demand, etc., appropriately adjusted the power generation strategy, and gained improvement in power regulation in a profitable way

• Capital Assurance

Established the capital assurance emergency system to ensure no exposure to capital chain rupture risk

Carried out the coal electricity relief package and strove for government policy aids

Ensured access to the coal procurement capital need, gained special funds of 18.9 billion yuan, thus assuring the electricity coal procurement funds and putting fund risks under control

Firmly Holding the Bottom Line of Work Safety



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We should adhere to the principle saying both party committees and governments are held accountable, and related people should take responsibility for work safety as well, and meanwhile all departments shall manage work safety and anyone who fails in his/her duty will be held accountable. For work safety, industry overseers, business overseers, and production and operation overseers must oversee safety.

— Xi Jinping

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Consolidating the Foundation of Safety

Zero Casualty and Zero
Accident in Infrastructure Field

In an effort to improve work safety's standardized and law-based level, we have released the 14th Five-Year Action Plan for Work Production of Electric Power, revised 22 safety management systems in terms of thermal power and new energy, distributed the nuclear emergency related systems and guidelines for the status maintenance of 3 main generating units and 10 auxiliary machines in thermal power enterprises, thus establishing a full professional technical supervision standard system in all types of power generation, including fire, water, wind, light and nuclear, subsequently further improving the work safety system.

In 2021, the Company performed well in work safety as no major or worse work safety accident occurred and the goals of zero casualty and zero accident were achieved in the field of engineering and construction.

Carrying out Patrol and Assessment	- Improved the <i>Inspection and Evaluation Standard of Work Safety Responsibility System</i>, completed the work safety responsibility system inspection and evaluation of 12 secondary companies and 18 front-line enterprises, disclosed and rectified common problems - Conducted safety inspection of infrastructure projects. Particularly, Ruijin Phase II, Yingliangbao hydropower, Shangdu wind power projects underwent the "Field Investigation without Notice and Report" to closely monitor rectification
Doubling Prevention Mechanism	- Boosted implementation of the <i>Guidelines for Risk Classification and Control</i>, established the safety risk database and executed the risk classification control - Continued the safety assessment to provide reliable basis for the safety risk control - Carried out "Three-year action for special rectification of work safety" and "Five checks and five controls" concerns identification and treatment, established "Two lists" of concerns and institutional measures, and implemented dynamic management to eliminate site concerns
Strengthening Key Area Management	- Formulated and implemented the <i>Work Plan for the Implementation of Outsourcing Standardized Management</i> in power enterprises, and included outsourcing teams in the integrated management of front-line enterprises to obtain integration of system construction, production scheduling, safety training, supervision and inspection, assessment, reward and punishment - Formed a hydropower dam safety supervision center to facilitate coordinated management of hydropower dams, and identified areas of concern in the hydropower dams in Yunnan, Tibet, Sichuan and other regions, followed by the elimination of severe potential dangers - Established a safety assurance responsibility system for hazardous chemical enterprises and major hazards, and carried out identification and treatment of safety concerns of hazardous chemical equipment and facilities to ensure safety
Enhancing Emergency Capacity	- Carried out work safety accident risk assessment and emergency resource investigation - Completed the revision and release of <i>Integrated Emergency Plan and Special Emergency Plan on Work Safety</i>
Driving Safety Development by Technology	- Promoted the construction of a unified work safety management platform, in which 53 power plants started operation, Dalian Power Plant and Yuhuan Power Plant started online equipment status-based maintenance, thus bringing the work safety management to a higher level - We won 1 first prize, 7 second prizes and 9 third prizes of the safety science and technology progress award, ranking first in the power generation industry

Lessons Learned

Course of the Accident

On April 24, 2021, Mr. Yang and his workmates completed the painting of tailrace maintenance gate in Hengdan hydropower station, and unfortunately fell into the tailrace when he released the buckle of his safety belt at the working place. After the incident, the site staff immediately carried out rescue. Two generating units of the power station were shut down, and the gate was lifted to drain, and rescue was carried out along the river from the tailrace. Gansu Company launched Level I emergency response for personal casualty accidents. Finally, Yang's body was found about 4km away from the power station on April 30. His death was identified by the forensic experts.

Causes of the Accident

Operator Mr. Yang lacked safety awareness as he unfastened his safety belt within the dangerous area, which led him to death.

- Inappropriate awareness of extreme importance of work safety
- Inadequate safeguards
- Work in breach of rules
- Lack of proper safety peer check at workplace

Handling of the Accident

- 1% and 3% of gross wages of Gansu Company and Hydropower Company of the current year were deducted respectively
- Heads of Gansu Company and Hydropower Company as well as their work safety directors were disciplined to a varying extent, plus appropriate penalty
- The management of Gansu Company and Hydropower Company as well as related team members were subject to economic penalty
- The Hydropower Company was asked to punish persons responsible for the accident in the Hengdan hydropower station

Reflections

- Constantly strengthen the awareness of the red line, and firmly abide by the bottom line of safety
- Strengthen the dual prevention mechanism, and carry out risk control and concern investigation
- Carry out work safety from the perspective of political awareness, overall situation and people's livelihood
- Strengthen safety risk identification at every workplace, step and post
- Put more efforts in training on the safety education, carry out the examination and assessment of personnel's induction training, and improve personnel's safety awareness and skills

Improving Equipment Safety

The Company remains committed to equipment integrity and lean management, solidly carries out power generation equipment rating, actively promotes performance-based maintenance of generating units, and achieve the classification-based maintenance at an interval of 2 years in 19 power plants. In 2021, the number of unscheduled shutdowns of the Company's generating units declined by 6.2% on a year-on-year basis; the equivalent availability factor of water and thermal power was 93.90%, of which 9 regional companies, 88 thermal power plants and 28 hydropower plants with an installed capacity of more than 100MW operated without unscheduled shutdown; 53 units operated continuously for more than 300 days, 7 units operated continuously throughout the year, and 5 units operated continuously for more than 500 days; first-class equipment failure happened 4 times, 5 times less than that in the previous year. The performance of various types of units and comprehensive utilization hours ranked first if compared with others. The reliability and energy efficiency of equipment held the lead in the industry.

Safety in Coal Industry

The Company's coal segment strictly implemented the two-level safety assurance responsibility system, with more efforts being made in the prevention of water, fire, gas and rockburst disasters and the investigation and treatment of hidden dangers. The Company utilized various safety measures, such as safety assurance and resident surveillance in the mine, and achieved remarkable results in safety management. Given the coal production hitting a record high, the number of accidents decreased significantly compared with previous years, and no large-scale accidents or worse occurring. Matigou coal mine, Xichuan coal mine and methanol company have been operating at safety for more than 6700 days, 5200 days and 4000 days respectively.

- Group Company, Huating Coal Company and Dalai Nur Coal Company were awarded as **Safe and Efficient Group** in Coal Industry.
- 6 coal mines passed Level I work safety standardization deferred acceptance inspection.
- 13 mines were labeled as **safe and efficient coal mines**.



Safety in Nuclear Power Sector

The Company actively pushed ahead the construction of nuclear safety assurance system, carried out A Hundred Actions for nuclear power, and addressed more than 4000 areas of concern. The Company's nuclear emergency technology command center was brought online. *The Nuclear Emergency Capacity Building Plan (2021-2025)* was issued, thus contributed to the nuclear emergency response capability.

Adhering to the nuclear safety culture concept of "Three color mission, no risk at all", we carried out efficient daily safety study, nuclear safety lecture, nuclear safety culture education, leaders talk on safety and other learning practices to promote the integration of Huaneng's "Three color culture" and "Three thousand spirit" with the nuclear safety culture, thus bringing the construction of nuclear safety culture to a higher level, and promoting the continuous improvement of nuclear safety assurance capability with use of cultural soft power.

Cultivating Safety Awareness

The Company vigorously carried out Dual Improvement Activities of safety education and training and team safety management, strengthened safety accident warning education and employee safety training, enhanced process control, effect evaluation and closed-loop assessment, thus contributing to significant improvement of employees' safety awareness and safety skills, safety risk identification and control ability, and standardized operation level.

Guizhou Branch-led Training on Operators' Work Safety Skills Improvement

In 2021, Guizhou branch carried out training on operators' work safety skills improvement 3 times, totally attended by over 120 operators. All operators took part in the training. Guizhou branch organized the theoretical study on Work Safety in Confined Space lectured by professionals, and carried out practical training on actual feeling on closing with grounding wire, falling object strike, electric shock first aid, actual feeling on human body's exposure to electric shock, self-rescue from pole falling, and so on, thus effectively strengthening the awareness and skills of operators in work safety and helping improve the level of work safety management.

Nuclear Power Company Successfully Completed "Rongcheng 2021" Nuclear Emergency Response Exercise

In order to ensure that the Shidao Bay HTR-PM Demonstration Project was properly loaded under the permitted conditions, the nuclear power company arranged the "Rongcheng 2021" nuclear emergency exercise and the first pre-loading emergency exercise for the high temperature reactor demonstration project in March 2021. This exercise combined the pre-loading comprehensive exercise with the off-site exercise, which was the first of its kind in the country. The content of the exercise included the launch and command of Shandong Nuclear Emergency Command Center, the response of Rongcheng Nuclear Emergency Command Center and Shidao Bay Nuclear Power Company, as well as the radiation patrol, evacuation, shelter and other actions inside and outside the accident scene.

This exercise provided an approach to test on the coordination ability of joint exercises inside and outside the accident scene in Shandong province and the effectiveness of the emergency system of Shidao Bay company, and test on fulfillment of nuclear emergency management policy of "Constant vigilance, versatile compatibility, unified command, active coordination, public safeguard and environmental protection".



"Rongcheng 2021" Nuclear Emergency Exercise and the First Pre-loading Emergency Exercise

Stimulating Sci-tech Innovation Potential



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Science and technology are the powerful weapon of a country. The country strives for prosperity with it, enterprises forge ahead with it and people live a better life with it. The powerful science and technology are essential for China vowing to forge ahead and Chinese people expecting to live a better life.

— Xi Jinping

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Improving Top-level Policy Design

406

New Sci-tech Projects
Launched

The Company continuously strengthened the top-level policy design and system layout of scientific and technological innovation, formulated and implemented the special plan for scientific and technological innovation during the "14th Five-Year Plan" period, as well as the "action plan for supporting carbon peaking and carbon neutrality by scientific and technological innovation"; we aimed to strengthen the whole process management of science and technology projects, launched 406 science and technology projects, and initiated 18 "Top ten science and technology demonstration projects". The Company received more than RMB 800 million yuan of national financial sci-tech funds, a 33-fold increase on a year-on-year basis. The investment in scientific and technological research and development amounted to RMB 10.16 billion yuan, up 53% on a year-on-year basis, an intensity of 2.63%, up 0.53% on a year-on-year basis, ranking first among similar enterprises. The Company won 66 provincial and ministerial science and technology awards across the year, up 69.2% on a year-on-year basis, marking a record high, including 10 China Power Science and Technology Progress Awards and 8 Energy Innovation Awards. Xi'an Thermal Power Research Institute Co., Ltd. was awarded the benchmarking enterprise from the Sci-tech Reform Demonstration Enterprises Assessment by SASAC.

The Company strove to improve the quality and quantity of patents, and carried out patent layout and potential tapping, which focused on 10 key research and development areas, such as nuclear power, photovoltaic power generation, and offshore wind power. The Company applied for 11891 patents in the year, up 114.37% on a year-on-year basis, including 4871 invention patents, up 109.33% on a year-on-year basis, accounting for 40.96% of total, 160 PCT international patents, up 26.98% on a year-on-year basis; 95 overseas patents, up 196.88% on a year-on-year basis. A *Flue Gas Low-temp. Adsorption and Denitration System and Process* is our first patent certified by EU following approval by German Patent and Trade Mark Office. The Company won 5 outstanding prizes of the China Patent Award in 2021, ranking 36th in SASAC-led patent quality evaluation, and ranking first among similar enterprises.

The Company attached great importance to the preparation of technical standards, and established professional technical standard systems for wind power, photovoltaic, thermal power and nuclear power. As a result, the number of industrial technical standards has experienced remarkable increase. In 2021, the Company issued 5 national standards, 37 industry standards, 20 association standards and 26 enterprise standards, further enhancing the Company's influence and discourse power in the power industry.



Focusing on Technological Breakthroughs

The Company pledged to win the battle of key technologies to tackle containment difficulties. We undertook the most national key research tasks in the industry, fully completed the annual task of national scientific and technological research, won the bid for five national major energy science and technology demonstration projects via an open competition mechanism, led four national key research and development plan projects, and scored a number of landmark achievements.

- National key sci-tech project—Shidao Bay HTR-PM Demonstration Project was successfully generated the first kilowatt-hour of nuclear power in Huaneng.
- HT700 series high-temp. alloy materials for 650°C and 700°C ultra supercritical units have been successfully developed, which is the forerunner in the world.
- The first home-made 5MW (semi direct drive) and 7MW (direct drive) offshore wind turbines were manufactured, with a localization rate of more than 96%, thus facilitating access to the core components of large offshore wind turbines.
- The No. 2 unattended bucket wheel machine project for Changchun Thermal Power Plant has been steadily operating for more than 300 hours on a trial basis, marking the success of the first unattended gantry bucket wheel machine upgrading project in China.
- The national key R&D projects such as high alkali coal liquid slag removal and 700°C power generation, successfully passed the acceptance of the Ministry of Science and Technology.
- Phase change carbon dioxide capture technology has completed its verification on a megaton carbon capture industrial unit.
- A water electrolysis hydrogen production unit with the world's largest capacity per tank (1300 standard cubic meters) has been developed.
- The conversion efficiency of large-area components of perovskite battery exceeded 15.5%.

Transforming Scientific and Technological Achievements

PLC Research and
Optimization of

100

Fans Completed

The Company printed and distributed *the Catalogue of Application and Promotion of Advanced Technologies in 2021*, actively promoted the industrialized application of independent innovation achievements, such as DCS/PLC fully home-made chemical control system, fan optimization and energy-saving transformation, sludge garbage coupling power generation, improving the achievement transformation capability.

- Utilization of Ruiwo DCS system in Ruijin power plant and other 8 thermal power storage units was completed.
- The first domestically produced monitoring system for 700MW hydraulic turbine generator set was successfully put into service at Xiaowan Hydropower Station.
- Jintan Salt Cavern Compressed Air Energy Storage Demonstration Project, the world's first non-supplementary fired compressed air energy storage power station, was subject to on-grid test.
- The research and technical optimization of home-made main control panel for 100 fans were completed.
- Smart heating technology has been successfully applied in 21 heating enterprises. After transformation, they gained credit in the heating consumption, power consumption and water consumption by a decrease of 10.6%, 12.9% and 15.8% respectively.
- The traditional advantageous technologies such as fan optimization and energy-saving transformation have been popularized, with the gross contract amount exceeding 60 million yuan.
- The zero output technology of steam turbine LP cylinder has been applied to more than 130 enterprises nationwide, playing a leading role in the deep peak load regulation and heat supply technology progress of coal power industry.
- The first domestic super capacitor hybrid energy storage auxiliary unit AGC variable frequency technology demonstration project was launched in Luoyuan power plant.
- The sludge and waste coupled power generation technology has been commercially applied, with a daily sludge treatment capacity of 6000 tons.



