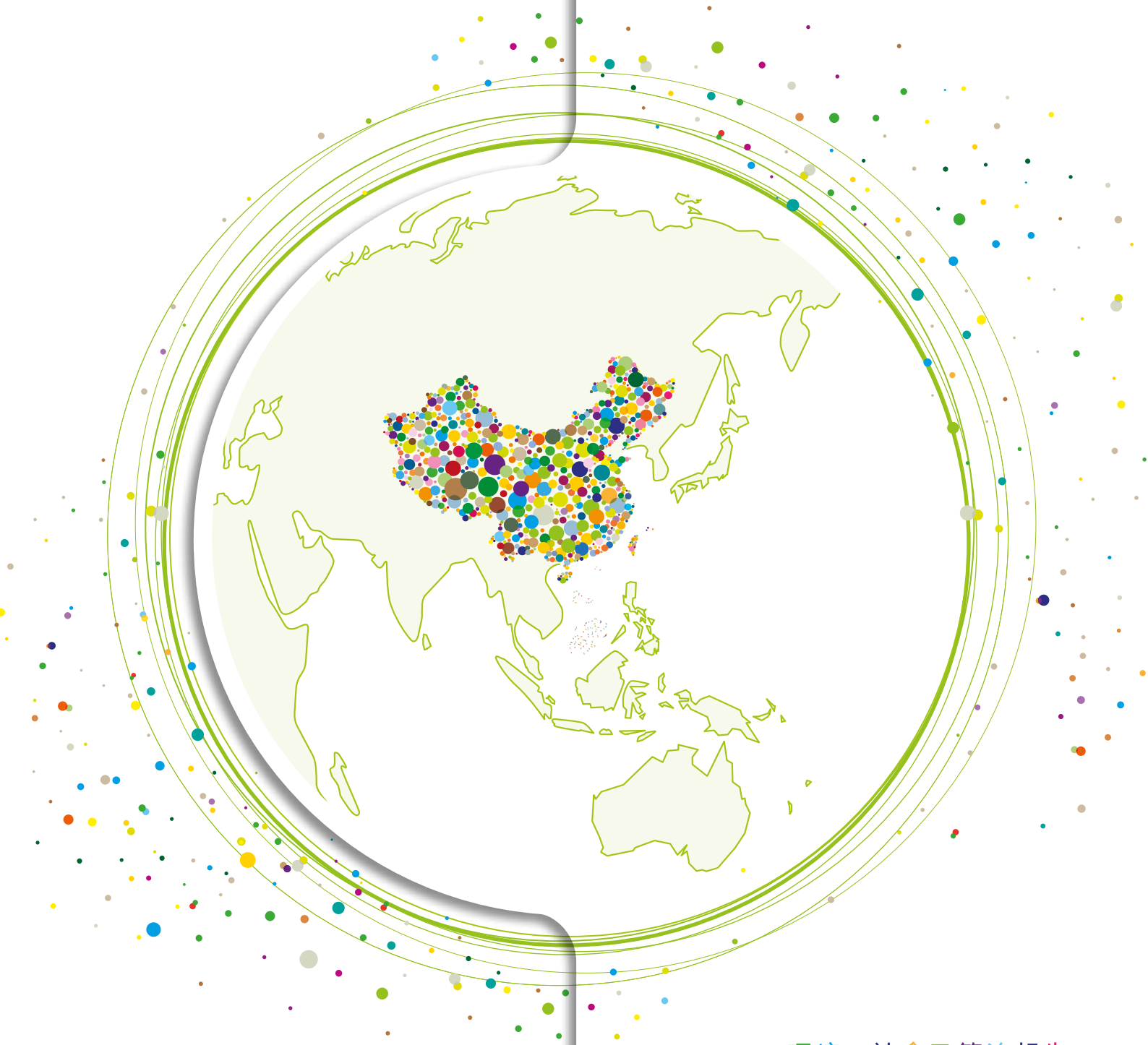
華能國際電力股份有限公司
Huaneng Power International, Inc.



環境、社會及管治報告
Environmental, Social and Governance Report
2019

華能國際電力股份有限公司
Huaneng Power International, Inc.

綠色未來
GO GREEN

CONTENTS

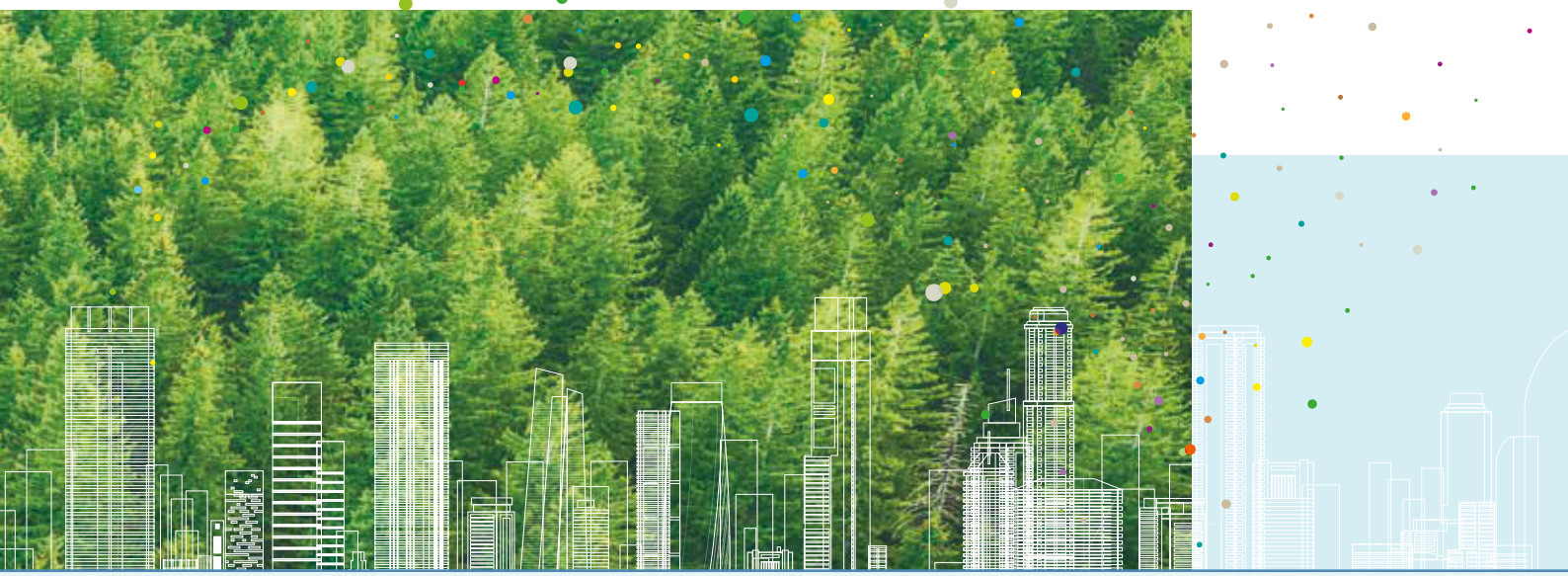
Chairman's Statement

In 2019, we advanced through difficulties and achieved breakthrough through innovation. 2019 is a crucial year for building China into a moderately prosperous society as well as for achieving its first 100-year goals. This year comes at a time when Huaneng International is taking further steps to develop itself into an international leading power generation listed company.

Huaneng International came into existence amid a wave of reform and opening-up policies and continues on the path of sustainable development with determination to fulfil the responsibilities and missions under the New Era. As a company engaging in power generation, we are dedicated in providing sufficient, reliable and environmental-friendly electrical power to the society; as a listed company, we are dedicated in creating long-term, stable and incremental return to our shareholders; as a People-Oriented company, we are dedicated in providing our staff with an environment which encourages contribution and facilitates career development and integrated development.

As an influential corporate, Huaneng International persists in carrying forward the environmental protection concept of "Energy Conservation, Emission Reduction and Clean Development" in its battle against pollution. In 2019, we took concrete measures to push forward several pollution prevention projects under the government's pollution control initiative, including the successfully-completed ultra-low emission retrofit project under the "13th Five-Year Plan" and the progressing environmental protection renovation projects such as coal field close-down and wastewater and ash yard treatment. We have remained industry-lead in respect of the emission performance of pollutants such as sulphur dioxide, oxynitride and soot.

As an influential corporate, Huaneng International always adheres to the production safety principles of "people oriented, safety first, prevention first and comprehensive management" to build a solid foundation for safety production. We prioritize the identification and remedial of safety hazards and have zero-tolerance on accidents. In 2019, Huaneng International actively performs inspection and assessment for the production safety accountability system and performs special inspections on high-risk technical renovation sites such as closed-down coal fields as well as emergency response exercises for incidents such as natural gas pipeline explosion and liquid nitrogen leakage. We secured the power supply for key hours during the 70th National Day celebration, the second session of the Belt and Road Summit and National People's Congress and Chinese People's Political Consultative Conference.



As an influential corporate, Huaneng International insists on the harmonious development concepts of "serve the Country, benefit society, seek multilateral benefits and develop together", and is committed to working with stakeholders to promote high-quality and sustainable development. In 2019, we maintained effective communication with stakeholders by thoroughly considering and promptly responding to their concerns and demands to create mutual benefit and shared values and to share achievements and fulfil social responsibilities, while continuing to boost our corporate image and give back to society.