Ruijin Power Plant Became China's First Home-made DCS/DEH/SIS Smart Power Plant

In September 2021, unit 3 for Huaneng Ruijin Power Plant Phase II expansion project, a megawatt ultra supercritical high-efficiency secondary reheat coal-fired unit successfully completed full-rate trial operation for 168 hour, marking a major breakthrough in tackling the stranglehold problems in key technologies in the industrial control systems of power generation in China.

Ruijin Power Plant became the first home-made DCS/DEH/SIS smart power plant in China, which utilized a number of leading technologies for synchronous demonstration: application of the first safety intelligent DCS/DEH main and auxiliary integrated distributed control system independently developed by the Company; utilization of the new generation of home-made SIS system for the first time by means of the Company's self-developed high-performance home-made Ruiteng real-time database.



Home-made DCS/DEH/SIS Smart Plant — Ruijin Power Plant



The First Home-made Computer Supervisory Control System for 700MW Hydropower Unit in China was Put into Service at Xiaowan Hydropower Station

In August 2021, Huaneng Ruiwo HNICS-H316, the first home-made computer supervisory control system for 700MW hydropower unit, which was independently developed by the Company, was put into operation in Xiaowan Hydropower Station, marking that China had facilitated access to the monitoring system in an autonomous and controllable way, which was a critical component in the high head and large capacity hydroelectric generation sector. As a result, the stranglehold problem of long-term reliance on import of software and hardware of hydropower computer monitoring system had been fundamentally addressed. This system operated at a level meeting the industrial standard and technically surpassing foreign similar products, whose application further helped reinforce the security of China's electric industry.



Startup of Huaneng Ruiwo HNICS-H316 in Xiaowan Hydropower Station



Success of On-grid Test of the World's First Non-supplementary Fired Compressed Air Energy Storage Power Station

In September 2021, Jiangsu Jintan Salt Cavern Compressed Air Energy Storage Demonstration Project, the world's first non-supplementary fired compressed air energy storage power station, was subject to on-grid test. As the only national demonstration project in the field of compressed air energy storage in China, the project (Phase I) has an installed capacity of 60MW in generation and 300MWh in energy storage. It marked an important milestone in the research and application of compressed air energy storage technology in the world as it completed the compressed air energy storage technology test, standard creation, engineering and commercial operation demonstration. Furthermore, it signaled a major innovation in the research and application of new energy storage technology in China.



Jintan Salt Cavern Compressed Air Energy Storage Project

Establishing Scientific Research Platform

The Company has established a fairly complete technical innovative system featuring the top-level policy design, joint execution by industry (regional) companies and institutes. The system includes Xi'an Thermal Power Research Institute Co., Ltd., Huaneng Clean Energy Research Institute and Huaneng Nuclear Energy Technology Institute as well as the professional technical center, covering all the main business sectors and forming a R&D entity with the industry-university-research-application integration in a coordinated way.

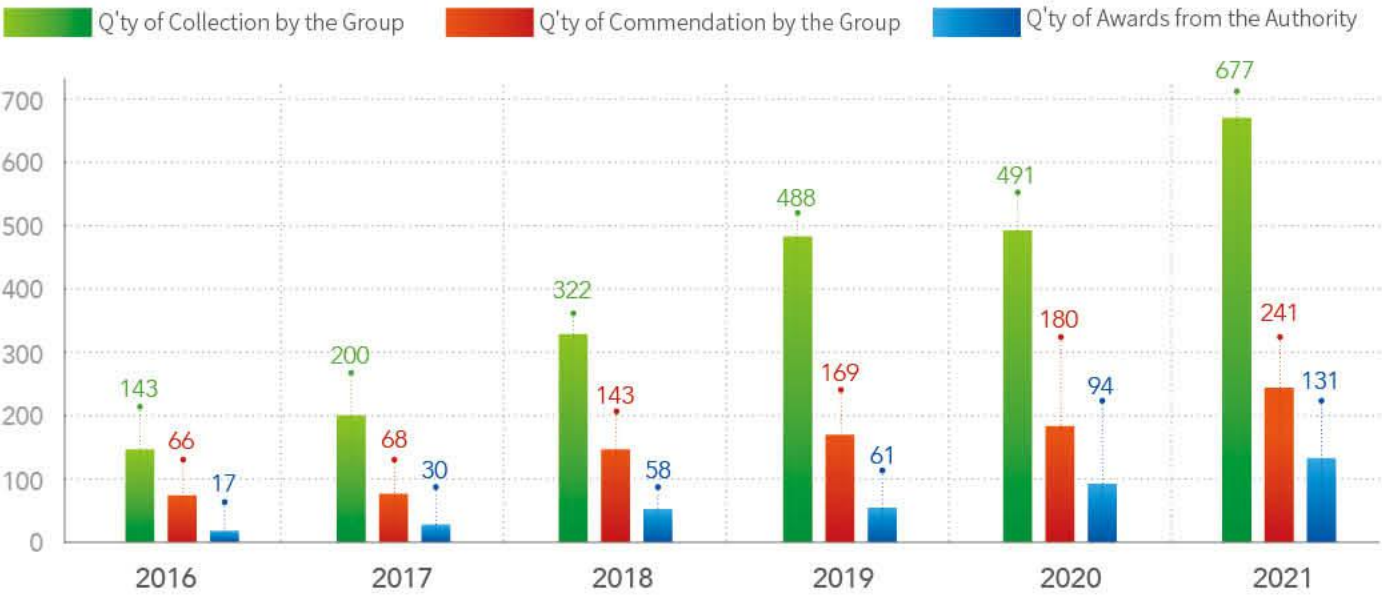
- Gained remarkable achievements in restructuring of state key laboratories.
- Clean low-carbon thermal power generation system integration and operation & maintenance national engineering research center was included in the **list of updated set of national engineering research centers**, which was the only listed power company.
- Formed innovation alliances on offshore wind power, CCUS, 650 °C high-temp alloy material, supercritical carbon dioxide cycle power generation technology, etc.
- Built Huaneng new energy smart operation & maintenance system, to which 35.6GW new energy has been introduced, taking a leading position in the country in terms of fault pre-warning, big data support, etc.

Technical Innovations by Employees

The Company pushed ahead with the "Mass Entrepreneurship and Innovation" work to include the work results in the sci-tech innovation evaluation system, support development of technical innovation in front-line enterprises and encourage employees' endeavor's in tackling technological problems. The Company has established 604 Crowd Innovation Projects in the whole year, with an investment of RMB 98.45 million yuan; 677 employees' technological innovation achievements were declared, and 241 outstanding achievements were selected and commended, with a year-on-year increase of 38% and 34% respectively; 12 cross regional, cross enterprise and cross industry employee innovation studio alliances were established, and 221 key research (transformation) projects and 49 alliance activities were carried out.

In 2021, the Company's 131 technical achievements won the **technical innovation achievement award** of China Electricity Council and China Energy, Chemistry and Geology Union, 2 patents won the **annual patent award** of Chinese Workers' Technical Association, and 27 cases won the **innovation and efficiency award of the first (2021) power team**. Liu Bin Innovation Studio under Hainan branch was awarded the "National Model Workers and Craftsmen Talent Innovation Studio".

Summary of Selection and Commendation of Employees' Technological
Innovation Achievements of Huaneng Group from 2016 to 2021



Pushing Forward the Ecological Progress



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We need to take up our lofty responsibility for the entire human civilization, and we need to respect nature, follow its laws and protect it. We need to find a way for man and nature to live in harmony, balance and coordinate economic development and ecological protection, and work together to build a prosperous, clean and beautiful world.

— Xi Jinping

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Strengthening Environmental Management

The Company continued to improve the top-level policy design of environmental management by setting up a leading group for supervision and rectification of ecological environment protection. Furthermore, we comprehensively carried out special self-inspection of ecological environment protection, and took measures to push ahead with pollution prevention and green development. As a result, no major environmental protection and safety accidents occurred across the year.

The Company continued to strengthen risk management and control in the field of environmental protection, carried out special inspections in the field of energy-saving and environmental protection, conducted spot inspection of more than 500 key technical transformation projects, followed by correction of 69 specific problems under supervision. We held meetings to promote the rectification of ecological and environmental protection risks, and continued to promote 191 special rectification of environmental protection risks such as the red line of ecological protection and the "Three Simultaneities" of construction project environmental protection.

- Vigorously advanced treatment of waste water, coal yard and ash yard of key power plants along the Yangtze River and Yellow River basins.
- Allowed 39 hydropower stations' access to online monitoring of biological diversity and ecological flow along the basins.
- Completed the acceptance of environmental protection and soil and water conservation of 5 hydropower projects in Lidi, Huangdeng, etc.

Adjusting Energy Structure

The Company pushed ahead with green transition focusing on the application of low-carbon clean energy, with installed capacity totally amounting to 78.49GW, accounting for 38.12% of total, up 1.5 percentage points against that in the beginning of the year. The Company vigorously promoted energy restructuring and advanced three major support including new energy, nuclear power and hydropower projects, and scored remarkable achievements in the fulfillment of "two-lines" and "two-integrations" strategies.

"North line": The first 10GW-level multi-energy complementary green comprehensive energy base in the country (i.e. Eastern Gansu energy base) has been under construction, thus the development pattern of large bases has gradually taken shape.

"East line": A whole-process model covering the offshore wind power base investment, construction, operation & maintenance has taken initial shape.

In 2021, the new energy industry made a profit of RMB 14 billion yuan, up 88% on a year-on-year basis, ranking first in the benchmarking among similar enterprises in terms of the profit per kilowatt and the profit per kilowatt hour. The annual cumulative power generation of new energy amounted to 73.44TWh, up 37% on a year-on-year basis; the approved (filed) generating capacity was 40.19GW, hitting a record high. The newly commenced new energy projects and newly grid-connected new energy projects were both beyond the scale of 10GW in terms of capacity. To be specific, 201 new energy projects, with a total capacity of 16.44GW, were physically commenced, and 135 new energy projects, with a total capacity of 10.15GW, were newly connected to the grid, making a record high in two consecutive years.



Wind Power

For onshore wind power projects, Tongyu 0.7GW wind power project was completely put at on-grid generation; Shangdu wind power base project was under construction, with installed capacity of 2GW and annual investment of 2.26 billion yuan.

For the offshore wind power projects, the entire year witnessed new capacity of 2.15GW, total on-grid generation of 3.8GW, ranking first among similar enterprises.

- Jiangsu Rudong offshore wind power farm was completely built to specification, which has been put into on-grid generation at full capacity.
- Shandong Peninsula South, Zhejiang Jiaxing No.2, Jiangsu Qidong and Liaoning Zhuanghe wind power farms have been put into on-grid generation at full capacity.



PV Power

The Company tried every possible means to secure the roof distributed photovoltaic resources across the county, getting access to 61 pilot development projects out of 676 roof distributed photovoltaic pilot projects across the county, accounting for nearly 10%, with the reserve resources exceeding 10GW.

The 0.32GW water surface photovoltaic power station in Dingzhuang, Dezhou was put into operation. This project is part of the photovoltaic project of the "Wind-solar storage integration" power generation base in Dingzhuang, Dezhou, and also the largest floating photovoltaic power station per unit capacity in the world.

The Company built Qinggang Photovoltaic Power Plant, China's first full intertidal fishery-PV hybrid ecological photovoltaic power station with an offshore booster station. The project has an installed capacity of 130MW and uses 1800mu of unused coastal wetland. After completion, it can render possible high-efficiency photovoltaic power generation in the upper space, biological carbon sequestration in the middle space, and full-scale aquaculture in the lower space. Its operation may contribute to saving of about 45,000 tons of standard coal and reduction of CO₂ emissions by more than 110,000 tons per year, increasing ecological and economic benefits, and providing a demonstration for large-scale green development near the beach.



Nuclear Power

With efficient and safe development of nuclear power, CHNG built three nuclear bases: Shidao Bay Nuclear Base, Changjiang Nuclear Base and Xiapu Nuclear Base. CHNG obtained "Four Permits/Licenses" for the first time, including Construction Permit for Nuclear Facility, Nuclear Material License, Operator License and Operation License, fully had the capacity of nuclear safety assurance, and gradually formed a development pattern of preparation, infrastructure construction and operation.

- Shidao Bay HTR-PM Nuclear Power Plant, as a Major National Science and Technology Project, successfully output CHNG's first kilowatt of nuclear electricity, and the Shidao Bay PWR Project won the "Travel Permit" of four 1GW units at one time.
- Commencement of Hainan Changjiang Nuclear Power Station Phase II Project realized that two units started to build within a year. Leveraging this project, CHNG held the PWR license for the first time, promoting the large-scale development of nuclear power industry into the fast lane.
- Xiapu PWR Project won the "Travel Permit" of four 1GW units.



Hydropower

CHNG's annual profit of hydropower industry was 7.93 billion yuan, a year-on-year growth of 52%, a record high; the preliminary works of hydropower stations upstream of Lancang River, midstream of Yarlung Zangbo River and downstream of Yarlung Zangbo River were steadily advanced. Three hydropower bases formed a sound rolling development pattern of "Some Completed, Some Started Up and Some Standby".

CHNG continued to consolidate and strengthen the advantages of developing strategic hydropower resources in the southwest, constructed a national clean energy base integrating wind, solar, hydro and storage in the Lancang River Basin, and duly signed a framework agreement on power supply from Lancang River Clean Energy Base to Guangdong-Hong Kong-Macao Greater Bay Area, so as to realize the development of Lancang River Basin in Yunnan Province.

- River closure for key hydropower projects (i.e. Tuoba Hydropower Station, Yingliangbao Hydropower Station) was completed successfully on schedule.
- Four pumped storage projects (i.e. Jiangxi Yongxin Pumped Storage Power Station) were included into the list of key projects to be implemented during the "14th Five-Year Plan".
- CHNG basically obtained the development right of Xinjiang Aoku Hydro-Junction Project.

Saving Resources and Energy

Reducing Energy Consumption

Through heating facility transformation, energy efficiency diagnosis, operation optimization, technological progress and others, CHNG achieved 294.04g/kWh of coal consumption for power supply, a decrease of 1.30g/kWh year-on-year; 3.69% of service electricity consumption rate, a drop of 0.04% year-on-year; by strengthening the cultivation of benchmark units, a total of 86 thermal power units won the awards in the National Benchmarking Competition of Thermal Power Units' Energy Efficiency Level held by CEC, with the number of awards leading the industry.

Huaneng Guilin Gas Distributed Energy Co., Ltd. Actively Carried out Water Management

Huaneng Guilin Gas Distributed Energy Co., Ltd., as the sole reclaimed water reuse enterprise in Guilin, invested 40 million yuan to implement the reclaimed water treatment project and purchase wastewater treatment equipment, with the aim to avoid environmental pollution caused by draining untreated industrial wastewater into external environment and to minimize the natural water consumption.

The water treatment equipment of Huaneng Guilin Gas Distributed Energy Co., Ltd. reached a remarkable water-saving effect, with water consumption for power generation of 1.39 kg/kWh, recycle rate maintained at over 98% causing that 100% wastewater was recycled and reused, and natural water consumption reduction of about 900,000t. This effectively alleviated the pressure of Guilin municipal water supply. Huaneng Guilin Gas Distributed Energy Co., Ltd. won the honorary titles of **Advanced Water-Saving Enterprise** in Guangxi Autonomous Region and Guilin City for two consecutive years, and 2021 **Benchmarking Water-Saving Enterprise** in Guangxi Autonomous Region.



Huaneng Guilin Gas Distributed Energy Co., Ltd.