The year 2020 marks the end of the implementation of the "13th Five-Year Plan". The task is difficult, and the situation is complicated, but the mission is glorious. Huaneng International will adhere to "Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era", uphold the new development concept and high-quality development requirements and at the same time strengthen our confidence, seek transformation, improve quality and efficiency, prevent risks, build strong brands, overcome difficulties and focus on innovation. To achieve this honourable mission, we will overcome difficulties and complexities to fulfil the goals set out in the "13th Five-Year Plan" with determination, diligence and perseverance and improve the Company's resilience, service quality and scale so as to establish ourselves as the international leading listed power generation company.

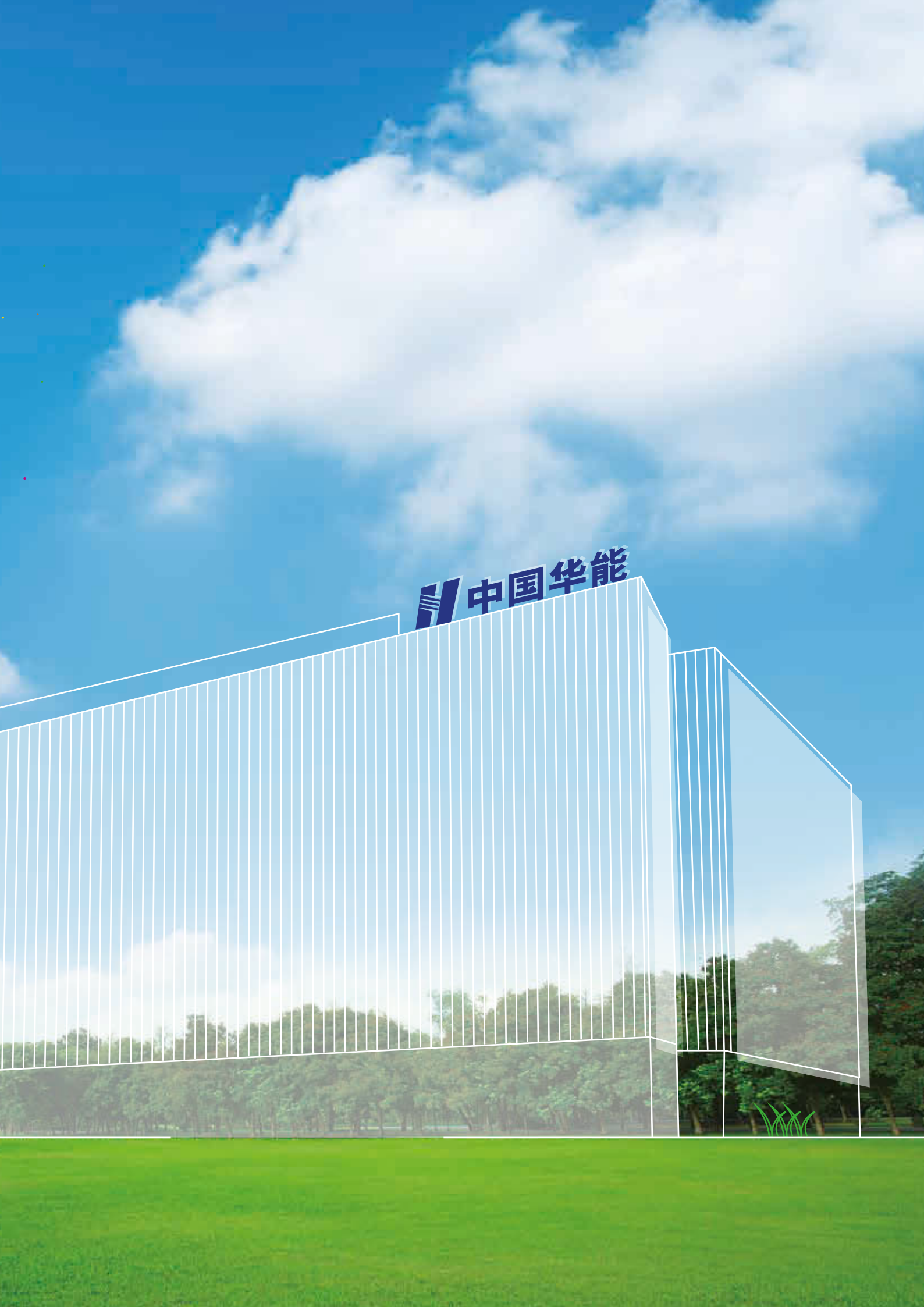
Zhao Keyu

Chairman

Huaneng Power International, Inc.

02

About Us


中国华能

2.1 Company Profile

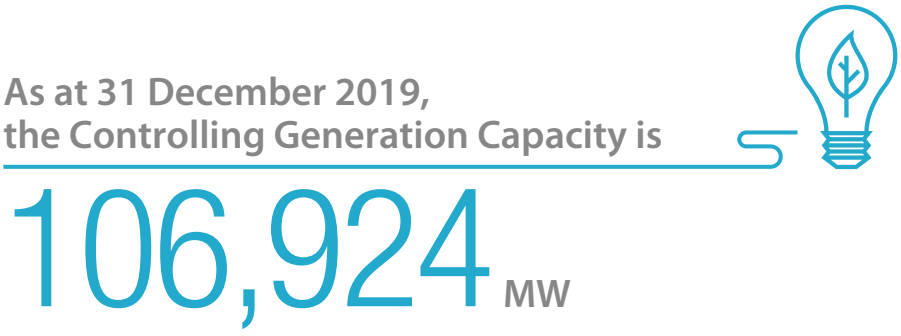
Huaneng Power International, Inc. ("Huaneng International", "the Company" or "we") was incorporated on 30 June 1994. The core business of the Company is, by making use of modern technology and equipment and also financial resources available domestically and internationally, to develop, construct and operate large scale power plants. The company is one of China's largest listed power producers, as well as the first power company in China to get listed in New York, Hong Kong and Shanghai.

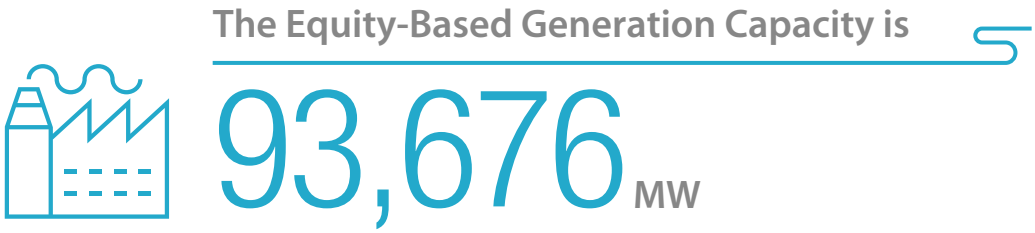
As the core enterprise of China Huaneng Group Co., Ltd.'s ("Huaneng Group" or "Group Company") central industry, Huaneng International is committed to developing itself into an international leading power generation listed company, committed to providing sufficient, reliable and environmentally friendly power and high-quality energy services for the society, as well as to system, technology and management innovations. On aspects regarding the advancement in power technologies and construction and management of power plants, the Company has been the pioneer and has created various milestones within the domestic power industry, which facilitated the great leap development of the power business and technological advancement of the power station equipment manufacturing industry in China, and also significantly contributed to the improvement of technical and management standards of the domestic power generation enterprises.

Throughout the years, with efforts in seeking expansion and operating our business in a prudent manner, the Company has expanded successively with steady growth in competitive strengths. The success of the Company is attributable to its various advantages, including advantages in scale and equipment, advantages in geographic layout of power plants, strong support from major shareholders, sound corporate governance structure, advantages in market reputation, extensive experience in the capital markets, advantages in overseas development, staff with high calibre and professional management.

As at 31 December 2019, the Company had a controlling generation capacity of 106,924 MW and equity-based generation capacity of 93,676 MW. The Company's domestic power plants are located in 26 provinces, autonomous regions and municipalities. The Company wholly-owns a power company in Singapore and invests in a power company in Pakistan.

In 2019, the Company won the "Outstanding Social Responsibility Enterprise" under the Golden Bull Award for Corporate Social Responsibility at the China Social Responsibility 100 Forum and the "Outstanding Contribution Enterprise for the 70th Anniversary of the People's Republic of China" award at the China Securities Golden Bauhinia. The "Outstanding Social Responsibility Enterprise" signified the Company's achievement in its fulfilment of corporate social responsibilities and demonstrated the Company's value. The "Outstanding Contribution Enterprise for the 70th Anniversary of the People's Republic of China" award marked the capital market's recognition of our opening-up policy and "go global" strategy as well as our tremendous contribution to the prosperity and revival of our country. This further reflected the Company's strong image in the international capital market and was a great honour to the Company.