Building a Circular Economy

The Company actively carries out the construction of circular economy, and improves the utilization rate of industrial "Three Wastes" and waste heat and energy, so as to create a new model of harmonious environmental-economic development.

Aiming at "Being the Terminate of Municipal Wastes", CHNG increased investment in sludge, biomass and multiple solid waste coupled power generation projects to build 12 coupled power generation projects in Jiangsu, Shandong, Zhejiang, Henan, etc. with designed daily disposal capacity of 3,790t, in order to effectively solve the dilemma of "City Besieged by Wastes" and promote the construction of a "Zero-Waste City".

Application of Pre-drying and Carbonization Technology for Municipal Wastes in Several Coal-fired Coupled Sludge Power Generation Projects

The pre-drying and carbonization technology for municipal wastes is developed by Changjiang Environmental Protection Technology Co., Ltd. The feasibility of its technical route has been verified through laboratory and pilot tests, and a set of system design scheme and the equipment sizing parameter, operation and commissioning scheme have been prepared. This technology breaks through the technical barrier of pulverized coal boilers in power plants to municipal waste disposal, provides technical support for the integrated development of thermal power industry and solid waste disposal industry, and allows the thermal power units to release the potential of waste disposal by making full use of existing national infrastructure. Therefore, it boasts great significance to the development of "Zero-Waste City". This technology is becoming more mature in the field of coal-fired coupled sludge power generation, and has been successfully applied in Yangliuqing Power Plant, Yunhe Power Plant, Yueyang Power Plant and other coal-fired coupled sludge power generation projects.

Carrying out Clean Production

Winning the Battle Against Pollution

The Company adheres to the ecological red line, and further promotes the battle to prevent and control pollution. CHNG reinforced the construction of real-time monitoring platform for pollutant discharge and completed the construction of online monitoring platform for wastewater pollutants; prepared the *Work Plan for Promoting Ecological Protection and High-quality Development of the Yellow River Basin* to achieve the treatment of wastewater from all power plants in the whole basin, 95% of power plants in key areas had been modified after closure of their coal yards.

By strictly controlling clean production, CHNG always maintained the emission performance at a leading position in the industry. The capacity of ultra-low emission units reached 123 GW, accounting for 99%, 12% higher than the national average level. By the end of 2021, the emission performance of sulfur dioxide, nitrogen oxides and soot of thermal power units was 0.070g/kWh, 0.137g/kWh and 0.009g/kWh respectively, a decrease of 2.78%, 1.44% and 10% year-on-year, and a drop of 63%, 39% and 74% when compared to 2016.

Building Zero-emission Green Buildings in Yingliangbao Hydropower Station

Yingliangbao Hydropower Station adhered to the principle of "Closed Site, Full Utilization of Sands, Full Treatment of Wastewater and Full Utilization of Resources" for its aggregate processing system, provided a spray system in the key dust prevention and control parts, and used fog guns to reduce dusts when transporting by belt. The industrial wastewater was treated using the "horizontal flow sedimentation type mechanical pretreatment—high efficiency radial-flow sedimentation—dehydration by pressure filtration" process. The treated water quality met the requirement of $SS \leq 70\text{mg/L}$ and the treated wastewater was recycled, and over 90% of water was recycled, to ensure zero-emission green buildings.



Aggregate Processing Area of Yingliangbao Hydropower Station

Yingliangbao Hydropower Station should endeavor to take the lead in the hydropower industry concerning the resource recycling of its aggregate processing system and build a beautiful plant area truly realize the zero-emission goal.

——Kou Xiaomei, Deputy Chief Engineer of PowerChina Northwest Engineering Corporation Limited

Yuhuan Power Plant Developed the Solid Waste and Sludge Direct Combustion and Blending Technology to Promote the Construction of a "Zero-Waste City"

Yuhuan Power Plant developed the solid waste and sludge direct-fired blending technology with independent intellectual property rights, fulfilling the breakthrough of no coupled combustion technology of industrial solid wastes. This project, featured by less system investment, short construction period and high reliability, has extremely strong techno-economic feasibility and industry demonstration and guiding role. Besides, it provides guidance for the pulverized coal fired boilers to burn solid wastes, opens up a new path for low-carbon ecological development of thermal power units, and creates a new channel for the construction of a "Zero-Waste City".



Solid Waste and Sludge Direct Combustion and Blending Technology

Contributing to Carbon Neutrality

CHNG continuously strengthened the top-level policy building of carbon neutrality-related works, and established Huaneng Research Institute for Carbon Neutrality to carry out basic research on strategic orientation, evolution law and technological innovation of carbon neutrality. Huaneng Research Institute for Carbon Neutrality became the first research institute for carbon neutrality among central SOEs in power industry. CHNG proactively studied the development path under the goal of "Emission Peak & Carbon Neutrality", participated in major consulting projects and research projects of CAE and SASAC, and prepared two technical standards. In 2021, CHNG won the **Excellent Solution Award for Innovative Application Integrating Informatization and Industrialization** in Power Industry with its "Carbon Asset Management Platform for Large Power Groups Based on Big Data Technology".

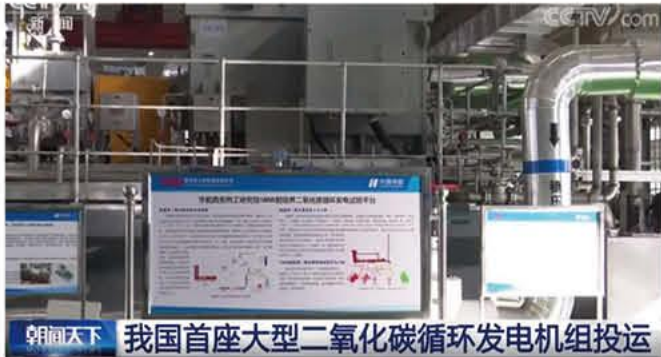
CHNG's first carbon emission pledge financing business in China was implemented to meet the financing demands of thermal power enterprises while exploring a new path for enterprises to revitalize carbon assets. CHNG proactively adapted to the integrated development of power market under the goal of "Emission Peak & Carbon Neutrality", and set up a green power certificate and carbon trading office to manage the green power certificate and carbon trading activities in an overall manner, with over 2 million tons of quota resources saved and carbon-related compliance costs of 16.35 million yuan reduced. In 2021, more than 100 thermal power enterprises of CHNG completed the performance in connection with carbon trading 14 days in advance, sold 5.24 million tons of carbon quotas, and produced a benefit of 23.74 million yuan, showing a remarkable result in operation and management of carbon assets.

China's First Large-scale Supercritical Carbon Dioxide Cycle Power Generation Test Unit Independently Developed by CHNG was Successfully Put into Service

In December, 2021, China's first large-scale supercritical carbon dioxide cycle power generation test unit independently developed by CHNG was officially put into service. This unit is a supercritical carbon dioxide cycle power generation test unit with the largest capacity and the highest parameters in the world. The localization rate of core equipment is up to 100%, more than one year ahead of the construction progress of similar test units in USA. The successful operation of the unit is the first time in the world to achieve an unimpeded process flow of the supercritical carbon dioxide cycle power generation system above megawatt level, breaks through key challenges of core equipment, and further verifies the feasibility of industrialized application of this technology.



Supercritical Carbon Dioxide Cycle Power Generation Test Unit



Scan the QR code to watch CCTV report on
*China's First Large-scale Carbon Dioxide Cycle
Power Generation Unit Put into Service*



Supercritical Carbon Dioxide Cycle Power Generation Technology is a frontier field in the world. The successful operation of the unit represents that China has broken the long-term monopoly of foreign companies in this field. It is of great significance for China to build a new power system dominated by new energy, reduce greenhouse effect and achieve the goals of carbon peaking and carbon neutrality.

—Yang Yongping, President of North China Electric Power University



The development of CO₂ capture technology using biphasic solvents and the successful verification of industrial demonstration project on the 120,000t industrial carbon capture device of Shidongkou No.2 Power Plant has benchmarking significance and promotion value in the process of thermal power enterprise transformation.



Scan the QR code to watch CCTV report on
How to Capture and Collect Carbon Dioxide?



Promoting Environmental Awareness

Implementing Ecosystem Conservation

During the construction of power stations, the Company comprehensively considers all the relevant requirements concerning power generation, flood control, water and soil conservation, aquaculture, tourism development, etc., implements environmental protection measures for project construction, and strives to protect the surrounding environment and biodiversity, so as to achieve a harmonious unity of project development and the ecological environment.

CHNG Put the First Large-scale Hydropower Station Fish Collection and Transportation System in the Stem Stream of the Yangtze River into Operation

In April 2021, the first large-scale hydropower station fish collection and transportation system in the stem stream of the Yangtze River was officially put into operation in Longkaikou Hydropower Station. The fish collection efficiency was up to 62.6% by innovatively using the fish collection method featuring the priority of blocking and the combination of blocking and attraction and the technologies including dual-frequency identification sonar, underwater fish attraction light, etc. This system is helpful for protecting the aquatic biological resources in Yangtze River and promoting sustainable development of hydropower industry. This exploration is useful for CHNG to facilitate high-quality development of the Yangtze River Economic Belt.



First Large-scale Hydropower Station Fish Collection and Transportation System in the Stem Stream of the Yangtze River

Jiaxing Offshore Wind Farm Carried out Releasing for Stock Enhancement Activity

In June 2021, on the occasion of the 13th World Oceans Day and the 14th China Ocean Day, Jiaxing Offshore Wind Farm organized staff to carry out marine organism releasing for stock enhancement activity based on fishery ecological compensation and restoration. Approximately 200 million marine biological seedlings were released. Jiaxing Offshore Wind Farm invested RMB 6 million yuan for fishery ecological compensation and restoration throughout the year, making positive contributions to the marine ecological environment and protecting fishery resources in the surrounding waters.



Releasing for Stock Enhancement on the World Oceans Day

Zhuolu Dasi Wind Farm Realized Harmonious Development with the Environment

Zhuolu Dasi Wind Farm scrupulously executed the environmental protection measures and the "Three Simultaneities" system for main works during the construction to protect the original landform to the greatest extent. The grass storage and number of livestock around the wind farm were not affected, and wild animals might be seen everywhere, realizing the harmonious coexistence between the project construction and the natural environment.

- During the excavation of wind farm roads and wind turbine platforms, do not dump waste earth and stones onto the slope beside the roads and platforms without prior permission, and endeavor to avoid stripping large area of turf on the top soil
- Use a novel construction method for water and soil conservation - zero disturbance of lower slope, to keep the landform of lower slope maintain its original green environment and avoid environmental pollution caused by water and soil loss of lower slope
- Upon the completion of project construction, take a series of measures including covering, leveling, tree and grass planting to restore the ecological environment and minimize the impact of project construction on the natural environment



Zhuolu Dasi Wind Farm

Working on Green Offices

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 official vehicles, and strictly control the purchase of official 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 informatization and paperless office work, reduce paper printing by setting up an internal WLAN.

Spreading Environmental Protection Concepts

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 public welfare activities and environmental protection knowledge training. The Company has set up a communication platform for stakeholders to better respond to the demands of relevant parties.

Jinghong Hydropower Station Carried out the "Protect Mother River" Volunteer Activity

In conjunction with hot topics, such as ecological protection, Jinghong Hydropower Station carried out volunteer activities called Protect Mother River for six consecutive years, including collecting garbages on the riverside of Lancang River, promoting environmental knowledge to call for attention to environmental protection and protect our mother river, and actively participating in environmental protection actions such as river course inspection based on river chief system, water source protection, tree planting and greening, etc. The activities were widely praised by the community. Jinghong Hydropower Station was rated as **the Learn-from-Lei Feng Demonstration Site**, and won the 9th **National Mother River Award - Green Contribution Award** and the honorary title of **National May Fourth Red Flag Youth League Committee**, etc.



"Protect Mother River" Volunteer Activities

Anyuan Power Plant Carried out the On-campus Activity to Popularize Environmental Protection Knowledge

In December 2021, Anyuan Power Plant carried out the "Science Popularization into Campus" activity on "Learning the Spirit of the Sixth Plenary Session of the 19th CPC Central Committee and Co-building Low-Carbon Homes", and invited teacher expertized in environmental protection to take part in the activity to popularize the concept of low-carbon life and the environmental protection knowledge to all teachers and students in the school.

At the event, the teacher used vivid and interesting examples to guide the students to gradually understand the concept of Carbon Peaking & Carbon Neutrality, and explained to them the environmental problems faced by mankind, the relationship between environment and human health and how to classify garbage in daily life, and called on them to start with the little things around to be a propagandist and practitioner of ecological environmental protection. Students expressed that they would strive to establish a new low-carbon concept and develop a habit focusing on green travel and low-carbon lifestyle.



On-campus Activity on Popularizing Environmental Protection Knowledge



Rooting in Old Revolutionary Base Areas in Gansu Province and Exploring a Mode Applicable to Eastern Gansu

On July 10, 2021, the Energy Base in Eastern Gansu commenced construction. As the first pilot clean energy base with complementarities featuring intensive, digitalized and standardized management built by CHNG, it is also China's first 10GW integrated energy base with multi-energy complementarity (wind, solar, thermal, storage and transmission). The development and construction of the Energy Base in Eastern Gansu focused on overcoming the key technical challenges with regards to collaborative control of large-scale integrated wind-solar-energy storage power stations, 1,000,000t CCUS project and high-efficiency PV power generation to form a number of scientific and technological achievements with independent intellectual property rights and international leading level, and explore a reproducible and scalable development mode of multi-energy complementary energy base, which is of great significance for CHNG to achieve the strategic goal of Carbon Peaking & Carbon Neutrality, self-reliance and self-strengthening in science and technology, promoting the development of old revolutionary base areas, and keeping aligned with the national strategies for rural vitalization, which also provides a smart, clean and efficient "Eastern Gansu Sample" for the development and construction of future energy bases.



Starting Construction of Multi-energy Complementary Integrated Energy Base in Eastern Gansu

Huaneng Energy Base in Eastern Gansu is a demonstration project to help achieve the strategic goal of Carbon Peaking & Carbon Neutrality and build a new-type power system. It is a model project to achieve self-reliance and self-strengthening in science and technology and make industry chain more autonomous and controllable, and a livelihood project to boost the development of old revolutionary base areas and keep aligned with the national strategies for rural vitalization. Besides, it is also a green project to support collaborative development of eastern and western regions and advance the optimization and adjustment of energy structures.

—Shu Yinbiao, Secretary of the Party Leading Group and Chairman of the Board of Directors of CHNG

A Demonstration Project to Help Achieve the Strategic Goal of Carbon Peaking & Carbon Neutrality and Build a New-type Power System

Based on the rich wind, solar and coal resources in Eastern Gansu, CHNG takes the clean and multi-energy complementary energy base in an intensive, digitalized and standardized manner as the main development path, centers on driving the integration of base planning, investment, construction, management, O&M and dispatching, persists in clean energy-based, technology-led and innovation-driven strategies, relies on micro grid and integrates into the large markets to explore a reproducible and scalable development mode of multi-energy complementary energy base, aiming at building an energy base in Eastern Gansu at a high level and creating a "3060" demonstration model.



Sketch of Peak-regulating Power Supply Project

Wind Solar

Qingyang integrated wind/solar new energy demonstration project is expected to add more than 10GW installed capacity of new energy. Upon the completion, it will become the largest wind-solar hybrid farm project in the world, with an annual clean power generation of more than 20TWh and CO₂ emission reduction of about 20,000,000t.