2.2 Corporate Governance

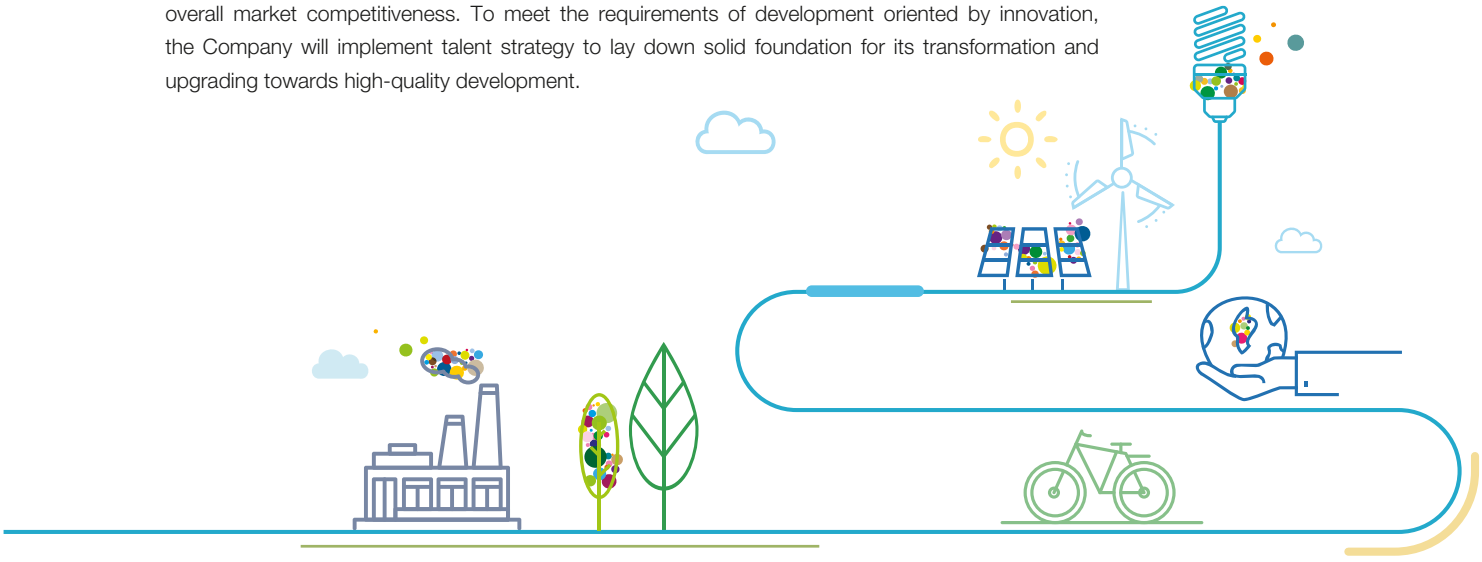
As a public company listed in three markets both domestically and internationally, the Company is subject to the regulations of the securities regulatory authorities of the three listing venues and the supervision of investors at large. Since its establishment, the Company has been completing and improving its modern governance system and capacity in accordance with the requirements of modern enterprise systems. We have established and improved a corporate governance structure consisting of the shareholders' general meeting, the Board, the Supervisory Committee, and the management team and built an operating system where those granted with decision-making power, supervisory power, and management powers have clearly-defined powers and responsibilities, perform their duties, check and balance each other, and coordinate with each other, ensuring the effective enforcement of the decision-making power of the shareholders' general meeting and the Board, and the supervisory power of the Supervisory Committee, and the efficiency and compliance of the operation and management power of the management team.

Through years of exploration and practice, it has gradually built up a sound and regulated corporate governance structure and an effective system of rules that caters for the development of the Company. The company will regularly review and evaluate the suitability of the corporate governance structure and make any necessary amendments and improvements to achieve a dynamic maintenance system.

2.3 Development Strategy

The Company is committed to implementing new development initiatives for innovation, coordination, greenness, openness and sharing. The Company will focus on quality and efficient development in accordance with the requirements for clean, low-carbon, safe and efficient energy system. Driven by reform and innovation, safeguarded by institutionalized mechanism and oriented towards supply-side structural reform, the Company strive to grown into an internationally leading public power producer with standardized management, advanced technologies, energy saving and environment-friendly, reasonable operating structure, outstanding operations, sound corporate governance and superior market value.

The Company will implement green conversion strategy in line with requirements of energy transformation and reform, focus on development and acquisition to speed up investment in integrated large-scale clean energy base including wind, solar, coal, power, transmission and offshore wind power base, consider and implement development with reduced coal-fired power generation, steadily eliminate backward coal-fired power generation, promote orderly improvement and upgrade of coal-fired sector, and increase technological innovation in clean and efficient use of coal to actively build an integrated heating producer. The Company will adapt to the requirements of market-oriented power reforms by implementing business transformation strategy, actively extend its main business from power generation to integrated industrial chain of power and heat generation, peak adjustment, distribution, energy storage, energy conservation and environmental protection, promote integration of the industrial chain, supply chain and value chain, and strive to transform into an integrated energy service provider. The Company will meet the requirements of the intelligent era by implementing digital operation strategies, make steady efforts for construction of smart power plants, industrial Internet, and online operation system, and improve overall market competitiveness. To meet the requirements of development oriented by innovation, the Company will implement talent strategy to lay down solid foundation for its transformation and upgrading towards high-quality development.



China
Network

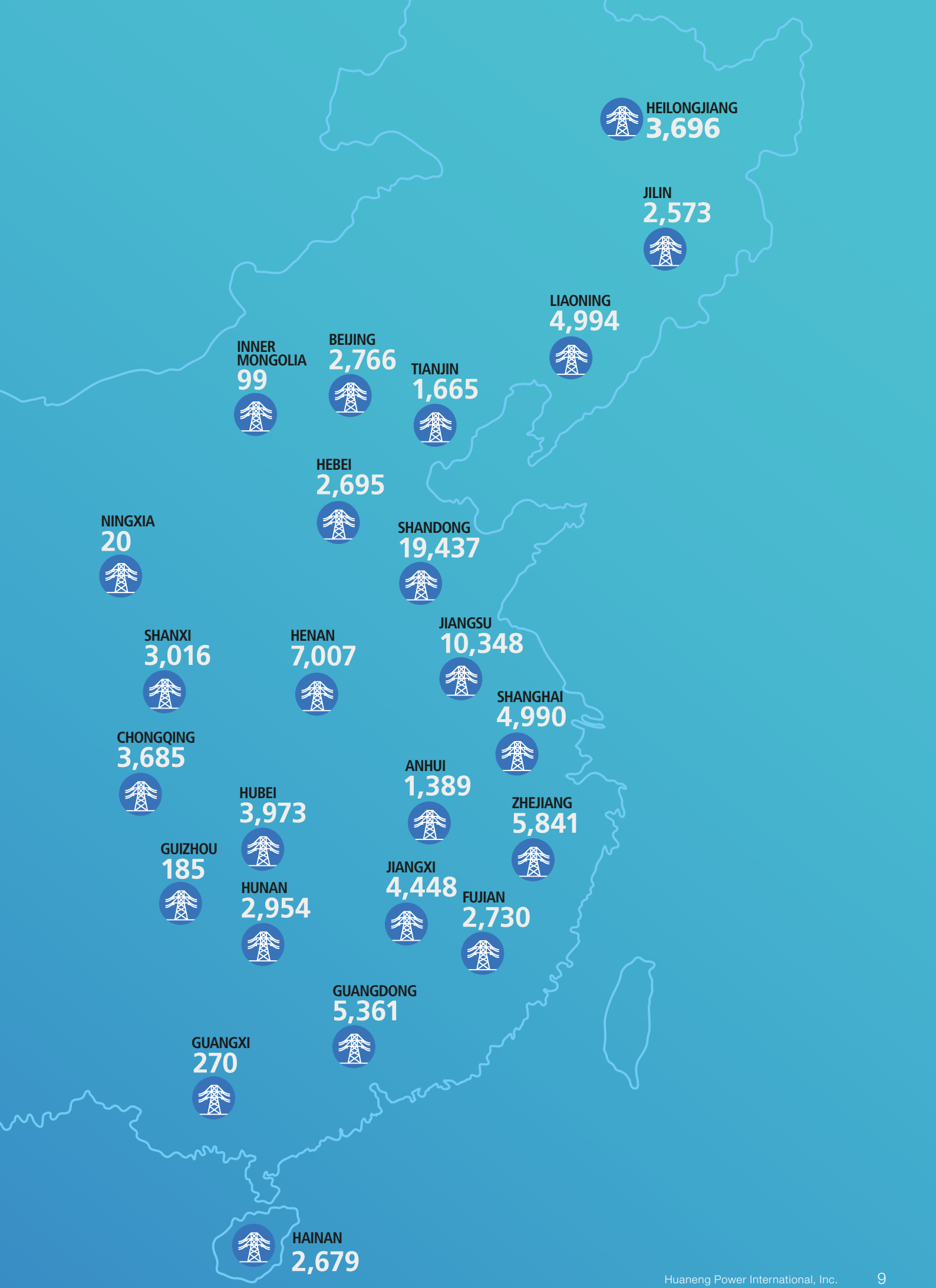
GANSU
3,697

DISTRIBUTION OF POWER PLANTS OF THE COMPANY

The controlled power generation capacity of the Company as at 31 December 2019 is 106,924 MW, distributed in areas as depicted in the chart (Unit: MW)

Overseas Network

YUNNAN
3,800


HEILONGJIANG
3,696
JILIN
2,573
LIAONING
4,994
INNER MONGOLIA
99
BEIJING
2,766
TIANJIN
1,665
HEBEI
2,695
NINGXIA
20
SHANDONG
19,437
SHANXI
3,016
HENAN
7,007
JIANGSU
10,348
SHANGHAI
4,990
CHONGQING
3,685
ANHUI
1,389
HUBEI
3,973
ZHEJIANG
5,841
GUIZHOU
185
JIANGXI
4,448
HUNAN
2,954
FUJIAN
2,730
GUANGDONG
5,361
GUANGXI
270
HAINAN
2,679

2.4 Company Philosophy

Corporate Missions	• Becoming a "red" company that contributes to and serves national strategies, ensures energy security, and serves socialism with Chinese characteristics • Becoming a "green" company that carries out energy revolution, helps construct ecological civilization, and provides clean energy and power to meet the needs of the people for living beautiful lives • Becoming a "blue" company that participates in global energy stewardship, serves the "Belt and Road" construction, and makes a positive contribution to building a community of shared future for mankind
Corporate Core Values	• Upholding integrity, focusing on cooperation • Innovating continuously, progressing actively • Creating achievements, serving the state serving the Country
Corporate Target	• Developing itself into an international leading power generation listed Company
Corporate Responsibilities	• Provision of sufficient, reliable and environmental-friendly power for the society • Strive for delivery of long-term, stable and increasing returns for shareholder • Support the fully development for employee to establish self-achievements
Corporate Spirits	• Spirit of professional dedication-undergoing all conceivable hardships and using every conceivable means • Spirit of pioneering-cutting paths through mountains and building bridges across rivers • Spirit of progress-finding oneself gaps and pushing oneself ahead • Spirit of innovation-daring to lead and venturing to do the impossible
Corporate Manner	• Being good at pioneering; focusing on efficiency; caring for reputation; thrifty in working

2.5 ESG Responsibility Management

The Board of Directors assumes the overall responsibility for the Company's tactics and reports on environmental, social and governance ("ESG") as well as for the assessment and determination of risks concerning ESG, and ensures for the Company the establishment of a proper and effective system of risk management and internal supervision thereto. The Company's management provides information to the Board of Directors to assess the effectiveness of the system. Each of the requirements of ESG play a catalytic role for the improvement of operation and management level of Huaneng International.

Situations Faced with the Company's ESG

In 2020 the Chinese government will further its efforts to maintain stability of employment, financial market, foreign trade, foreign and domestic investments, and expectations; continue to improve macro-control measures to be more foresighted, pertinent and effective; focus on continued economic reform to ensure consistent economic growth; and make continued efforts of supply-side reform for quantitative growth as well as steady quality improvement qualitatively with view to promoting high-quality development.

In the electricity market, with comprehensive consideration of international and domestic conditions, industrial and local developments as well as other factors, absent of floods and other extensive, extreme climate changes, it is expected that in 2020, total electricity consumption nationwide will increase by 4% to 5%, newly installed power generation capacity for infrastructure construction will be approximately 120 million kilowatts, and utilization hours of thermal generating units will be 4,280 hours, which is generally consistent with those in 2019.

In the coal market, coal supply is expected to steadily increase with approval by competent Chinese authorities of operation of new and existing major coal producers with expected capacity of 100 million tons of coal in 2020. The improved environmental protection and safe production of coal mines and lessened impact of inspections on the normal production of coal mines will also contribute to sufficient coal supply. In 2020, the coal market will generally see its balanced supply and demand move towards a relatively over supply situation, and the thermal coal prices are expected to move further down.

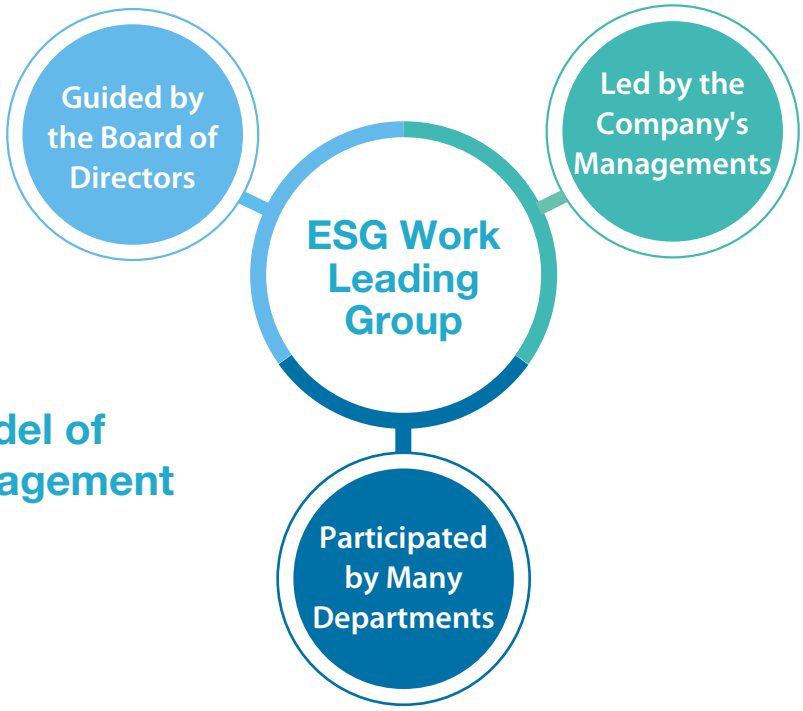
In capital market, the Chinese government will continue to implement proactive fiscal policies and prudent monetary policies in 2020. The prudent monetary policy is expected to be implemented flexibly and appropriately, maintain reasonable and adequate liquidity, and increase monetary credit and social financing in line with economic development while reduce social financing costs. Accordingly, 2020 is expected to see reasonably sufficient capital supply throughout the year with reduced funding costs.

ESG Management

In addition to providing supervision and guidance, the Company's Board of Directors hold regular meetings at which management teams present their reports on production safety, operation and management, internal controls, and corporate social responsibility. There are four committees under the board, namely strategy, audit, nomination, and remuneration and evaluation. The strategy committee is in charge of the Company's decision making in comprehensive risk management and regularly reviews reports on the Company's risk management work. Its responsibilities include, but are not limited to, risk rating, risk management effectiveness evaluation, and approval of the Company's comprehensive risk management annual report as well as risk assessment reports on important decisions. The audit committee is responsible for identifying and assessing the risk of fraud committed by senior executives and board members of the Company, and compiles independent fraud risk assessment reports. It also regularly reviews reports on the Company's internal controls and evaluates the effectiveness of the internal control system, as well as communicating with the human resources department on issues concerning recruitment and code of conduct. All members on the audit committee are independent directors of the Company who carry out onsite inspection every year to monitor and make recommendations on production safety, operation and management, internal controls, and corporate culture of the Company's subsidiaries. The management of production safety, employee health, energy conservation and environmental protection, fraud risk, internal controls and corporate culture has already been incorporated into the daily work of the board and its various committees.

To ensure that the requirements of Environmental, Social and Governance Reporting Guide (《環境、社會及管治報告指引》) ("ESG Reporting Guide") issued by The Stock Exchange of Hong Kong Limited ("Hong Kong Stock Exchange" or "HKEx") are effectively implemented, the Company has established ESG work leading group. A dedicated principal of the Company has been assigned as group leader, with principals of different departments and offices being vice group leaders. They make decisions on major issues during the process of the guidelines' implementation. Meanwhile, different departments also have assigned certain relevant personnel as group members to take charge of daily communication and detailed implementation of ESG management. With the establishment of ESG work leading group, the contact mechanism of ESG management has made its appearance in the Company. This has established a work model of ESG management, which is guided by the Board of Directors, led by the Company's managements and participated by many departments together, and comprehensively guaranteed the effectiveness and applicability of the Company's ESG management.

Work Model of ESG Management



2.6 Table of Key Performance Indicators in 2019

Based on the requirements of HKEx's ESG Reporting Guide and the Global Reporting Initiative (GRI)'s Sustainability Reporting Standards (《可持續發展報告指南》), Huaneng International has analysed the Company's environmental, social and governance status, carried out benchmarking analysis against the guidelines' requirements and peer companies' situations, and finally laid down the key performance indicators of year 2019. Please see the table below.

Performance Categories	Performance Indicators	2019	2018
Economy	Operating revenue[1] (100 million RMB)	1,740.09	1,695.51
	Sales of power and heat[1] (100 million RMB)	1,649.36	1,663.07
	Sales of coal and raw material[1] (100 million RMB)	18.81	8.64
	Port service[1] (100 million RMB)	1.75	1.45
	Transportation service[1] (100 million RMB)	0.49	0.53
	Others[1] (100 million RMB)	69.68	21.82
	Operating expenses[1] (100 million RMB)	1,597.99	1,576.47
	Net profit[1] (100 million RMB)	11.08	13.30
	Donation in the Company's name (ten thousand RMB)	2,372.70[2]	1,986.02
	Controlling generation capacity[1] (MW)	106,924	105,991
	Equity-based generation capacity[1] (MW)	93,676	93,755
	Domestic power generation (100 million kWh)	4,050.06	4,304.57
	Average annual unplanned outage (times/unit·annum)	0.22	0.40
Environment	Average coal consumption rate for power sold (g/kWh)	307.21	307.03
	Year-on-year change of average coal consumption rate for power sold (%)	0.06 ↑	0.18 ↑
	Consumption of standard coal (ten thousand tons of standard coal)	11,122.21	11,710.00
	Oil consumption in production (tons)	32,056.74	34,031.00
	Natural gas consumption (ten thousand of standard cubic meters)	478,015.35	482,147.00