Storage

The energy storage project is designed to support the stable and full-power production of new energy, comprehensively considers appropriate battery type based on service life, cost, etc., and is put into operation upon the completion according to the construction progress of new energy project, in order to advance the Base's clean energy utilization rate to exceed 95% in an all-round manner.

Thermal

The peaking-regulating power supply project intends to build two 1GW coal-fired units, and synchronously build environmental protection facilities in terms of flue gas desulfurization and denitration, in order to build clean, efficient and green units. After completion, the annual power generation will reach 10TWh, and approx. 2,700,000m³ draining water will be utilized.

Transmission

It is planned to build the Eastern Gansu - Shandong UHV DC power transmission channel, with a length of about 1,000km, an investment of about 18 billion yuan and a total transmission capacity of 8GW, so as to optimize the configuration of clean energy in transmission channel and meet the increasing power demand in Shandong.

A Model Project to Achieve Self-reliance and Self-strengthening in Science and Technology and Make Industry Chain More Autonomous and Controllable

The Base's 10GW multi-energy complementarity key technology is one of the "Huaneng Top10 Science and Technology Demonstration Projects". CHNG focuses on the research on the configuration and optimization technology of the Base's multi-energy complementary power supply, key technology of control system, economic evaluation index and policy, establishes a theoretical system for planing the large-scale new energy base construction, completes the structural layout scheme of wind, solar and thermal energy storage and the technical achievements concerning key technology of the unit's peak regulating and operation capacity, multi-energy complementarity and coordinated dispatching control strategy, etc., in order to create Huaneng science and technology demonstration project, and provide industry standards and replicable construction experience for the construction of future integrated energy bases at home.



Sketch of Key Technology of Multi-energy Complementary Energy Network Integration

A Livelihood Project to Boost the Development of Old Revolutionary Base Areas and Keep Aligned with the National Strategies for Rural Vitalization

Upon completion, the Base will realize the transformation and utilization of local resources, with a total investment of more than RMB 100 billion yuan and an annual tax of RMB 4.6 billion yuan, and more than 28,000 new jobs will be created, which will better support the economic and social development of old revolutionary base areas and make important contributions to speeding up the improvement of local infrastructure, improving the economic quality & efficiency and core competitiveness, consolidating the achievements made in poverty alleviation in new development stage, promoting rural vitalization, embarking on a new journey toward building a modern socialist country, and building a new happy and beautiful Gansu.

A Green Project to Support Collaborative Development of Eastern and Western Regions and Advance the Optimization and Adjustment of Energy Structures

The Base focuses on clean energy, gives full play to the advantages of regions rich in new energy resources to realize the large-scale consumption of clean power and the clean & efficient utilization of coals. It optimizes the energy structure, breaks the resources' environmental constraints, advances the coordinated and sustainable development of energy field and ecological environment, and supports the country to reach the goal of Carbon Peaking & Carbon Neutrality. After completion, the Base will produce more than 20TWh of clean power annually, and the utilization rate of clean energy will exceed 95%. Through the comprehensive demonstration and application of 100,000 t/a CO₂ capture and EOR (CCUS) technology, the Base will actively explore net zero emissions of fossil energy. The realization of high-quality development in agriculture-solar hybrid project, husbandry-solar hybrid project and PV sand control project will play a positive role in promoting the realization of "Lush Mountains and Lucid Waters" in areas with serious soil erosion and desertification in the Loess Plateau of Eastern Gansu, and effectively facilitate the green and low-carbon development of eastern provinces.

Launching the development and construction of the Energy Base in Eastern Gansu is a major practice to implement the new energy security strategy featuring "Four Revolutions and One Cooperation", an useful attempt to promote the "Integration of Source-Network-Load-Storage" and the multiple-energy complementary development, and also a powerful measure to implement the national strategy of "West-to-East Electricity Transmission", support the power supply to receiving provinces, and speed up the economic and social development of old revolutionary base areas.

—Huang Xuenong, Director General of Electric Power Department of National Energy Administration

Huneng's investment and development of integrated energy base in Eastern Gansu is an important measure to faithfully implement the new energy security strategy featuring "Four Revolutions and One Cooperation" stated by General Secretary Xi Jinping, focus on the goal of Carbon Peaking & Carbon Neutrality, consolidate the achievements Gansu has made in poverty alleviation and promote the rural vitalization.

—Shang Peng, Deputy Director General of Planning and Development Bureau of SASAC of the State Council

Taking More Responsibilities and Embarking on a New Journey of China's Development

High-quality Social Development

If one expects the country to be prosperous and stable, one must stand up with enough morality and virtue.
— Quoted from *A Memorial to Tai Zong on Ten Aspects of Self-discipline* by Wei Zheng, Tang Dynasty

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- Investment for Paired Assistance
41.60 million yuan
- Introduced Fund for Paired Assistance
17.88 million yuan
- Fund for Purchasing Agricultural Products
91.35 million yuan
- Sales of Agricultural Products
81.90 million yuan
- Total Overseas Installed Capacity
9 GW
- Total Overseas Profit
1.19 billion yuan

- Procurement Amount of
120.4 billion yuan
- Capital Saving Rate in Procurement
21%

The strategic bolster of the state-owned sector will be brought into full play, so that it can focus more on helping ensure strategic security, promote industry leadership, bolster the national economy, raise people's living standards, improve public services, and other functions. We will adjust and revitalize stock assets, improve the allocation of incremental capital, and move towards important industries concerning national security and the lifeline of the national economy, industries that provide public services and concern capacity building for emergency response, public welfare, etc. as well as emerging industries of progressive and strategic significance.

— Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China

Working Hand in Hand with Partners to Achieve Win-Win Results



“

China is a country with a vast territory and large population. China has great differences in natural resource endowments in different regions, which is rare to see in the world. Balanced development across areas and regions has always been recognized as a major issue.

—— Xi Jinping

”

Supporting Regional Development

CHNG proactively implements the national and regional development strategies, and continuously supports the national strategies for regional integration, e.g. Xiong'an New Area, Guangdong-Hong Kong-Macao Greater Bay Area, Yangtze River Delta, Hainan Free Trade Port, etc.

CHNG actively implements *the Work Plan for Promoting the Development of Xiong'an New Area*, provides advanced and feasible Huaneng solutions of comprehensive energy services for Xiong'an New Area, promotes the registration and implementation of Huaneng International Engineering Technology Co., Ltd. and Shanghai e-commerce companies in Xiong'an New Area, and plays an exemplary role in advancing the development of Xiong'an New Area.

Be the "Energy Adviser": CHNG prepared *the Energy Development Report of Xiong'an New Area* to lay a solid foundation for Xiong'an New Area to create a model of Carbon Peaking & Carbon Neutrality city; CHNG formulated *the Administrative Measures for Distributed PV Power Generation in Xiong'an New Area* to accelerate the high-quality development of new and renewable energies in Xiong'an New Area.

Be the "Industry Leader": CHNG organized and held forums with Xiong'an energy enterprises, and led 12 central SOEs and Xiong'an New Area Ecological Environmental Protection Association to jointly establish the Red-Green Alliance of Xiong'an New Area. The Alliance adheres to the principle of "Red Traditions — Staying True to the Original Aspiration; Green Mission — Ecological Civilization Construction of Xiong'an".



CHNG Participated in the Construction of Xiong'an New Area

In December 2021, CHNG held the signing ceremony of strategic cooperation framework agreement with the Administrative Committee of Xiong'an New Area and the launching ceremony of Huaneng Xiong'an Headquarters Project. As one of the first batch of central SOEs to be relocated to Xiong'an New Area, CHNG actively advanced the coordinated development between Beijing, Tianjin and Hebei through relocation of functions non-essential to Beijing's role as the capital, and seized this opportunity to deeply participate in the construction and development of Xiong'an New Area in aspects of relocation of central SOEs, energy services, power innovation, industrial layout, etc.

- Arrange relocation-related matters in a unified manner and advance reforms and development while maintaining stability, and focus on building Huaneng Xiong'an Headquarters into a model for relocation of functions non-essential to Beijing's role as the capital, in order to accumulate successful experience for the relocation of the headquarters of central SOEs out of Beijing
- Develop a comprehensive energy service arrangement plan, and build a "Source-Network-Load-Storage-Charging" urban energy supply system, to provide reliable and environment-friendly energy and power for the construction of a new green and smart city in Xiong'an New Area
- Focus on major strategies concerning national energy security, self-reliance and self-strengthening in high-level science and technology, etc., and actively establish the joint innovation platforms, to facilitate the construction of a national energy and power innovation center in Xiong'an New Area
- Leveraging the platform and resource advantages in the fields of supply chain logistics and international business, plan and create a layout for high-end high-tech industries in Xiong'an New Area to make contributions to the construction of a beautiful new area

As one of the first batch of central SOE headquarters relocated out of Beijing, CHNG took the lead in initiating the construction of headquarters project. This fully demonstrates its firm political stance and strong sense of mission, which is of great significance for further giving play to the agglomeration demonstration effect of Xiong'an New Area and accelerating the relocation out of Beijing.

——Zhang Guohua, Member of the Standing Committee of the CPC Hebei Provincial Committee, Vice Governor of Hebei Province, Secretary of the Party Working Committee and Director of the Administrative Committee of Xiong'an New Area

Building Cooperation Platforms

12

Strategic Cooperation
Agreements Signed with
Governments

CHNG actively built platforms, and strengthened cooperation with local governments, upstream and downstream enterprises, scientific research institutions and universities to achieve mutual benefit and win-win results in resource acquisition, project development, scientific and technological innovation, energy services, talent training, etc.

- Signed strategic cooperation agreements with 12 provincial and municipal governments including Shandong, Yunnan, Tibet, Nanjing and Sanmenxia.
- Signed strategic cooperation agreements with 8 upstream and downstream enterprises including PowerChina and SANY Group.
- Signed strategic cooperation agreements with 3 scientific research institutions including IWHR and Chinese Academy of Sciences.
- Established a school-enterprise cooperation mechanism with colleges and universities to carry out cooperation, e.g. "Career Coaching Program" and "Order-orientated Cultivation of Talents".



Deepening Enterprise-Local Cooperation to Create a "China Energy Valley"

In the context of Carbon Peaking & Carbon Neutrality, CHNG continuously deepened its strategic cooperation with Nanjing municipal government. Leveraging the industrial resources and scientific research strength of Nanjing and CHNG, CHNG worked with leading enterprises in the energy industry to build the "China Energy Valley" project on the basis of the Huaneng International Energy Pilot Zone project.

"China Energy Valley" aims to gather the best energy industry resources, lead the direction of the most advanced energy industry and represent the cutting-edge level of energy science and technology to create a future energy industry ecosystem integrating technology research and development, capital growth, demonstration and application as well as mechanism innovation, in order to fulfill the mission of "Supporting the National Strategies, Safeguarding the Energy Security, Advancing Energy Revolution, Supporting Ecological Civilization Construction, and Making Positive Contributions to Building a Community with a Shared Future for Mankind" and the vision of "Being the Cradle of Energy Sciences and Technologies, the Innovation Center in Energy Sector, the Energy Application Demonstration Zone and the Future Low-Carbon Smart City". Besides, "China Energy Valley" aims to gather more than 100 energy industry leaders to create a core driving force of industry, boost the regional economic development with more than RMB 100 billion-level industrial clusters, and lead the energy transformation and development with more than RMB 1 trillion-level industrial ecosystem, to help Nanjing create a new business card of "Low-Carbon Pioneer City".



Signing of the Strategic Cooperation Agreement for Joint Construction of China Energy Valley Project

Implementing the Responsible Procurement Policy

In 2021, CHNG completed a total of 120,069 procurement projects, with a procurement amount of 120.4 billion yuan, saving 31.6 billion yuan compared with the estimated budget. The capital saving rate reached 21%, and the centralized procurement rate, on-line procurement rate, public procurement rate, electronic bidding rate, suppliers' dynamic quantitative assessment rate and procurement quality control coverage rate were all at 100%, reaching SASAC's "advanced level" standard. CHNG deepened the construction of centralized material supply service system. Throughout the year, CHNG centrally supplied the materials for production and infrastructure equivalent to 19.4 billion yuan, allocated the materials equivalent to 62.69 million yuan, and achieved a 12.79% drop in overall inventory compared with the last year.

Optimizing Procurement Management

CHNG kept on optimizing procurement management, reinforced the "Two-level Centralized Procurement System" management, revised the management regulations of overseas procurement and suppliers as well as bid evaluation experts, issued guiding documents including *Guidelines for Non-Bidding Mode Procurement Agency Service* and *Guidelines for Green Procurement*, and conducted the procurement bidding management, supervision and inspection to identify and correct any problem, in order to further standardize the procurement behaviors and facilitate management improvement.

Deepening Platform Construction

CHNG boosted the digital and intelligent transformation of procurement and supply chain management, orderly advanced the upgrading and function development of various system modules for procurement and material supply chain management, preliminarily completed the integrated smart supply chain platform, and achieved an unimpeded whole-process flow of supply chain management in key areas, e.g. procurement demand, external sourcing, product manufacturing, supply and transportation, material warehousing, etc.

- CHNG upgraded the bidding procurement platform, built and put the supervision modules for intelligent bidding and bid evaluation, intelligent auxiliary bid evaluation and remote bid evaluation into service, which fully covered the bidding procurement business in the system, in order to ensure the whole-process business control and real-time monitoring of bidding procurement activities and effectively solve the challenges of remote bid evaluation supervision to prevent the risk of missing or leaking confidential information. Compared with the original electronic bidding module, the intelligent bidding and bid evaluation module reduced the preparation time of bidding documents by 40%, saved the bid evaluation time by 25%, and decreased the workload of bid evaluation experts by 30%. Its digital and intelligent level is in a leading position in the industry.
- CHNG built a new smart material management system, aiming to effectively integrate relevant information systems (i.e. material and safe production management), optimize functions (i.e. e-commerce centralized material supply services and centralized disposal of idle and waste materials), and adopt advanced technologies (i.e. Blockchain, intelligent equipment and big data) to initially achieve intelligent material management.

Improving Quality and Efficiency

CHNG fully took the advantages of intensive and large-scale procurement, and scientifically expanded the scope of binding bidding, annual prequalification assessment and framework agreement for procurement range to realize that the products under the material framework agreement covered 61% of the categories of production materials.

CHNG established and improved the "Centralized + Remote" bid evaluation system, and 29 nationwide remote bid evaluation sites were built and put into service, which not only effectively prevented and controlled the COVID-19 epidemic and risks, but also facilitated the standardized and efficient development of business activities.

CHNG reinforced the management of bid evaluation experts, issued the *Guidelines for Hierarchical Management of Bid Evaluation Experts (Trial)*, established the hierarchical management system and mechanism of experts, and improved the management methods and bid evaluation methods, to further improve the bid evaluation quality.

CHNG focused on optimizing the business environment, defined main responsibilities of supplier management, reinforced the management of suppliers' delinquent conduct, and guided suppliers to improve their service level. In 2021, 9 suppliers were rated as Grade D, and 5 suppliers with delinquent conduct were punished.

Creating International Partnership



China will work with all parties to advance results-oriented implementation of projects in the spirit of an architect refining the blueprint, ensure substantive, steady, sustained and high-quality development and usher in a brighter future of Belt and Road cooperation.

— Xi Jinping



Strengthening the Top-level Design

CHNG prepared the plan for international development during the "14th Five-Year Plan", coordinated the domestic and international markets and resources, improved the international development platform featuring "One Body and Two Wings", set up seven overseas representative offices in UK, Pakistan, Myanmar, Cambodia, Singapore, Australia and Kazakhstan, and formulated the management measures and assessment rules for overseas representative offices, and overseas equity participation management measures to promote substantive and steady development of the Belt and Road cooperation.

Carrying out International Exchanges

CHNG always upheld the concept of "International Exchanges of Enterprises Shall Comply with and Serve the State's Overall Diplomatic Strategies", continued to deepen exchanges with partners such as Siemens, GE, EDF, Shell Group and TotalEnergies, and carried out cooperation in cutting-edge technology research fields, to create a new pattern of multi-level and wide-ranging international exchanges.

CHNG actively participated in the activities organized by many international organizations, i.e. China Development Forum, Boao Forum for Asia, UN Biodiversity Conference, 18th China-ASEAN Expo, China International Fair for Trade in Services and International Electrotechnical Commission (IEC), officially joined the Global Sustainable Electricity Partnership (GSEP), and greatly enhanced CHNG's popularity and reputation by using high-level platforms.



CHNG Successfully Completed Works for Participating in the 4th China International Import Expo

In November 2021, 169 persons from 6 units in CHNG's system formed a trading subgroup to participate in the 4th China International Import Expo, and CHNG held a Intelligent & High-end Equipment and Service Procurement Signing Ceremony during the Expo. During the Expo, CHNG signed 18 procurement agreements or contracts concerning high-end equipment, clean energy equipment, coal and so on with Mitsubishi, Dongfang Electric, Schaeffler, etc., totaling RMB 7.68 billion yuan. The number of procurement projects exceeded that of the previous expo. Related works were highly praised by SASAC and China International Import Expo Bureau.



Intelligent & High-end Equipment and Service Procurement Signing Ceremony Held by CHNG

Improving Overseas Guarantee



CHNG continued to strengthen its foreign affairs service capacity, enhanced the foundation of entry-exit management, risk prevention and control, talent training, safe operation and COVID-19 control and prevention, to provide a solid guarantee for smooth construction and operation of overseas projects.

Exit-Entry Management

CHNG continuously and dynamically tracked the global COVID-19 situation and exit-entry policies, strictly restrained overseas business trip during the epidemic, and effectively ensured safe personnel rotation of overseas projects. 88 exit-entry groups, equal to 695 man-times, were managed in the whole year.



Risk Prevention and Control

CHNG prepared *the Overseas Investment Risk Management Report and the Overseas Compliance Management Report*.

CHNG deepened the risk screening, monitoring and early warning, and legal review of overseas investments to ensure the risks are under control and the operation of overseas projects is in compliance.



Talent Training

CHNG innovatively adopted the combination of post training and country researches to cultivate international talents, selected 36 persons to participate in post training and 30 persons to carry out country researches and learning practice, and additionally included 163 persons into the international talent pool.

CHNG's international talent training was included into **the list of national excellent innovation cases of talent training work in the power industry** during the "13th Five-Year Plan", and CHNG won the **"Talent Development Award"** bestowed by Silk Road International Talent Alliance.



Health and Safety

Alltrust Insurance created a collaboration network covering 1.2 million medical institutions in 190 countries around the world to provide comprehensive personal accident rescue and overseas health protection for employees stationed abroad.

CHNG organized overseas safety and emergency training to improve the safety awareness of personnel involved in foreign tasks and the emergency capability to respond to overseas security incidents.

CHNG always cared for the physical and mental health of overseas employees and their families, and provided online medical consulting services on the telemedicine platform to carry out online psychological counseling for overseas employees.



COVID-19 Epidemic Prevention and Control

CHNG regularly held overseas epidemic prevention and coordination meetings, and established a normalized overseas epidemic prevention and control mechanism.

CHNG completed the deployment of the command center of telemedicine platform and the medical terminals of overseas project units. 100% of overseas employees got vaccinated against COVID-19, keeping a remarkable record of "zero-input and zero-infection".

Crafting Projects of Excellent Quality

CHNG steadily advanced international development, built a whole industry chain of "integration of investment, construction and operation", set up international engineering company, and obtained the EPC qualification. By the end of 2021, the overseas installed capacity under control of and managed by CHNG exceeded 9GW, with an accumulated operating profit of RMB 1.19 billion yuan, maintaining a good profit level.

CHNG overcame many challenges including traffic blockade caused by COVID-19 epidemic, endeavored to advance the development of overseas projects in an orderly manner, and made significant progress in a number of power engineering projects.

- Sahiwal Coal Fired Power Plant in Pakistan completed 8.1TWh of power generation, and achieved 1,668 days of uninterrupted safe production, which made up for the shortage of electricity and greatly boosted economic development and livelihood improvement in Pakistan. It won the **"Environmental Protection Excellence Award"** of the National Forum for Environment and Health and the **"Reliable Power Station Award"** of Pakistan State Grid.
- Lower Sesan II Hydropower Station generated 2TWh to meet the power demand of more than 2 million people in a year, effectively alleviating the local power shortage.
- Myanmar Shweli River I Hydropower Station generated 3.6TWh, and the electricity supplied to Myanmar accounted for 1/3 of its national grid capacity, greatly supporting the local power supply.
- UK Minety Battery Storage Project Phase I has an installed capacity of 99.8MW and a localization rate of more than 70%. It reached profitability once it was put into operation in June 2021, and became the first power project independently constructed by CHNG in a developed country. It won the **"CCCUK Outstanding Achievement Award - Green Cooperation Award"**, and the honorary title of **Excellent Case on "Living with Nature"** in the Construction of International Image of Chinese Enterprises.
- Singapore Jurong Island Desalination Plant Project has been officially put into operation. It uses the most advanced technologies such as filtration, reverse osmosis and energy recovery. The daily drinking water production is about 30 million gallons, reaching 7% of daily water demand in Singapore.
- CHNG seized the opportunities from projects in Central Asia, Vietnam, Laos and other regions, and targeted 1GW wind power resources in Tajikistan and Uzbekistan.



Huaneng Sahiwal Coal-fired Power Plant



Huaneng Lower Sesan II Hydropower Station



Myanmar Shweli River I Hydropower Station



China Huaneng UK Minety Battery Storage Project

Participating in Local Development

Adhering to the concept of "constructing a power station and driving the local development", the Company ensures the smooth operation of overseas projects while actively fulfilling its economic, environmental and social responsibilities in hosted countries to benefit the local people, building demonstrations of close people-to-people bond.

Lower Sesan II Hydropower Station Achieved Win-Win Results in Operation and Local Livelihood Improvement

Lower Sesan II Hydropower Station made a sufficient reference to the China's poverty alleviation experience, followed a sustainable development path by ensuring smooth relocation and resettlement of residents and by making sure those involved have the means to better themselves, and completed the resettlement project with the largest scale and largest number of people (840 households and 3,690 people) in local history, to create a "win-win" situation in operation and livelihood improvement.

Improving the living environment: The area of each new house for resettling villagers was increased to 80m², and the cultivated land was changed from 3ha to 5ha. Water and power connection was completed, and all supporting infrastructure and public facilities were built for the resettlement villages.

Stimulating local employment: More than 3,000 jobs were provided for nearby villagers during the construction; after the station was put into operation, 14 local college students were recruited to engage in the O&M activities in the station.

Improving the quality of education: Accumulated 60,000 yuan grant was provided to schools in resettlement villages for four consecutive years, benefiting 120 persons, and schooling supplies were donated to teachers and students in such schools many times.

Providing technical training: Agricultural experts were invited to provide technical training to enhance planting skills, and to provide technical guidance and training based on targeted policies, aiming at helping villagers improve their economic benefits of cultivated lands.



New House after Resettlement



Local Students Received Grants and School Supplies



Cambodian Employees were Engaged in the Operation and Maintenance in the Station



Cashew Trees in Cultivated Lands of Resettled Residents

I'd like to praise CHNG for its resettlement work related to Lower Sesan II Hydropower Station project. CHNG built beautiful new houses and complete public infrastructure for resettled residents, and successfully solved the resettlement issues.

—Hun Sen, Prime Minister of the Kingdom of Cambodia

Myanmar Shweli River I Hydropower Station Started the Construction of "Hundred-Thousand-Ten Thousand Projects"

Myanmar Shweli River I Hydropower Station continued to deepen its assistance overseas, focused on the difficulties encountered by the villagers near the project in production and life, and comprehensively started the construction of "Hundred-Thousand-Ten Thousand Projects", which was highly praised by the surrounding villagers and created a harmonious enterprise-local relationship.

The Station provided 650,000 yuan to build a new student dormitory building in Banda Village Middle School in Muse City, covering an area of 390m², which greatly improved the accommodation conditions of boarding students. In 2021, the Station donated 300,000 yuan to help the surrounding villagers who were significantly affected by the COVID-19 epidemic, and provided them with necessary medical supplies to fight against COVID-19 pandemic.



New Student Dormitory Building of Banda Village Middle School

Lower Sesan II Hydropower Station Created a Typical Demonstration Project of Environmental Protection and Soil and Water Conservation

Lower Sesan II Hydropower Station always adhered to the policy of "protecting resources during development, and developing based on resource protection", and invested about RMB 10 million yuan to build a nature-like fishway with the maximum lifting height and the maximum length in the field of hydropower projects in Asia, which greatly reduced the impact of project construction on aquatic organisms, protected the survival and reproduction of migratory fish around the Station, maintained fish biodiversity, river connectivity and healthy river ecosystem, and realized the coordinated development between resource development and environmental protection. In 2021, Lower Sesan II Hydropower Station won the "Fishery Conservation Award" granted by Cambodia's Fisheries Administration.



Nature-like Fishway of Lower Sesan II Hydropower Station

UK Minety Battery Storage Project Protecting Local Ecosystem

Before the commencement of UK Minety Battery Storage Project, CHNG organized ecological experts to scrupulously and comprehensively evaluate the surrounding ecological environment, and identified that wild animals such as swamp fritillaries and bats inhabited around the project site.

To minimize the impact of project construction and operation on local ecological environment, CHNG installed a 1,200m long fence around the project site to protect the amphibians, and invited relevant experts to periodically check its integrity every month. Additionally, the surrounding trees were not affected at all during the construction, reducing the loss of wildlife habitat, effectively maintain the ecological balance and protect local biodiversity.

CHNG makes the right decision to get in on the ground floor, successfully operates the UK Minety Battery Storage Project, and becomes a "pioneer" in implementing the important consensus reached between the two heads of state and advancing UK-China green development cooperation.

—Yang Mi, Counsellor of the Economic & Commercial Office of the Embassy of the People's Republic of China in the United Kingdom of Great Britain and Northern Ireland

Carrying out Charitable Activities to Convey Love and Warmth



“

Everyone should learn the Lei Feng spirit; everyone can go into action to show love and care. It is beneficial to accumulate the good behaviors. When someone is in need of help, we should give him a hand so that our society can be more harmonious.

— Xi Jinping

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The Company set up a youth volunteer platform, and formulated *Measures for the Administration of Three-color Sails Youth Volunteer Activities*, and carried out in-depth brand public welfare activities of "Three-color Sails" youth volunteers, calling upon all employees to actively participate in. Activities involved donations to help students, servicing community, emergency relief, caring for vulnerable groups and other public welfare fields to convey the Company's love and warmth to the society.



Huaneng Real Estate Co., Ltd. Carried out "Three-color Sails" Rainbow Plan Public Welfare Activity

Huaneng Properties Co., Ltd. adheres to synchronous expansion of volunteer services and business development, has carried out the "Three-color Sails" Rainbow Plan Public Welfare Activity, and actively advances the normalized volunteer projects, caring for children with autism, supporting rural teenagers to study in schools, protecting ecological environment, etc. This activity is a new exploration for Huaneng Properties Co., Ltd.'s "going out" to serve social public welfare, and enhance the influence of public welfare actions together with the society, simultaneously, "bringing back" the public welfare ideas and stories in the activities, so as to call on the masses to participate in public welfare activities in the ways they can and widely spread the positive energy of public welfare.



"Three-color Sails" Rainbow Plan Public Welfare Activity



Huaneng Haikou Power Plant Carried out the "Three-color Sails" Volunteer Activities on Home Appliance Repair in the Communities

In March, 2021, Huaneng Haikou Power Plant carried out the "Three-color Sails" Volunteer Activities on Home Appliance Repair in the communities, which was widely supported by the communities. The residents brought their damaged electrical appliances for repair. Volunteers repaired more than 40 electrical appliances, with a success rate up to 90%. As a unique brand of "Three-color Sails" Volunteer Services of Huaneng Haikou Power Plant, this activity has lasted for 17 years, making a positive contribution to enhancing the reputation of CHNG and showing good spirit of China's youth to the society.



"Three-color Sails" Volunteer Activities on Home Appliance Repair in the Communities

Improving Living Standards



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We should strengthen CPC's leadership of all endeavors related to agriculture, rural areas, and rural residents. Party Committees at all levels should assume full political responsibilities and implement the policy of giving priority to the development of agriculture and rural areas to make greater efforts to advance rural revitalization.

— Xi Jinping

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CHNG conscientiously implements the relevant decisions and deployments of the CPC Central Committee and the State Council, and takes rural vitalization as an important form and carrier for practical activities of "Offering Practical Services and Bringing Tangible Benefits to the People". CHNG has prepared the *Assistance Plan of the Headquarters during 14th Five-Year Plan* and the *Guidelines on Consolidating and Expanding the Achievements in Poverty Alleviation, Promoting Rural Revitalization and Providing Assistance in a New Stage of Development* to provide a solid institutional guarantee for the effective connection between the consolidation and expansion of achievements in poverty alleviation and the promotion of rural vitalization.

CHNG faithfully strengthened the organization and leadership of rural vitalization-related work, adjusted and established the Rural Vitalization Leading Team consisting of the Secretary of Party Leadership Group as the team leader, the Deputy Secretary and the Deputy General Manager in Charge as the deputy team leaders, and set up a leading team office to be responsible for specific works. In 2021, CHNG's leaders went to Hengshan District, Yulin City, Shaanxi Province and Aheqi County, Xinjiang Autonomous Region for investigation, actively gave suggestions on assistance measures to local governments, visited and expressed condolences to farmers and staff stationed in villages, and fully implemented the main responsibility of rural vitalization.

In the paired-assistance regions (Hengshan District of Yulin City and Aheqi County), CHNG assigned 12 outstanding cadres to take temporary posts or serve as the first secretary in a year, and directly invested RMB 41.60 million yuan and introduced RMB 17.88 million yuan as the assistance funds, to provide talent and financial supports for building a rural vitalization demonstration site. In Yunnan, Huaneng Lancang River Hydropower Inc. formulated and implemented the *Guidelines for the Promotion of Rural Vitalization by Implementing the "Hundred-Thousand-Ten Thousand Projects"* in a New Era, and focused on the implementation of the "Project combining five areas" (Industry development, Ecological improvement, Civilization as guidance, Social Governance, Guaranteeing public wellbeing), with a total investment of RMB 24.98 million yuan and 40 projects implemented, opening up a journey for rural vitalization.