Performance Categories	Performance Indicators	2019	2018
Environment	Weighted average house consumption rate (%)	4.49	4.34
	Overall water consumption (million tons)	18,268.44	19,742.20
	Fresh water consumption in power generation (million tons)	435.82	448.24
	Water consumption in open cooling circulation (million tons)	17,832.62	19,293.96
	Performance value of consumption of fresh water in power generation (kg/kWh)	1.08	1.04
	Performance value of emission of sulphur dioxide (g/kWh)	0.06	0.06
	Performance value of emission of nitrogen oxides (g/kWh)	0.13	0.13
	Performance value of soot emission (g/kWh)	0.01	0.01
	Sulphur dioxide emissions (tons)	25,355.58	26,104.17
	Nitrogen oxides emissions (tons)	52,501.67	56,043.93
	Soot emissions (tons)	3,583.00	4,070.97
	Total amount of energy-related direct greenhouse gas emissions (ten thousand tons of carbon dioxide equivalent)	33,615.42	34,810.51
	Greenhouse gas emissions generated by coal consumption (ten thousand tons of carbon dioxide equivalent)	32,495.00	33,674.61
	Greenhouse gas emissions generated by natural gas consumption (ten thousand tons of carbon dioxide equivalent)	915.40	902.45
	Greenhouse gas emissions generated by fuel consumption (ten thousand tons of carbon dioxide equivalent)	9.92	10.13
	Greenhouse gas emissions generated by desulphurization (ten thousand tons of carbon dioxide equivalent)	195.10	223.32
	Energy-related direct greenhouse gas emission intensity (grams of carbon dioxide equivalent/kWh)	733.89	730.02
	Total amount of energy-related indirect greenhouse gas emissions (ten thousand tons of carbon dioxide equivalent)	14.72	11.91
	Energy-related indirect greenhouse gas emission intensity (grams of carbon dioxide equivalent/kWh)	0.32	0.25
	Total water discharge (million tons)	17,237.21	17,717.45
	Total discharge of sewage (million tons)	34.50	30.63
	Total discharge of open cooling circulation water (million tons)	17,202.71	17,686.82
	Hazardous liquid water production (tons)	721.62	778.04
	Production of denitration catalysts (tons)	8,034.30	2,564.66
	Production of other hazardous solid waste (tons)	210.45	398.46
	Production of general solid waste (ten thousand tons)	3,949.59	4,194.05
	Production of fly ash and cinder (ten thousand tons)	3,064.44	3,362.57
	Production of desulphurised gypsum (ten thousand tons)	885.15	831.48
	Comprehensive utilization rate of fly ash and cinder (%)	89.87	89.33
	Desulphurization gypsum disposal utilization rate (%)	81.78	87.90
	Amount of grievous (and above) environmental accidents (times)	0	0

Performance Categories	Performance Indicators	2019	2018
Society	Total amount of full-time contractual employees[1] (persons)	58,263	57,970
	Number of employee deaths due to duty[3] (persons)	0	0
	Number of contractor and subcontractor deaths due to duty[4] (persons)	0	0
	Grievous personal injury and death accidents (employees)(times)	0	0
	Personal injury and death accidents during the power production (times)	0	0
	Accidents that endangered safe operation of power grid (times)	0	0
	Lawsuits on corruption raised and concluded against the Company or its employees (items)	0	0
	Average equivalent availability factor of coal-fired power unit (%)	93.49	94.51

[1] The scope of statistic of Operating revenue (including Sales of power and heat, Sales of coal and raw material, Port service, Transportation service and Others), Operating expenses, Net profit and Total amount of full-time contractual employees, takes Singapore Tuas Power Ltd., the wholly owned subsidiary of Huaneng International and Huaneng Shandong Ruyi (Pakistan) Energy (Private) Limited into consideration, of which the Operating revenue (including Sales of power and heat, Sales of coal and raw material, Port service, Transportation service and Others), Operating expenses and Net profit are published in accordance with the International Financial Reporting Standards, Others including Lease income. The statistical range of Controlling generation capacity and Equity-based generation capacity includes Singapore Tuas Power Ltd., the wholly owned subsidiary of Huaneng International.

[2] The Donation in the Company's name in 2019 is the payment for donation made in name of the Company within China for poverty alleviation.

[3] Number of employee deaths due to duty: the number of employees who died from production safety incidents.

[4] Number of contractor and subcontractor deaths due to duty: the number of deaths of contractors and subcontractors during production for which the Company is responsible.

2.7 Stakeholder Engagement and Identification of Material Issues

2.7.1 Information about and Communication with Stakeholder

Huaneng International has always been adhering to concepts of harmonious development of "serve the Country, benefit the society, seek multilateral benefits and develop together" by fully considering and effectively responding to stakeholders' demands, and worked together with all stakeholders to promote economic and social development and share corporate development achievements.

Stakeholders	Expectations of Stakeholders	Mechanisms of Communication and Participation	Responses from the Company
Investors	Increase of the Company's market value and profitability. The Company's environmental and social responsibility performance continues to improve	Shareholders' meeting; information disclosure; company website	Truthful and thorough disclosure of information; investment of efforts in improving business performance and generating profits; absorption of market opinions for rectification of operating behaviours; active participation in questionnaires from international institutions; investment of efforts in the improvement of environmental and social responsibility management
Clients	Assurance of high-quality products; guarantee of good service	Making contracts and agreements	Supply of sufficient, reliable and eco-friendly energy and services; guarantee of safe stable delivery of power and heating
Employees	Guarantee of welfare, health and security; improvement of communication mechanism; impartiality concerning in chances of promotion and development	Employment contracts; employees' assembly	Strict observance of provisions within employment contracts; improvement of the institution of employee's assembly; improvement of administration of salary and welfare; provision of avenues for vocational advancement and training
Suppliers	Honest, fair and just cooperation; mutual benefits and win-win scenarios	Making contracts and agreements; regular communication through mutual visits; correspondence through files, letters and telegraphs	Adherence to open and transparent business principles and processes; active fulfilment of contracts and agreement; promotion of mutual visits
Communities	Joint cultivation of communal civility; support for public welfare; focus on social development	Promotion and organization of public welfare activities; participation in volunteer activities; guarantee of employment	Extensive organisation of and active participation in public welfare undertakings; cultivation of harmonious and civilized communities; attempts at growth of local employments
Regulatory Authority	Observance of disciplines and laws; compliance with operation; green energy; energy conservation and emission reduction	Participation in relevant meetings and work report on energy	Strict observance of relevant laws and stipulations; vigorous advocate of energy conservation and emission reduction
Competitors	Fair competition; honest cooperation; joint development; safe production	Participation in industry associations[5], policy studies, daily meetings and business exchanges	Competition and cooperation with competitors; jointly creation of a healthy and orderly competitive environment; mutual benefits and joint progress

[5] China Electricity Council, China Electric Power Promotion Council, Chinese Society for Electrical Engineering and etc.

2.7.2 Processes of Identification of Material Issues

According to requirements of HKEx's ESG Reporting Guide, Huaneng International refers to relevant procedures for substantive analyses from Global Reporting Initiative, collects issues at the heart of key stakeholders' interests by way of questionnaires, interviews, etc. Huaneng International analyses and prioritizes collected information and determines the Company's material issues with respect to ESG, which are disclosed in report.

The process of identification of material issues is divided into four steps:

1 Identifying relevant issues: sources of issues include Environmental, Social and Governance Reporting Guide of HKEx, GRI Sustainability Reporting Standards (《可持續發展報告指南》) and issues disclosed by domestic and international peers

2 Prioritising issues: internal stakeholders, when it comes to prioritisation, mainly consider impacts on the Company's strategies, policies, processes and commitments, on the Company's competitive advantage and management excellence, and on the Company's current and future financial status; external stakeholders, with respect to prioritisation, largely focus on the extent to which a certain issue has impact on assessment and decision-making of the Company as well as on its own interests

3 Verifying: the Company management assesses and approves identified issues and their prioritisation

4 Reviewing: after the end of one reporting period, the Company will organize internal and external stakeholders to provide feedbacks on contents of this report in order to prepare for the next one

Following our communication with various stakeholders, the Company has identified the following issues as well as their respective priorities