CHNG distributed and implemented the *Assistance Plan by Purchasing the Agricultural Products*, opened a assistance-specific section on Huaneng E-Commerce Platform with 273 products on the shelves, cooperated with e-commerce platforms such as JD.com and benlai.com, and set up exclusive shops in Xi'an, Chengdu, etc. to promote the development of product sales channels. In 2021, CHNG purchased the agricultural products equivalent to 91.35 million yuan, and helped sell the agricultural products with an accumulated sales amount of 81.90 million yuan.

CHNG · Assistance and Rescue Honor List

- Our Fanghuiju (Visit the People, Benefit the People and Bring Together the Hearts of the People) work team residing in Bedel Village, Aheqi County was awarded the honorary title of **"National Advanced Group for Poverty Alleviation"** by the Central Committee of the Communist Party of China and the State Council.
- Paired Assistance Work was rated as **"Good" (the highest grade)** in the national evaluation for five consecutive years.
- The "Hundred-Thousand-Ten Thousand Projects" of CHNG and Huaneng Lancang River Hydropower Inc. won the **"China Charity Award"** granted by the Ministry of Civil Affairs.
- CHNG's Leading Team Office for Poverty Alleviation was awarded the honorary title of **"Shaanxi Provincial Outstanding Unit for Poverty Alleviation"** and **"Qinghai Provincial Outstanding Unit for Poverty Alleviation"**.
- The "Three-Color Culture Guidance and Empowering of Infrastructure Construction" case was included into the *Targeted Poverty Alleviation Model of Central SOEs (II)*.



Industrial Vitalization

Paired Assistance

In Hengshan District, CHNG invested 14.50 million yuan to support the development of white cashmere goat industry, including building the Northern Shaanxi White Cashmere Goat Industry Innovation Research Center, Hengshan District Sheep Industry Development Service Center and Big Data Center of Breeding, Expansion and Traceability, and support the construction of the "Northern Shaanxi Hengshan" regional public brand. CHNG entrusted professional teams to establish flagship stores in Tmall and JD.com, be responsible for planning the "Northern Shaanxi Hengshan Mutton Noodle Restaurant" project, and open brand demonstration stores in Yangzhou, Nanjing and Yangling and organize promotional activities. In cooperation with local state-owned enterprises, CHNG initiated the Industrial Poverty Alleviation Investment Fund in Yulin City, Shaanxi Province, with 60.50 million yuan invested in Phase I. In 2021, 15 million yuan was invested in Hengshan District to build three standardized brand product sub-packaging centers for rice, coarse cereals and mutton. In 2021, there were more than 2.40 million sheep in Hengshan District, achieving an annual output value of 1.13 billion yuan.

In Aheqi County, CHNG invested RMB 11.63 million yuan to promote the regional public brand of "Gobi Seabuckthorn", aiming at the construction of whole industrial chain of seabuckthorn industry in the form of modern agriculture. CHNG worked with JD to implement the JD Farm project, including building a seabuckthorn breeding and standardized planting demonstration base and establishing a seabuckthorn industry standard production system, product traceability system and market promotion system. A total of RMB 1 million yuan was introduced to establish Xinjiang Chunxiao Agriculture Co., Ltd., explore a new mode of rural industrial socialization service, and guide farmers and herdsmen to create wealth by hard work. In 2021, 1,041 tons of seabuckthorn were harvested in Aheqi County with a sales amount of more than RMB 20 million yuan. Approx. 2,000 farmers and herdsmen participated in seabuckthorn-related works, with a cumulative income of more than RMB 6 million yuan. The employment difficulties of 17 registered low-income families were eliminated, and stable poverty alleviation was achieved.



Farmers and Herdsmen Picked Seabuckthorn

Local Assistance

Huaneng Northeast China Branch invested a total of RMB 300,000 yuan to provide industrial assistance for the Willow Root Fish Breeding Project in Yueshan Village, Anshan City, including improving the fish pond environment and purchasing fingerlings. The fish production reached 11,000 kg in the first breeding cycle with an income of RMB 187,000 yuan.

Huaneng Zhejiang Energy Development Co., Ltd. assisted the People's Government of Zhuao Town, Taizhou City in creating a tea brand of "Longxiang Valley Tea", and building the tea deep processing base in Shanao Village, which effectively advanced the development of local tea industry. Huaneng Zhejiang Energy Development Co., Ltd. applied for the provincial agricultural industry support project of "Longxiang Valley Smart Ecological Tea Garden Construction", with a total investment of 20 million yuan. It is the first large-scale agricultural industry construction project in Zhuao Town.

Huaneng Tibet Yarlung Zangbo River Hydropower Development Investment Co., Ltd. focused on reinforcing the cultivation of foregoers for getting rich, developing specialty industries, transforming wastelands into tea gardens, registering tea cooperatives, set up tea primary processing workshops, and encouraged entrepreneurship to create more employment opportunities, so as to effectively expand income channels.

Total Investment of Longxiang
Valley Smart Ecological Tea Garden
Construction Project

20 million yuan

Huaneng Xinjiang Energy Development Co., Ltd. took the resource advantages of Alituntuogelake Village, Jiashi County to encourage local villagers to plant pomegranates. In 2021, the planting area reached 1,388 mu with an output of 80t; worked with local government to build a pomegranate processing plant, entrusted a professional planning agency to register the "Jiayu Juice" trademark, formulate marketing strategies and plans, aiming to boost the development of whole industry chain of pomegranates, greatly increase the collective income of the village, and facilitate the villagers to get rich.

Huaneng Hainan Branch donated 200,000 yuan to develop a cattle breeding project in Changpi Village, Tunchang County. The Village Committee provided funds to purchase 24 cattle for villagers. 70% of the profit after deducting the cost from the sales amount of cattle was distributed to the contracted farmers, effectively increasing the income of farmers. Huaneng Haikou Power Plant fully took the advantages of existing resources in Chunfang Village, Chengmai County, and built a 500m² black goat breeding base confining 150 black goats, which brought sustainable and considerable benefits to the villagers and effectively lifted 23 registered low-income families out of poverty.



Cattle Breeding Project

Talent Vitalization

Paired Assistance

CHNG provided a special fund of RMB 3 million yuan to construct Hengshan District Sheep Industry Development Training Center and Aheqi County Farmers and Herdsmen Employment Skills Training Center. In the whole year, 1,706 grass-roots cadres, 550 rural vitalization talents and 1,097 professional technicians were trained, and 100 people received the training on labor skills concerning e-commerce, animal husbandry, agricultural planting, etc. Additionally, CHNG continued to carry out the Pillar Program in paired-assistance regions, invested RMB 3.24 million yuan to improve the infrastructure of two primary schools, subsidize 589 students from poor families, reward 477 excellent students and provide assistance to 66 poor families.

Local Assistance

Huaneng Anhui Branch actively carried out the "Pillar Program" to help students, improved the education and teaching conditions in Huangchong Village, Huoqiu County, subsidized 30 students from poor families and excellent students, and donated 50,800 yuan to help poor students and reward excellent students.

Huaneng Fujian built an energy research and education base integrating energy knowledge popularization, science popularization education, interactive experience and energy exploration in Xikeng Village, Pinghe County by using collective assets and buildings that were due and recovered, aiming at rural vitalization.

Huaneng Gansu Energy Development Co., Ltd. carried out the "Spring Seedling Action" and "Pillar Program" activities, donated 62,200 yuan to provide grants for 57 college students, and donated 200,000 yuan to the Central Primary School of Liangyi Town, Zhuanglang County to improve the school's infrastructure.

Huaneng Guicheng Trust proposed that the education is a critical support for rural vitalization, and helped Fake Village, Guanfang Village and Lianying Village in Hezhang County to implement the concept of "Education First" by utilizing the company's social resources and talent advantages, to explore the characteristic assistance path of "Enterprise - Rural Education - Rural Vitalization".



Awarding Ceremony of "Spring Seedling Action" and "Pillar Program" Grants



The Volunteer Teacher Team Popularized Scientific Knowledge to Rural Students

Culture Vitalization

In combination with the development of characteristic industries in Hengshan District, CHNG deeply explored the local loess culture, grassland culture, border area culture and red culture in the old revolutionary base areas, and invested RMB 3.05 million yuan to build the first sheep culture exhibition hall in Northern Shaanxi to vividly show the time-honoured history, traditional folk customs and characteristic diet of local sheep culture, promote the fusion of agriculture, culture and tourism industries, and become a new window for cultural promotion, folk custom experience and brand communication in Hengshan District.

Ecological Vitalization

Paired Assistance

CHNG gave full play to its advantages of main business, developed green energy resources, and promoted the ecological environment protection in paired-assistance regions. In Hengshan District, 1.1 billion yuan was invested in the construction of 100MW wind power project in Nanta and 100MW agriculture-animal husbandry-photovoltaic power generation project in Diqingyuan; in Aheqi County, 2 million yuan was invested to purchase 280 sets of photovoltaic power generation equipment for households to solve the electricity difficulties in border animal husbandry points. CHNG actively improved the living environment, consolidated the achievements of "Toilet Revolution" in rural areas, investigated and rectified the pollution issues caused by wastewater, garbage and waste residues, implemented the clean farmland project, leveled and demolished 13 places and 120mu of arable lands.

Local Assistance

Shandong Branch built the rural vitalization-led, "Carbon Neutrality"-oriented and new energy development-based "Carbon Neutrality" characteristic demonstration town project located at Shima Town, Boshan District, Zibo City. This project fully exploited the capacity to regulate the power supply, energy storage and other aspects with PV, energy storage, clean heating, hydrogen production and charging pile as the main axis. It is an active exploration of integrated development of national strategies such as energy transformation, climate response and rural vitalization, and contributes to the income increase of farmers, agricultural development and prosperity in rural areas.

Huaneng Sichuan Energy Development Co., Ltd. actively promoted the strategy of "PV + Rural Vitalization", and planed the renewable energy projects involving PV, pumping and storage, geothermal energy, etc. in Daofu County based on the resources of Daofu County, to advance the construction of Daofu clean energy base and the high-quality development of local economy and society.

Huaneng Zhejiang Energy Development Co., Ltd. completed a 198kW PV project on the roof of office building in Shanao Village, Taizhou City, which might lead to an annual collective income increase of Shanao Village by RMB 80,000 yuan. The rooftop distributed photovoltaic power project for poverty alleviation located at Sandu Village, Hangzhou City supported by Yuhuan Power Plant generated 270MWh of electricity throughout the year, with an electricity tariff revenue of RMB 134,000 yuan, successfully achieving the expected goal of RMB 120,000 yuan annual increased income for Sandu Village.

Huaneng Northeast China Branch funded 550,000 yuan to build a 100kW PV power generation project in Yueshan Village, Anshan City. After completion, the annual power generation reaches 136MWh, and Yueshan village can earn about 50,000 yuan therefrom every year.

Guizhou Branch actively explored the organic integration of modern science and technology with traditional agriculture, implemented the "Tea-Solar Hybrid" assistance project to greatly improve the land utilization rate and achieve the goal of pollution-free and zero-emission power generation with an annual power generation of approx. 340MWh, and the realization of win-win result of PV power generation and tea production, lighting up the road to prosperity for local tea farmers.

Annual Power Generation
of "Tea-Solar Hybrid"
Assistance Project

340 MWh

Organizational Vitalization

Paired Assistance

CHNG funded 1.8 million yuan to provide the grassroots Party organizations with 310 sets of equipment for conference on teaching, covering all townships and villages under the jurisdiction of the paired-assistance areas, and regularly provided training for grassroots Party members and cadres.

Based on the work of the first secretary stationed in the village, CHNG was committed to exploring the rural economic development mode of "Party Branch Focusing on Organization and Promoting Cooperation by Industrial Development". In Shapinggou Village, Hengshan District, the first secretary assigned by CHNG gave full play to the role of grass-roots Party organizations, endeavored to promote the cooperation in sheep industry, implemented various assistance measures, and led people to actively participate in. This effectively established a good social convention of "Work Hard to Gain, and Get Rich by Working Hard". The resident working team in Biedieli Village, Aheqi County coordinated the introduced funds, led villagers to participate in the planting, management, protection and harvesting of seabuckthorn, and realized the corporate-style operation for 10,000mu seabuckthorn forest and RMB 800,000 yuan labor income of villagers; the resident working team established a joint-stock economic cooperative in Biedieli Village, consisting of 1,217 members and 40 shareholders. The collective income reached RMB 157,600 yuan by leasing the farmer's market, land clearing and redistribution.

Equipment for Conference
on Teaching Provided
for Grassroots Party
Organizations

310 Sets

Local Assistance

Huaneng Sichuan Energy Development Co., Ltd. comprehensively consolidated the grass-roots party building work, donated funds to improve the maintenance and function improvement of party building activity centers in Zhawa Village, Nongmu Village and Yari Village in Daofu County, carried out in-depth pairing co-building activities of the Party branches, implemented the policy of co-building of grass-root Party organizations, public management of Party members, joint cultivation of cadres and talents, win-win scientific development, joint assistance for people in difficulty, and sharing of Party building resources, and organized 8 Party members and foregoers for getting rich from Seka Township and Zawa Village to visit and study in Chengdu.



Racing against the Clock to Assist Henan in Flood Control and Disaster Relief

In July 2021, many places of Henan suffered from persistent severe torrential rain, and serious waterlogging occurred in Zhengzhou and other cities, causing major casualties and property losses, and the flood prevention situation was very grim. The Company attached great importance to this disaster event and donated RMB 30 million yuan to the Henan Charity General Federation to help flood prevention, disaster relief and post-disaster reconstruction of Henan. As an important power supply enterprise in Henan, Henan Branch has an installed capacity of more than 8GW in Henan, accounting for about 10% of the installed capacity of Henan Province, and the power plants are important supporting points for power supply of the power grid. Facing the major flood conditions, Henan Branch urgently launched an emergency response for flood prevention, set up a leading team for flood control, and arranged the deployment of flood control and disaster relief work. More than 1,700 people from 6 power generation enterprises adhered to the frontline of production, actively tackled the extremely heavy rain, ensured the safety of power plants, power generation and staff, and conducted all works in a smooth and orderly manner, effectively guaranteeing the needs of local people's livelihood.

Clean Energy Branch



Clean Energy Branch Participated in Flood Control and Disaster Relief

Henan Clean Energy Branch set up an emergency rescue team for flood control, organized the evacuation of villagers near power stations, and successively participated in flood control in Zhengzhou Headquarters, Zhenyao Wind Farm, Tangyin Phase II Wind Farm, Huixian PV Project and other places, and made an all-out effort to ensure the safety of employees and the stable operation of power generating equipment. With the joint efforts of various parties, all 12 wind farms and 5 pv stations within the jurisdiction of the branch have maintained safe operation.

Xiaodong Township, Wulu County, where the Wulu Wind Power Project Department is located, was besieged by the flood of the Qinhe River. The project team immediately donated daily necessities to the local people, and the project employees spontaneously donated nearly RMB 10,000 yuan in total.

Mianchi Thermal Power Plant



Mianchi Thermal Power Plant Continuously Receives and Unloads Coal

The power plant released meteorological information and meteorological disaster risk early warning, and the flood control and emergency commandos stepped up the patrol and inspection of the areas in charge, checked the flood prevention safety of key parts, and installed "raincoats" on the emergency buttons and outdoor terminal boxes plant-wide; strengthen flood control screening in fuel areas, and timely clean up key parts such as coal yards, ash yard catch-basins, and drainage ditches.