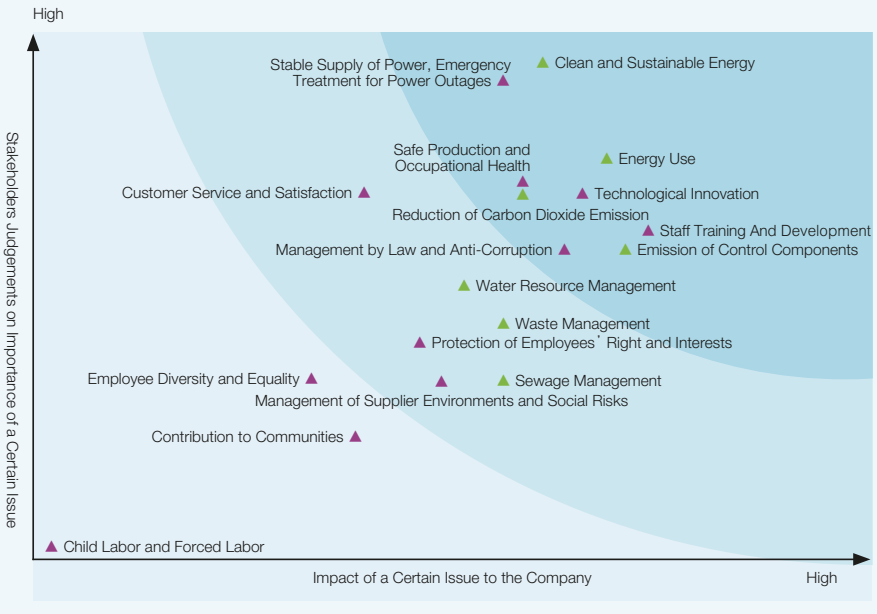
Grading Standard

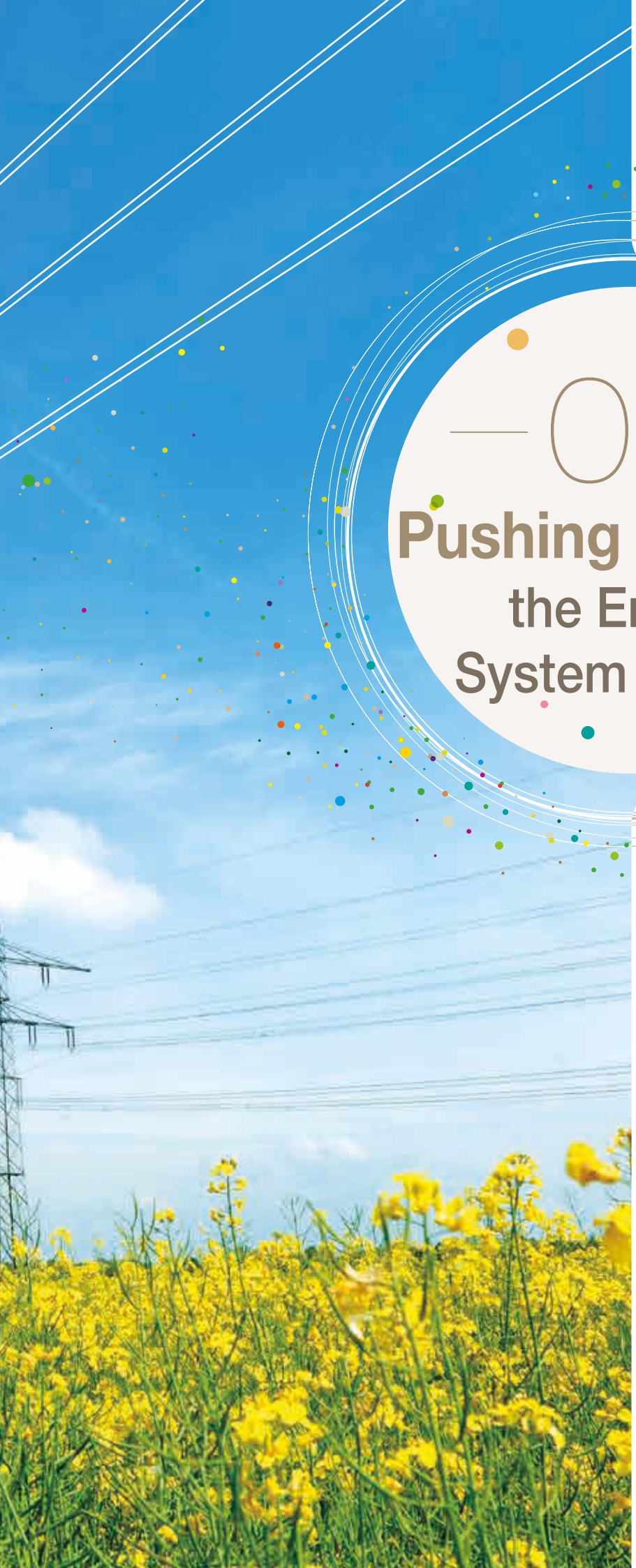
- According to their own degree of concern, internal and external stakeholders grade different issues in accordance with their importance.

Chart Description

- Horizontal Axis: Internal Stakeholders' grading for each issue
- Vertical Axis: External Stakeholders' grading for each issue

▲ Social Issues
▲ Environmental Issues





03

Pushing Forward the Energy System Reform

Since the electric power system reform in March 2015, the National Development and Reform Commission ("NDRC") and the National Energy Administration ("NEA") have worked with local governments and electricity generating companies to push forward the reform, relieve the control on the electric power generation and use plan and liberalise the electric power trading market. Up to now, the electricity market reform has entered deep waters. In 2019, the NDRC and NEA published the Notice on Building a Robust Renewable Energy Power Accommodation Mechanism (《關於建立健全可再生能源電力消納保障機制的通知》), the Notice on Abolishing the Control on Electric Power Generation and Use Plan for Commercial Electric Power User (《關於全面放開經營性電力用戶發用電計劃的通知》) and the Guiding Opinion on Deepening the Reform on the Feed-in Tariff Pricing Mechanism for Coal-fired Power Generation (《關於深化燃煤發電上網電價形成機制改革的指導意見》) to further the development of the electric power system reform from aspects of renewable energy-generated electricity accommodation, market liberalisation and the feed-in tariff pricing mechanism.

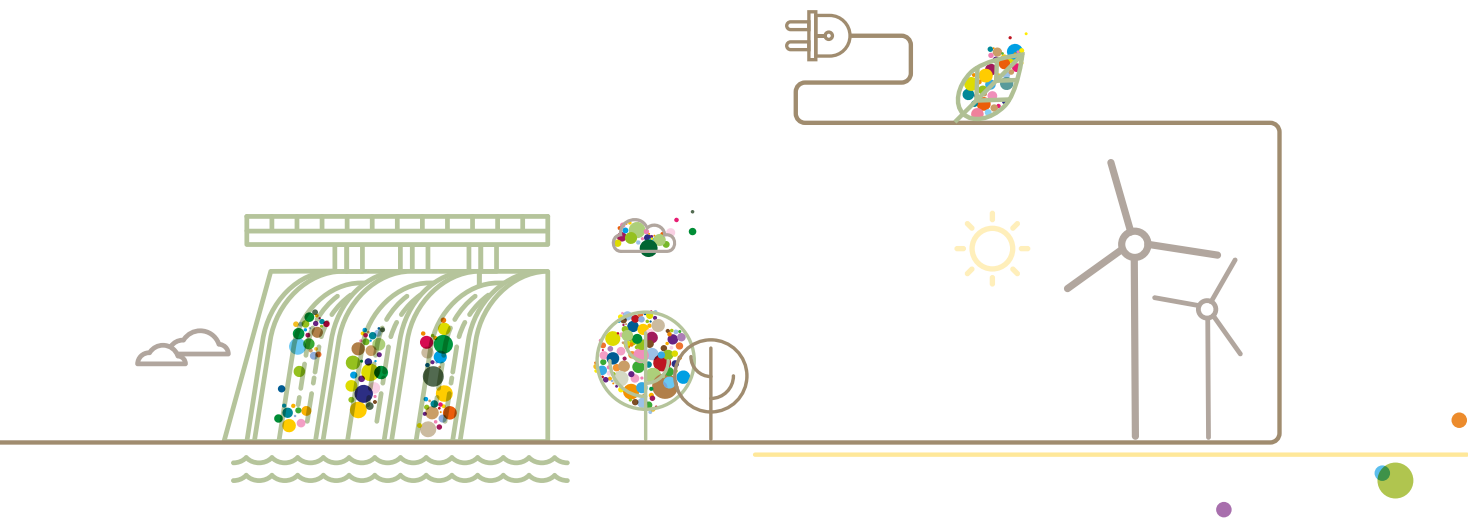
As one of the most influential enterprises in the electric power industry, Huaneng International will lend its full support to national policies and work conscientiously for arrangements concerning the Central Economic Work Conference and various government work reports by enhancing communication with electric power end customers, entering strategic cooperation and jointly promoting the energy production and consumption reform to build an energy system featuring clean energy, low-carbon emission, safety and efficiency.

Our Targets

Against the backdrop of the reform of the electric power system, the scope of business of Huaneng International has been expanded to cover generation and sale of electricity and the Company will strive to create a healthy and sustainable market environment. On the generation side, our specific targets are to maintain a traded amount of electricity no less than the generation capacity and keep electricity trading prices as high as possible and no lower than the market average. On the sale side, our specific targets are to sell all electricity generated and keep electricity selling prices as high as possible and no lower than the market average.

Management Mechanism

In 2019, in light of the new developments and new requirements of the current market-oriented reform of the electric power industry, the Company adjusted its marketing and management mechanism and system and integrated the internal resources to comprehensively improve its market development capability, responsiveness and competitiveness for better coping with the fierce market competition.



Management Measures

To reasonably and efficiently respond to power system reforms as well as provide greater support for trading decision making, the Company has taken the three measures below:

Firstly, we actively improved our understanding on the government's requirements on the electric power system reform and closely monitored the direction of the reforms of the economic system and electric power system. We also enhanced the policy tracking and research efforts and adjusted our strategies as to installation structure and business development to benefit from the synchronisation effect. We not only solidified and expanded our market share, but also innovated and enhanced our market competitiveness, thereby improving profitability and sustainability capability.

Secondly, we strengthened the training of our staff and provided two sessions of electricity spot market training to our market traders and analysts so as to foster talents for the spot market trade.

Thirdly, we conducted monthly climate predictions so as to develop and/or adjust our power generation and trade strategies according to movements of temperature and precipitation over the country, thereby improving the accuracy and rationality of our supply and demand prediction.

To gain greater access to the end customer market, the Company has adopted a three-pronged approach to improve customer service quality and customer satisfaction:

Firstly, the Company enhanced strategic cooperation with major corporate clients to expand sales channels and customer resources.

Secondly, the Company strengthened the maintenance of customer relationship by in-depth understanding of customers' electricity demand and the stress on company credit during the electricity trade to build trust among customers.

Thirdly, the Company enhanced customer satisfaction and strived to satisfy the service experience of different customers by improving the expertise of its value-added services. Up to now, we have established 19 provincial-level electricity distribution companies and 16 regional-level electricity distribution companies.

04

Maintaining Safety and Stability of Power Supply

Huaneng International aims to achieve a safe and reliable electricity supply by focusing on enhancing compliance management and gradually refining the management system to improve the power supply quality and effectively respond to emergencies.

4.1 Stable and Efficient Power Supply

Huaneng International is committed to developing itself into an international leading power generation listed company and providing sufficient, reliable and environmentally friendly power and high-quality energy services for the customers. Each of the Company's power plants has put in place contingency plans and response measures to ensure a safe and stable power supply.