The power plant actively coordinated the surrounding coal resources, and increased the transportation of high heat value coal to the plant. The staff of the fuel department continuously operated to receive and unload coal 24 hours a day, and the dispatchers were stationed in the plant to urge the transportation to ensure smooth unloading of incoming coal, to ensure the inventory at a high level. During the rainstorm, the coal storage in the power plant reached 105,000 tons, providing a strong guarantee for the stable supply of electricity.

Zhongyuan Gas Turbine Power Plant



Zhongyuan Gas Turbine Power Plant Conducted Special Grid Inspection for Flood Prevention

The power plant made deployment arrangements, and conducted special grid inspection for flood prevention; strictly implemented the cadres-leading 24-hour duty system, and the flood control and emergency rescue team was on standby at any time; strengthened the reserve of flood control materials, completed the desilting and clearing in advance; enhanced inspection and patrolling, focused on waterproof and leak-proof work in key places; strengthen the test and inspection of external discharge facilities to ensure that all sewage and drainage facilities are unobstructed.

The power plant issued a day-level emergency pre-alarming order and emergency plan order to further strengthen the entire plant's on-duty force and various flood control measures. Operation and maintenance personnel braved the heavy rain to inspect the safety of equipment and completed all preparations for the peak-regulating start of the units.

Luoyang Thermal Power Plant



Luoyang Thermal Power Plant Strictly Controlled Moisture Content in Coal Yard

The power plant formulated a special plan for flood control in advance, set up Party members and youth commandos for emergency, and stored more than 100 flood control sandbags in important places such as fire pump rooms and steam engine rooms in advance; inspected 26 outdoor emergency buttons that were installed with rain covers; dredged 4 clogged drainage outlets, found 8 rainwater leakage points in rooms.

Heavy rainfall caused the increase in coal moisture of power plants, which brought major tests to the anti-blockage and anti-breakage of the coal machine and conveyor belt. All the staff of the dispatching team of the power plant ensured that the incoming coal was unloaded as it arrived around the clock, strictly controlled the increase of moisture in the coal field, continuously increased the inventory of coal field, accurately carried out coal blending scheme, and finally realized the conveyance of dry coal into the mill to ensure the safe coal using and stable operation of the units.

Qinbei Power Plant



Qinbei Power Plant Conducted Drainage Work in Low-lying Area

The power plant issued the emergency plan start-up order, organized to set up a flood control commando team to carry out whole plant check and deal with potential dangers of leakage and drainage in low-lying areas, tackled 37 outdoor waterlogged control cabinets, 17 roof leaks and 19 water drains, efficiently ensuring safe and stable production.

This rainstorm caused the interruption of Houyue Line and Taijiao Line, resulting in about 80% of the incoming coal of the power plant being affected. The power plant quickly started emergency measures: timely issuance of measures to stabilize boiler combustion in response to poor coal quality, high coal moisture content and coal supply interruption; increasing supply and sending emergency notifications to provincial cooperative coal companies to apply for additional amount; strongly coordinating the increase of auto transport; vigorously coordinating suppliers to use alternative routes for coal supply and transport. During the rainstorm, the power plant coordinated a total of 185,600 tons of coal delivery, effectively relieving the coal tension.

Anyang Thermal Power Plant



Anyang Thermal Power Plant Investigated the Pits of Road in the Area of Pipe Network

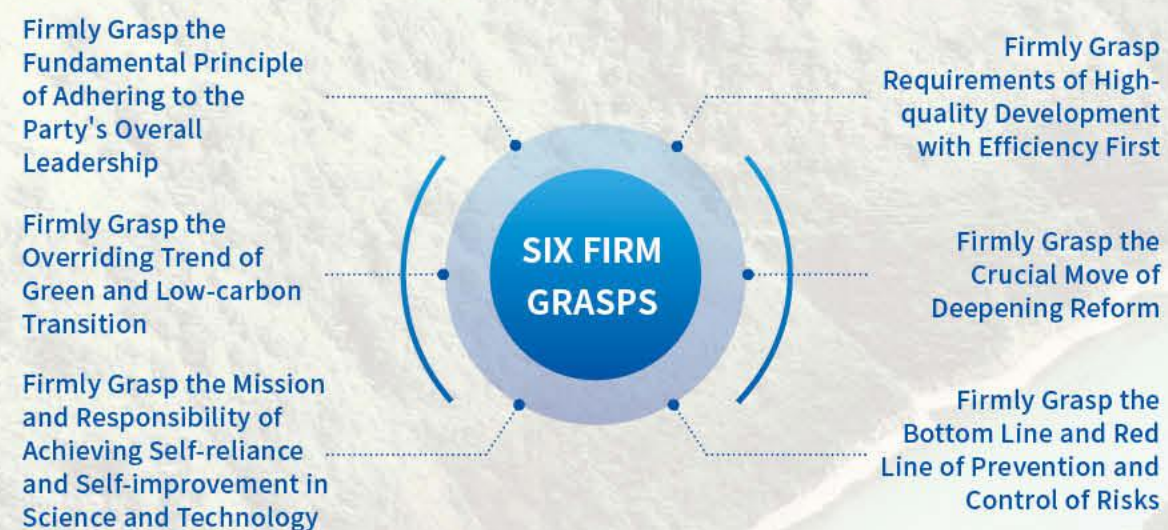
The power plant quickly entered into combat, held an emergency meeting for flood control, started the I-level flood control emergency plan, set up a Party member commando team and youth commando team for logistics support, and effectively responded to various dangerous situations with active attitude.

The commando team went to steam-using enterprises to check the operation of the steam pipe network, focusing on the valve wells and pipeline situation, investigating the pits of the road in the pipe network area, leading staff to enclose waterproof sandbags to ensure the stable operation of the steam pipe network; to inspect the situation of hot water pipe network project, arrange the deployment of temporary water drainage measures; to form a temporary rescue team to rush to the flooded Yidu substation to carry out rescue work. 17 staff and 3 trapped people were sent to a safe area, with practical action to protect people's lives and property.

Building on Past Successes to Further Advance Our Cause and Looking Forward to 2022

China has embarked on a new journey to fully build a modern socialist country, and CHNG has entered a new phase of development as well, fully launching its second entrepreneurship, accelerating the construction of a world-class enterprise, and achieving leading development.

Embarking on the new journey of the second entrepreneurship, the company must vigorously carry forward the leading culture of Huaneng and the spirit of struggle, be brave in pioneering and innovation, focus on deeply promoting the "Six New Leader" strategic tasks, adhere to the "Six Firm Grasps", focus on strengthening safe production, accelerate green and low-carbon development, make every effort to stabilize growth, vigorously promote scientific and technological innovation, deeply promote enterprise's reform and comprehensively improve the quality of Party building, and promote the company's higher-quality, more efficient, more sustainable and safer development.



No Major or
Above Incident
Occurred

Power
Generation Increased
by More than
4%
Year-on-Year

Operating Revenue
Increased by
6.6%
Year-on-Year

Profit Increased by
95%
Year-on-Year

New Energy Projects
Approved Reached
More than
25
GW

Strive to Put New
Energy into Production
with an Installed
Capacity of
18
GW

Maintain Grade
A
in Party Building
Assessment of Central
Enterprises

Appendixes

Selected Outstanding Corporate Responsibility Cases in 2021

In January 2022, the Company launched the 5th Selection and Appraisal of Excellent Responsibility Cases. All units actively participated and submitted a total of 75 cases, involving various issues linked to social responsibility such as ensuring energy supply and safe production, strengthening scientific and technological innovation, anchoring the dual-carbon goal, deepening the Belt and Road, and helping rural vitalization. After the initial review and two rounds of expert scoring, 15 outstanding cases reached the final. In the final session, the Company made the "Sustainable Development 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 5th Excellent Responsibility Case Selection and Appraisal Event of CHNG

Ranking	Case	Submitted by	Case Picture	Link for the Full Text of the Case
1	Actively Fight to Improve Quality and Efficiency, and Continuously Improve Security Capabilities	Huaneng Renewables Corporation Limited	 Unmanned Aerial Vehicle Patrol	
2	Implementing the Strategy of Innovation-driven Development, and Generating CHNG's First Kilowatt-hour of Nuclear Electricity	Huaneng Nuclear Power Development Co., Ltd.	 Shidao Bay HTR-PM Nuclear Power Plant Demonstration Project	
3	Doing Everything Possible to Release Potential to Increase Production, and Uniting as One to Guarantee Power Supply	Huaneng Coal Industry Co., Ltd.	 Huating Coal Industry Co., Ltd. Coal Transportation and Marketing — Wujin, the Chartered Freight Train for Coal	

Ranking	Case	Submitted by	Case Picture
4	Forge Ahead to Achieve a Major Breakthrough in Transformative, Flexible and Low-carbon Power Generation Technology	Xi'an Thermal Power Research Institute Co., Ltd.	 5MW Supercritical Carbon Dioxide Based Power Cycle Test Units (Boiler Island)
5	Charging for a Green Future	China Huaneng Group Hong Kong Limited	 Blue Sky and White Clouds Reflect Minety

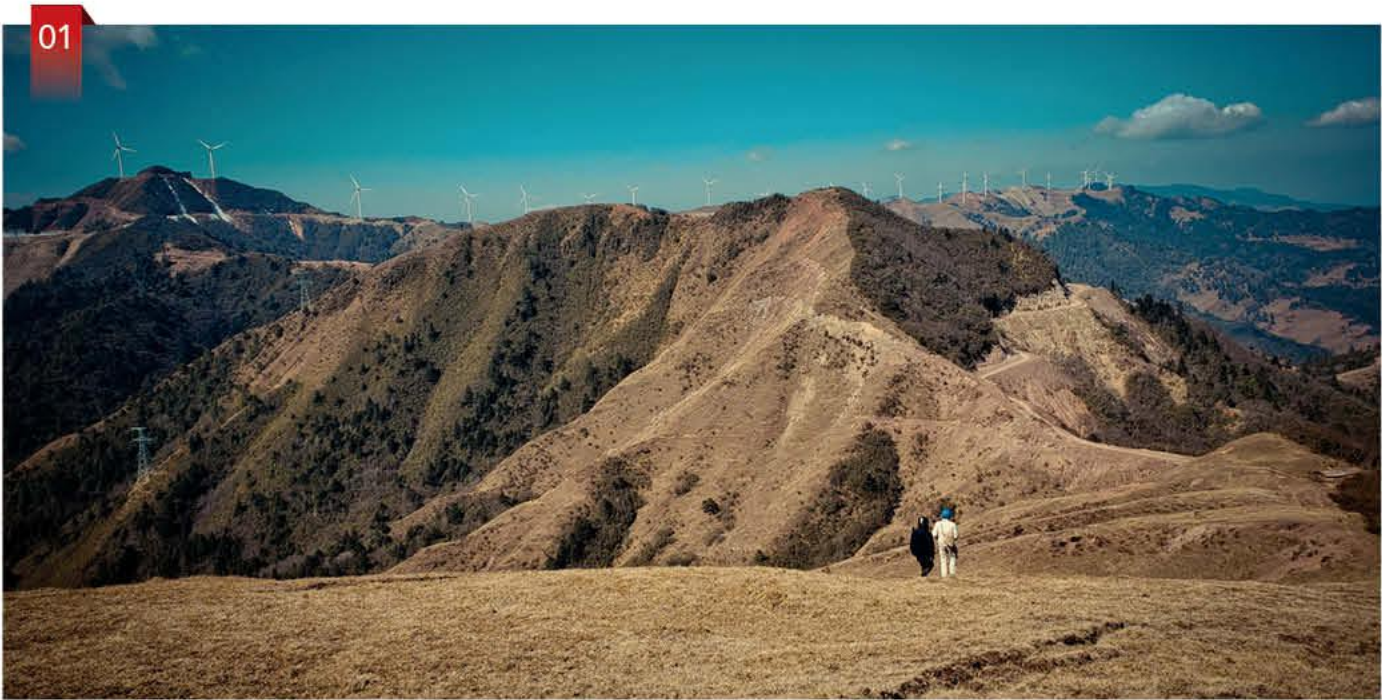
Ranking	Case	Submitted by
6	Get Ahead of the 14 th Five-Year Plan for Promoting the High-quality Development	Huaneng Jiangsu Energy Development Co., Ltd.
7	Secure the Way Home for the Fish — Chinese Hydropower Projects Help Cambodia's Green Development	Huaneng Lancang River Hydropower Inc.
8	Gather Strength in Rural Vitalization and Co-build Beautiful Homestead	Huaneng Xinjiang Energy Development Co., Ltd.
9	Do Everything We Can to Ensure Stability on Coal and Power, Serve People's Livelihood of Longjiang	China Huaneng Group Co., Ltd. Heilongjiang Branch
10	Conduct Layout of Work in an Orderly Manner, Fully Implement the Safety Responsibility	China Huaneng Group Co., Ltd. East China Branch
11	China's First Full Intertidal Fishery and Photovoltaic Complementary Ecological Power Station — Huaneng Qinggang PV Power Station	Huaneng Zhejiang Energy Development Co., Ltd.
12	Win the Battle Against Poverty Alleviation, Boost Rural Vitalization	Huaneng Sichuan Energy Development Co., Ltd.
13	Overall Coordination, Striving for the First Place, Bandao South No. 4 Leads the New Era of Offshore Wind Power in Shandong	China Huaneng Group Co., Ltd. Shandong Branch
14	The No. 8 Unit of Haikou Power Plant Completed Upgrading of Huaneng Ruiwo DCS System	China Huaneng Group Co., Ltd. Hainan Branch
15	New Lead in Scientific and Technological Innovation, and Strive to Build an Industry-leading "Bright Pearl" Power Plant	Huaneng Fujian Energy Development Co., Ltd.

Excellent Works Selected in the Appraisal of the Company's Most Beautiful Responsibility Pictures in 2021

In January 2022, the Company launched the third selection and appraisal of the most beautiful responsibility 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 "Sustainable Development Poll of China Huaneng" open to the public. After a week of fierce competition, the results were finally obtained via voting.



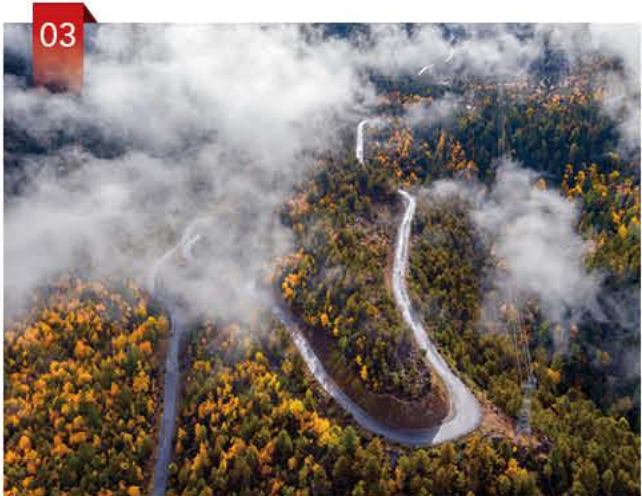
Scan the QR code to
view more information
about the 3rd Most
Beautiful Pictures
Selection and Appraisal
Event of China Huaneng



Huaneng Renewables Corporation Limited:
Green Power in Mountainous Area (by Zhoujie)



Huaneng Jiangsu Energy Development Co., Ltd.:
Nanjing Locals Grew up under the National Flag (by Huangning)



Huaneng Tibet Yarlung Zangbo River Hydropower
Development Investment Co., Ltd.:
**Autumn Scenery of Milin Section of Paizhen-Motuo
Highway** (by Dong Zhixiong)



China Huaneng Group Co., Ltd. Northeast
Branch:
Green Steps (by Dongnan)



Huaneng Coal Industry Co., Ltd.:
Green Mines (by Wang Weiguo)



China Huaneng Group Hong Kong Limited:
**UK Minety Battery Storage Project
Surrounded by Green Trees** (by Guo Jingyu)



Huaneng Shaanxi Power Generation Co.,
Ltd.:
Plateau Wind Farm Covered with Snow (by
Zhang Jie)



China Huaneng Group Co., Ltd.
Shandong Branch:
Offshore Wind Farm at Sunset (by Li Shi)



Huaneng Zhejiang Energy Development
Co., Ltd.:
**Picturesque Fishery and Photovoltaic
Complementary Power Station** (by Geng Tao)



China Huaneng Group Co., Ltd. East China
Branch:
**Females Are as Excellent as Their Male
Peers** (by Li Xiang)



China Huaneng Group Co., Ltd. Jiangxi
Branch:
The Light of Green Development (by
Wang Ben)



China Huaneng Group Co., Ltd. Shanxi
Branch:
**Thousands of Acres of 'Sunflowers' in
Full Bloom** (by Gao Yaping)



Huaneng Eastern Inner Mongolia Energy
Development Co., Ltd.:
Fish Big Splash (by Xiao Yv)



China Huaneng Group Co., Ltd. Qinghai
Branch:
Shadow of Light (by Gong Xiaowen)



China Huaneng Group Co., Ltd. Guizhou
Branch:
**Cultivating Harmony Between Humans
and Nature** (by Zhang Qipin)

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.