Establish Safeguard Policy Mechanism

In accordance with the Company's emergency management measures for major incidents and accidents and the contingency plans for major production accidents and large-scale blackouts in case of accidents such as all power units tripping, alternating current and direct current power outages, bus bar outages and large-scale power grid outages caused by system collapses, subsidiaries of the Company have formulated Emergency Plan for Thorough Power Failure (《全廠失電應急預案》), Emergency Plan for Black Start (《黑啟動應急預案》), Plan for Island Operation (《孤島運行方案》) and other preparatory measures and established corresponding emergency handling organizations in order to minimize negative impacts on society, upon occurrence of accidents, by unified leadership, clear division of labour, rapid response and fluent communication. Besides, the Company and subsidiaries will also manage accident report to power dispatch department and due offices of local governments, handle examination and approval of information disclosed to the public, start emergency measures, and be attentive to public concern, in order to reduce adverse impacts on society. Meanwhile we will do well in check and preparation for restart in the aftermath of power outage, making sure that after troubles hooting, we can timely restart power units to resume power supply.

Attention to Daily Management of Equipment

In 2019, as the central government continued to push ahead with its Blue Sky Battle Plan to fight air pollution, distribution network operators had further increased the frequency and extent of load-lopping for their coal-fired power generation units to consume more power generated from renewable energy. Power generation units saw a series of continued changes and more stringent requirements were put forth for the overall reliability of heavy-duty equipment.

The Company has continuously strengthened its equipment and technology transformation management to ensure that equipment is safe to use, reliable and up-to-date. The Company has been pushing ahead with the work of "reducing deficiencies and controlling unplanned power outages", strengthening generator units' unplanned power outage control with the unplanned power outage control as a breakthrough point, issuing unplanned power outage analysis report and conduct related monthly performance reporting. The Company initiated equipment management and risk investigation for several power plants, including Jiaxiang Power Plant, as well as project planning and process quality inspection for Grade A/B[6] overhauling units to enable full process management of reliability indicators for the main engine and key auxiliaries. We also strengthened technical supervision and management, conducted site evaluation and stepped up efforts in technology transformation projects to constantly improve equipment health and ensure the safety of equipment and our staff.

The Company has been placing a lot of emphasis on the precision of operations as well as the standardization of repair and maintenance. As at 31 December 2019, the company has been achieving an average 0.22 times of unplanned outages per unit per year. No unplanned outages were recorded throughout the year in 34 thermal power plants, including Yuhuan Power Plant, Changxing Power Plant and Liangjiang Gas Turbine Power Plant. Dandong Power Plant had none unplanned outages for six consecutive years. Yueyang Unit 4 and Baiyanghe Unit 6 achieved 652 days and 566 days of long-cycle operation respectively. 13 units including Haimen Unit 4 and Qinbei Unit 5 were enlisted in China Electricity Council's 2019 thermal power reliability benchmark. The Company outperformed industry peers in terms of the number of awards received.

[6] Grade A maintenance is a comprehensive disassembly inspection and repair of power units to maintain, restore and improve equipment performance; Grade B maintenance involves the conditional and targeted implementation of some of the Grade A maintenance work based on power units' equipment status, system properties and operating conditions.

Stable Power Supply During Major Events

To cope with the need for stable power supply of local governments for major state-level events and social events, the Company's regional branches cooperated with electricity users and power transmission and distribution companies under the coordination and instruction of local subsidiaries to develop special power supply plan, so as to improve service capability during these events. In 2019, our regional branches in North China, Shandong and Shanghai developed detailed power supply plan through thorough consideration and arrangement and successfully completed the tasks of ensuring stable power supply during key events such as the celebration of the 70th National Day, the Qingdao navy parade and the Shanghai International Import Expo.

Preventing Risk and Ensuring Safety for the Celebration

According to the instructions on security work for the celebration of the 70th National Day, the Company issued the Notice on Ensuring Safe Production during the Celebration of the 70th National Day (《關於做好新中國成立70週年國慶期間安全生產工作的通知》) under the principles of "Preventing Risk and, Ensuring Safety for the Celebration" and conducted special inspections on key locations in the Beijing-Tianjin-Hebei Region for ensuring stable power supply.

On 20 September 2019, Yangliuqing Power Plant and the Counter Terrorism Office of Tianjin Xiqing Public Security Sub-bureau jointly held a counter-terrorist exercise for the celebration of the 70th National Day to build a "Police-Enterprise" coordinated security mechanism and enhance the capabilities to respond to terrorist attacks; on 27 September, a video conference on security protection was held once again in Yangliuqing Power Plant to reiterate the importance of security protection and stable power supply during the celebration so as to ensure a safe and orderly production during the National Day.

Joint Counter-Terrorism Exercise for the Celebration of the 70th Anniversary of the Founding of the People's Republic of China

Safe Power Supply Under Extreme Weather Conditions

In 2019, the Company successfully maintained stable power supply under natural disasters such as extremely hot weather, typhoon and flood by planning ahead and making early preparations in accordance with the requirements laid down by the Safety Committee of the State Council and the National Energy Administration. We took prompt actions in a spirit of preventing major floods, guarding against strong typhoons, pre-empting serious hazards and responding to devastating disasters. We also improved the district-level coordination mechanism, strengthened our response to flood warnings, replenished relief supplies and organized emergency drills to improve our response capabilities during disastrous events and ensure safe power supply. Our regional branches in Fujian, Hainan and Zhejiang successfully prevented super typhoon Lekima from wreaking havoc.

Fuzhou Power Plant – Active Defence Against Heavy Rainfalls

Since July 2019, a majority of Fujian had been hit by extreme weathers such as thunderstorms and heavy rainfalls. Fuzhou Power Plant responded promptly and continuously refined preventive measures based on the need of the summer peak season to enable a smooth and stable operation of generator units under the extreme weather conditions.

Fuzhou Power Plant closely monitored the weather condition and issued alerts promptly upon signs of extreme weathers such as heavy rainfalls to enable a timely prevention. Special inspections for flood prevention were conducted on key locations and weak links such as ash storage site, and remedial actions for hazards identified were immediately adopted. The monitoring and adjustment of generator units' operating parameters and routine inspection for key equipment were enhanced; counter measures for coal blending, low-load operation and equipment repair were adopted. Through a thorough risk anticipation and contingency planning, Fuzhou Power Plant improved its response and disaster relief capabilities for emergencies arising from extreme weather conditions, thereby safeguarding a safe and stable operation.

Preparation for Flood Prevention

Qinbei Power Plant – Measures for Ensuring Stable Operation through the Summer Peak Season

In late July 2019, the temperature of the Central region was close to 40℃. Qinbei Power Plant adopted a series of measures to ensure a safe and stable operation of generator units:

In respect of safety protection, Qinbei Power Plant enhanced the implementation of the "two-ticket and three-policy[7]" and the management of operation sites while regularly performing exercises for emergencies such as main transformer trip, ammonia area leakage, electric shock at high altitude and heatstroke so as to enhance the training effect through exercises and improve emergency response.

In respect of operation and maintenance, Qinbei Power Plant improved the tracking and inspection of equipment defects by enhancing parameter monitoring, increasing the inspection frequency for key areas and equipment and refining the cooling equipment configuration to ensure a safe operation through summer.

In respect of flood control, Qinbei Power Plant further refined the contingency planning for flood, conducted major inspections for flood control hazards, performed scenario analysis on flooding accidents in pump room to ensure health of sewerage equipment in all areas and sufficient supplies for flood control.

In respect of resource supply, Qinbei Power Plant's staff stationed at coal mines stepped up their efforts in obtaining more coal resources and urged suppliers to improve the delivery of orders. It also urged shipment for coals traded at market price and used performance evaluation as the baton to ensure sufficient "food intake" for the generator units.

Fire Drills for Summer Peak Season

Enhancing Routine Inspection

Stable Heat Supply

Based on the winter heating conditions of various regions and the needs of livelihood protection, the Company performed on-site supervision of heat supply work in key areas in the northeastern and northern regions of China, and organized subordinate thermal power plants such as Yunhe Thermal Power Plant and Changchun Thermal Power Plant to formulate special plans for heat supply. The Company categorized the heating system malfunctions according to malfunctioning degree and developed contingency plans for each malfunction category and type. We also organized related departments in subordinate power plants to form emergency response organs led by department heads, which should provide heating system malfunction response operation cards. Where a heating system malfunction occurs, the response organ should implement the contingency plan under the leadership of the department heads so as to ensure effective fault clearance and smooth operation of the heating system.

[7] Two tickets: work ticket and operation ticket; three policies: operation handover policy, equipment inspection policy and regular equipment testing and rotation policy.

4.2 Compliance-Based Corporate Governance

Huaneng International continuously enhanced its anti-corruption efforts, insisted on clean and honest business practice, established a law-abiding corporate governance and actively followed policies issued by the government. We closely monitored new changes in regulatory laws and regulations in the place of listing to grasp the regulatory trends, understand the regulatory intent, and effectively implement the new regulatory requirements. The company is committed to operational compliance, regulated operation and multi-dimensional risk prevention to build a corporate culture that values integrity and compliance and to improve our corporate governance.

4.2.1 Strictly Abiding by the Law

Huaneng International strictly abides by the Company Law of the People's Republic of China (《中華人民共和國公司法》), the Law of the People's Republic of China on the State-Owned Assets of Enterprises (《中華人民共和國企業國有資產法》) and other laws and regulations, and implements the Articles of Association of the Company as a code of conduct to determine responsibilities and how the authority is exercised.

According to the implementation plan on establishing a law-based governance, "Huaneng Rule of Law", the Company actively pushed forward the compliance management work. With compliance management as the basis for the Company's steady growth, Huaneng International seeks to incorporate compliance management in its various business processes and establish a comprehensive and scientifically proven compliance management system.