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.

For many years, the Company has been steadfastly implementing national strategic deployments, earnestly performing the economic, political, and social responsibilities as a central SOE, and adhering to the "Three-color" corporate mission. The Company has gradually formed the strategic positioning of accelerating the building of a world-class modernized clean energy enterprise featuring "Three Colors, Three Strong, and Three Excellents", with power as the core business, synergy among various energy sources, innovation as the guiding force, finance as the supporting business, and a global layout, thus making contributions to guaranteeing the nation's energy security, promoting energy transition and upgrading, and improving the development of national economy.

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 2021, the total installed capacity of wholly-owned and majority-owned power plants was 205.92GW, and the production capacity of coal was 87.7 million tons per year. The company's total asset was 1.34 trillion yuan. The Company was ranked No. 215th among Fortune Global 500, up 33 places as compared to the previous year. SASAC has awarded the Company A-level performance assessment results for 17 times, among which 13 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	Audit Center	New Energy Intelligent Operation and Maintenance Center

Industrial Companies

Huaneng International Power Development Corporation (Equity Management Center)	Huaneng Renewables Corporation Limited
Huaneng Power International Inc. (Thermal Power Construction Center, Engineering Technological Economy Management Center)	Huaneng Nuclear Power Development Co., Ltd. (Nuclear Power Business Unit)
Huaneng Energy & Communications Holding Co., Ltd. (Material Supply Center)	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 Clean Energy Research Institute Co., Ltd. (New Energy Technology R&D Center)
Huaneng Properties Co., Ltd. (Huaneng Integrated Industry Co., Ltd.)	China Huaneng Group Hong Kong Limited (Overseas Business Unit, Huaneng Overseas Enterprises Management Co., Ltd.)
Xi'an Thermal Power Research Institute Co., Ltd.	Huaneng Integrated Energy Services Co., Ltd.
China Huaneng Group (Hong Kong) Treasury Management Holding Limited	Huaneng Yangtze River Environmental Technology Co., Ltd.
Huaneng Nuclear Energy Technology Research Institute Co., Ltd. (Huaneng High-temperature Reactor Technology Research Center)	

Regional Branch Companies

China Huaneng Group Co., Ltd. Xiong'an Branch (Huaneng (Xiong'an) Urban Integrated Energy Services Co., Ltd.)	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 (Maintenance Center)
China Huaneng Group Co., Ltd. Central China Branch	Huaneng Guangdong Energy Development Co., Ltd.	China Huaneng Group Co., Ltd. Hebei Branch	China Huaneng Group Co., Ltd. Shanxi Branch
China Huaneng Group Co., Ltd. Jilin Branch	China Huaneng Group Co., Ltd. Heilongjiang Branch	China Huaneng Group Co., Ltd. Anhui Branch	Huaneng Fujian Energy Development Co., Ltd.
China Huaneng Group Co., Ltd. Jiangxi Branch	China Huaneng Group Co., Ltd. Henan Branch	China Huaneng Group Co., Ltd. Hunan Branch	Huaneng Zhejiang Energy Development Co., Ltd.
China Huaneng Group Co., Ltd. Hainan Branch	China Huaneng Group Co., Ltd. Shandong Branch	China Huaneng Group Co., Ltd. Chongqing Branch	China Huaneng Group Co., Ltd. Guangxi Branch
China Huaneng Group Co., Ltd. Guizhou Branch	China Huaneng Group Co., Ltd. Qinghai Branch	Huaneng Jiangsu Energy Development Co., Ltd.	North United Power Co., Ltd.
Huaneng Sichuan Energy Development Co., Ltd.		Huaneng Ningxia Energy Co., Ltd.	
Huaneng Lancang River Hydropower Inc. (China Huaneng Group Co., Ltd. Yunnan Branch, Huaneng Lancang River Upstream Hydropower Co., Ltd.)		Huaneng Tibet Yarlung Zangbo River Hydropower Development Investment Co., Ltd. (China Huaneng Group Co., Ltd. Tibet Branch)	
Huaneng Eastern Inner Mongolia Energy Co., Ltd.		Huaneng Xinjiang Energy Development Co., Ltd.	
Huaneng Shaanxi Power Generation Co., Ltd. (China Huaneng Group Co., Ltd. Northwest Branch)		Huaneng Gansu Energy Development Co., Ltd.	

Companies Directly Managed by China Huaneng Group

Huaneng Tendering Co., Ltd.	Huaneng Information Technology Co., Ltd.
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Key Performance

Safety Responsibility Performance						
Indicator Name	Unit	2017	2018	2019	2020	2021
Investment in Production Safety (Technological Upgrading)	100 Million Yuan	4.17	5.43	11	9.8	5.97
Major Equipment Accident	Case	0	0	0	0	0
General Equipment Accident	Case	0	0	0	0	1
Accidents of Personnel Injury and Casualties	Case	4	2	6	10	7
Category 1 Obstacle	Case	15	17	14	9	4
Number of Unplanned Outages (hydro & thermal power)	Case	151	184	130	97	91
Unit Equivalent Availability Factor (hydro & thermal power)	%	94.19	94.21	94.22	94.49	93.90
Environmental Responsibility Performance						
Indicator Name	Unit	2017	2018	2019	2020	2021
Total Investment in Environmental Protection	100 Million Yuan	42.00	17.27	24.82	10.20	13.0
Total Investment in Energy-saving Technological Upgrading	100 Million Yuan	3.55	4.14	4.50	4.88	5.09
Low Carbon Clean Energy Installed Capacity	10MW	5325	5858	6163	7192	7849
Low Carbon Clean Energy Proportion	%	31.00	33.18	33.72	36.61	38.12
Hydropower Installed Capacity	10MW	2226	2607	2697	2756	2756
Wind Power Installed Capacity	10MW	1785	1863	1996	2530	2917
Photovoltaic Installed Capacity	10MW	243	318	400	645	912
Coal Consumption for Power Supply	g/kWh	300.11	298.72	297.55	295.34	294.04
Auxiliary Power Ratio	%	4.01	3.97	3.78	3.73	3.69
Ash Comprehensive Utilization Rate	%	81.40	76.45	75.92	75.64	77.10
Sulfur Dioxide Emission Performance for Thermal Power Generation	g/kWh	0.100	0.074	0.072	0.072	0.070
Nitrogen Oxide Emission Performance for Thermal Power Generation	g/kWh	0.164	0.146	0.141	0.139	0.137
Smoke and Dust Emission Performance for Thermal Power Generation	g/kWh	0.018	0.012	0.011	0.010	0.009
Installed Capacity of Ultra-low Emission Units	10MW	10562	11249	11526	11605	12300
Proportion of Ultra-low Emission Units	%	90	95	96	97	99
Fresh Water Consumption for Power Generation	10,000 Tons	56746	58597	57396	54021	59980
Unit Water Consumption for Power Generation	kg/kWh	1.09	1.04	1.06	1.00	1.02

Economic Responsibility Performance						
Indicator Name	Unit	2017	2018	2019	2020	2021
Installed Capacity	10 MW	17182	17657	18278	19644	20592
Thermal Power Installed Capacity	10 MW	12928	12869	13185	13712	14006
Power Generation	100 GWh	6496	7026	7057	7083	7744
Coal Production Capacity	10,000 Tons/Year	7790	7760	8260	8500	8770
Coal Production	10,000 Tons	7107	7086	7450	7607	8664
Total Assets	100 Million Yuan	10396	10733	11261	11875	13399
Total Operating Income	100 Million Yuan	2607	2786	3062	3142	3855
Total Profit	100 Million Yuan	119	144	178	224	133
Asset-Liability Ratio	%	78.88	76.98	73.70	69.61	72.74
Total Number of Personnel in Science and Technology	People	2993	1966	2388	1381	1493
National Authorized Patents	Item	541	648	777	1785	6307
Among Them: Patents for Invention	Item	199	163	121	135	251
Scientific and Technological Achievements Award at Provincial/Ministerial Level and Above	Item	22	21	21	39	66
Social Responsibility Performance						
Indicator Name	Unit	2017	2018	2019	2020	2021
Paid Taxes	100 Million Yuan	228	255	267	297	278
Number of In-Service Employees	People	138473	135329	131579	124628	120927
Number of New Employment throughout the Year	People	4754	4475	4222	4196	4366
Number of Female Employees	People	33929	32415	30319	28783	27096
Female Manager Ratio	%	32	38	32	31	30
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	64	85	70	86	82
Employee Training Coverage	%	66	78	79	80	76
Total Amount of Donation	Ten Thousand Yuan	55609	60377	73120	28205	16062
Employee Volunteers	Person-times	80750	80843	80710	80055	78593

Indicator Index

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CHNG in Sustainable Development		GRI102	P4.1,G1.1,G1.2	P02
Message from the Chairman		GRI200,GRI300,GRI400	P2.1,P2.2,P3.1,P3.2	P08
Paying Tribute to the Glory and Looking Back at 2021			P3.1,P3.2,G3.1	P10
Drawing Strength from the History of the Party and Creating a Mainstay in the New Undertaking		GRI102	P3.1,P3.2	P12
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Carrying out Charitable Activities to Convey Love and Warmth	B8.1,B8.2	GRI413	S4.6,S4.9,S4.10	P70
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Rating Report

Rating Report for 2021 Sustainability 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 2021 Sustainability 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 a social responsibility management committee with the President and Deputy Secretary of the Party Leading Group as the person-in-charge to review the content of the Report. The Social Responsibility Division of the Planning and Development Department took the lead in setting up a report compilation team. The Deputy Chief Economist of the company, the Director General 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 the social responsibility management 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, Huaneng Lancang River Hydropower, and Great Wall Securities to publish their respective CSR reports to build a multi-level reporting system. 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 100 Excellent Enterprises" for several releases. It will be presented in different forms including electronic file, printed version, Chinese and English versions, and animation video version. 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, securing power supply, production safety, developing green power, saving energy resources, developing circular economy, reducing "three wastes" emission, plant area and surrounding environment governance, etc. with detailed narration and excellent materiality performance.

Integrity (★★★★☆)

From the perspectives of "Enhancing Management and Shaping New Development Advantages of Huaneng", "Improving Main Businesses and Shaping a New Pattern of Power Development" and "Taking More Responsibilities and Embarking on a New Journey of China's Development", the main body of the Report discloses 82.53% of the core indicators of the power production industry with remarkable integrity performance.

Balance (★★★★★)

The Report disclosed negative data including "employees turnover rate", "work safety accidents of large-scale nature or worse", "major environmental protection and safety incidents", "number of major equipment accidents", "number of general equipment accidents", "number of accidents involving personnel injuries and casualties", "number of unplanned outages", etc. with resume of the causes and treatment measures of the safety accident of Hengdan Hydropower Station, with excellent balance performance.

Comparability (★★★★★)

The Report discloses the comparative data for 3 consecutive years of 54 indicators, such as "Total Operating Income", "Total Profit", "Training Time per Employee", "Total Amount of Donation", "Low Carbon Clean Energy Proportion" and "Coal Consumption for Power Supply", making an excellent comparability performance.

Readability (★★★★★)

The Report is themed on "Striving for High-quality Development", presents in three chapters a systematic display of CHNG's responsibility performance actions and results in respect of key issues, showing a clear frame structure, highlighting important issues and interprets the Company's in-depth understanding of the fulfillment of social responsibilities. In a variety of styles, the cover creatively integrates the elements of main businesses such as wind power, PV, nuclear power, hydropower and electricity industry worker into special responsibility performance scenarios, which contributes to an increased vividness and identification of the Report. Each chapter begins on a separate page with a large picture of the real scene of corresponding special responsibility performance scenarios, taking Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China as a guide and inserting key issues and major results, facilitating readers to quickly comprehend the key information. Third-parties' testimony is referred to as support of effective performance of corporate responsibilities. QR codes are printed in the Report for extended reading of in-depth interpretation, achieving better readability.

Innovativeness (★★★★★)

The Report is themed on four major topics including "Drawing Strength from the History of the Party and Creating a Mainstay in the New Undertaking", "Aiming at Goals of Carbon Peaking and Carbon Neutrality and Creating a National Business Card in the Field of Nuclear Power", "Empowering Common Prosperity and Composing a Splendid Movement about Rural Revitalization", "Deeply Implementing the Belt and Road Initiative and Daring to be an Energy Role Model Guided by International Standards", respond to the hot issues of the Party Building, Carbon Peaking and Carbon Neutrality Strategies, Common Prosperity and the BRI, which manifests CHNG's sense of responsibility as a centrally administered state-owned enterprise. Each chapter ends with a responsibility column to demonstrate responsibility performance highlights. These two features contribute to the Report's excellence in innovativeness.

Overall Rating (★★★★★)

According to the rating team, the 2021 Sustainability 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 Sustainability Report Received Five-Star Rating for the Eleventh Consecutive Year



Scan the QR Code to View Enterprise Rating Files

黄晓慧

Vice Chairman of the Expert Committee

王志刚

Leader of the Rating Team

张勇

Expert of the Rating Team

Date of Issuance: August 2, 2022

Feedback

Dear readers:

Thank you for reading the 2021 Sustainability Report of China Huaneng Group Co., Ltd. We would like to improve the quality of both our social responsibility 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 Report System



Interpretation of the Creativity of the Sustainability Report 2021-2025

CHNG's five sustainability 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 and fields along the "North Line" and seas and cities along the "East Line". 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", will concentrate on the implementation of the strategies featuring "two-lines" (North Line and East Line) and "two-integrations" (integration of wind, photovoltaic, coal, electricity transmission and consumption, and integration of offshore wind power investment, construction, operation and maintenance), make all-out efforts to develop new energy, nuclear power and hydropower, and embark on a new journey to start a new undertaking. In this context, CHNG will continue moving forward on the road of high-quality and sustainable development, make new, greater contributions to accelerating the building into a world-class modern clean energy company, and devote wholeheartedly to the successful conclusion of the "14th Five-Year Plan".