The Company has established a special department dealing with legal affairs and compliance management, with a business scope covering system management, risk management, compliance management, legal affairs management, internal control and corporate management. We followed through with the implementation of "Huaneng Rule of Law" requirements and incorporated the relevant provisions pertaining to general legal counsel in the Company's Articles of Association, with the aim of forming a compliance management working group system chaired by the general legal counsel, led by the Legal Affairs and Compliance Management Department and jointly governed by all departments of the Company.

4.2.2 Advancing Incorruptibility

In 2019, the Company rolled out anti-corruption campaigns, in the spirit of "Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era" and the spirit of the 19th National Congress of the Communist Party of China, urging all employees to uphold ethics as well as Party disciplines and state laws and create an atmosphere where everyone remains disciplined, abides by the law, discharges duties in a standardized fashion, and practices clean operation so as to provide a solid political, ideological and organizational support for the Company's sustainable business development.

Corruption Punishment and Prevention

In order to prevent corruption, bribery and other acts of the sort, Huaneng International has been stepping up efforts to promote clean governance.

1. The Company strictly effectuates responsibility system for the establishment of an incorrupt party, and party members of each level give a written undertaking thereof. to establish accountability;
2. The Company rigidly implements stipulations within the spirit of the "eight-point" guideline (the "Eight-point Guideline") issued by the Central Government, as well as Requirements on Further Implementation of the Eight-point Guideline for Enhancing the Development of Good Work Practices (《關於深入貫徹落實中央八項規定精神進一步加強作風建設的若干規定》) issued by Huaneng Group;
3. The Company paid special attention to the handling of complaints received in letters or visits or those handed over by the inspection team of the Central Government to timely process and respond to related matters and protect the informant's legal rights;
4. The Company will seize upon seven critical periods, such as the New Year's Day and the spring festival to publish documents regarding holiday corruption and discipline to reiterate relevant requirements, urge and remind staff to follow them, and carry out supervision and inspection.

Open Channels for Complaints

The Company has offense reporting hotline and email, opens channels of handling complaints expressed in letters or visits, welcomes letter and visits, regularly collects, analyses clues reported by all units that have to do with corruption, bribery and other undisciplined or unlawful cases.

In 2019, the Company's headquarter and subsidiaries did not have any illegal matters of significant influence, and there were also no lawsuits on corruption raised or concluded.

Anti-Corruption and Anti-Bribery

Within report period, the Company has developed various anti-corruption and anti-bribery activities, including:

Disciplinary education. The Company provided disciplinary education, video and cautionary tales to Party members to warn them of the disciplines and regulations and improve their work practices. The Company provided the Disciplinary Alert (《紀律之窗》), an electronic publication, to the chiefs of the Company. The publication collected over 100 articles on the clarification of Party regulations and disciplines, policy explanations and typical cases to help Party leaders to stay alert and disciplined.

Special inspection. The Company further implemented Opinions for the Implementation of Corruption Prevention and Control for Overseas Projects (《境外項目廉潔風險防控實施意見》), aiming at enhancing overseas risk control. The Company conducted special inspections on the implementation of the Company's disciplinary decisions issued since the 18th National Congress of the Communist Party of China and focused on addressing issues such as non-compliant or unfulfilled implementation of disciplinary decisions. We noticed related parties and issued our requirements on the remedial work. Then we urged to make remedial plan. We also consolidated policies and regulations regarding the disciplinary actions to further regulate and refine the implementation of disciplinary decisions. To ensure an effective and compliant implementation of disciplinary decision, the "one case one registry" approach was adopted.

Disciplinary dialogue. The Company adhered to Measures for the Implementation of Disciplinary Dialogue under the Four Conditions (《實行「四種形態」下紀律談話實施辦法》) to effectively conduct daily disciplinary dialogues. We held 6,203 person times of routine disciplinary dialogues, thereby urging Party members to strictly follow the Party regulations and disciplines as well the Company's rules and regulations.

4.2.3 Protection of Intellectual Property Rights

Huaneng International remains determined to advance scientific development and highly value intellectual property rights and patents and strictly abide by the Patent Law of the People's Republic of China (《中華人民共和國專利法》), the Copyright Law of the People's Republic of China (《中華人民共和國著作權法》), the Trademark Law of the People's Republic of China (《中華人民共和國商標法》) and other laws and regulations of China. We respect knowledge and intellectual achievements by regulating the management of intellectual properties, protecting the intellectual property rights in accordance with the law to foster a corporate culture that values knowledge, talents and innovation.

We have formulated Huaneng Power International's Intellectual Property Management Regulations (《華能國際電力股份有限公司知識產權管理規定》) to clarify the hierarchical approach to intellectual property management at the levels of headquarters, regional branches and grassroots business units. These regulations also clarified a classified approach to the management of trademarks, font size, engineering designs, product design drawings and descriptions, and computer software.

The Company has set up a special department to manage its figurative trademarks, including the legal rights of the trademark and the regulated use of the brand name "Huaneng". Up to the date of this report, the trademark had been registered for 47 types of products. The Company's relevant departments, regional branches and grassroot business units were responsible for their respective filing, maintenance and other managerial work related to intellectual properties according to their own business scope and functions. In 2019, the Company paid for the patent annuities of over 100 patents on time and completed the renewal of 13 trademarks. The validity of these trademarks after the renewal was 10 years.

To improve Huaneng International's brand image in management and innovation and its competitiveness in the global market, the Company applied for a US patent for an effective gradational graded compound de-sulphurizing tower (《一種高效漸變分級複合脫硫塔》) in 2019.

In 2019, there was no government penalty imposed on or litigation laid against the Company due to intellectual property issues.

05

Commitment to Environmental Protection

Providing the society with safe, clean and economic power is power generating company's goal as well as the key for it to achieve sustainable development. As a responsible corporate citizen, Huaneng International is committed to green development through "energy saving, emission reduction, clean operation and environmental protection". Huaneng International regards environmental protection as a prerequisite for the survival and development of an enterprise in line with the domestic condition and the trend of the energy system reform. To live up to our environmental responsibilities, we are committed to continuously promoting structural adjustment, optimizing industrial layout, vigorously developing clean energy, promoting scientific and technological innovation, increasing efforts on energy conservation and environmental protection, improving efficiency of resource consumption, and pushing forward the construction of a Green management system.

5.1 Continuously Optimizing Energy Structure

"Innovation, coordinated development, green growth, open economy and shared development" are the five key development concepts of our country. The Chinese government's response to climate change has been accorded the status of a major strategy for national economic and social development to advance eco-civilization, develop a green economy and earnestly promote various emissions reduction measures as core climate change policies.

The "13th Five-Year Plan" period signified the final stages of implementing the policy of building China into a moderately prosperous society as well as the start of a new normal in China's economic and social development. It was also a crucial period for developing Huaneng International into a world-class listed power generation company. In the meantime, Huaneng International redoubled its efforts to promote the development of low-carbon and clean energy with continuously improving on the development quality, and advanced business transformation and upgrading by introducing low-carbon and clean energy power units. We proactively adapted to the development of the power generating industry and achieved substantial results in accelerating green development.

Directions of Development

During "13th Five-Year Plan" period, Huaneng International will focus on promoting low-carbon clean energy development, and continuously improves installed capacity of the proportion of low-carbon clean energy. By 2020, the Company will boost its low-carbon clean energy installed capacity to above 20%. The main development directions include:

1. Vigorously Developing Wind Power

The Company is going to further increase the reserves of high-quality and energy efficient wind power projects and adjust the regional wind power deployment strategy according to local resources and conditions. We plan to expedite the construction of ten-thousand-megawatt grade onshore and offshore wind farms in the north-eastern, northern, north-western regions and south-eastern coastal areas to facilitate the transformation and upgrade of traditional power generating companies.

2. Accelerating the Development of Solar Power

The Company is going to vigorously take part in the development of large-scale photovoltaic power plants and promote the development of wind-photovoltaic power plants. We will also actively develop distributed photovoltaic, promote projects aiming at comprehensive utilization of photovoltaic power plants, advance the development of photovoltaic and hydropower complementary power generation and increase efforts in the research, development, application, planning and deployment of concentrating photovoltaic and concentrated solar power generation.

3. Optimally Developing Natural Gas Power Generation

We will earnestly promote the construction of large-scale natural gas combined cycle cogeneration power units and selectively launch natural gas distributed energy projects mainly for the replacement of coal-fired boilers in industrial parks. We will also advance the joint production and supply of heat, electricity and cooling for end-users as well as the development of integrated energy service providers for the generation, purchase, distribution and sale of electricity, in addition to piloting natural gas, photovoltaic, wind and geothermal complementary distributed energy systems, to provide integrated energy services. We will commence the preliminary preparation for the large-scale gas-fired power plant project for peak load regulation in the eastern load center and push forward the preparation for the gas turbine-based cogeneration project in accordance with applicable national policies.

4. Discretionary Layout of Pumped Storage Power Station

We will study the potential for investment in pumped-storage hydropower development and selectively deploy pumped-storage hydropower stations in major delivered-power recipient areas like Zhejiang and nuclear power-concentrated coastal areas in the eastern part of China like Fujian.

5. Striving to Participate in Nuclear Power Investment

Given the owned shares of Shandong Shidaowan Nuclear Power, Hainan Changjiang Nuclear Power and Fujian Xiapu Nuclear Power, the Company attempts to participate in nuclear power investment, and perform well in site protection and reserving resources.

6. Exploring Other Forms of New Energy

We will actively seek investment cooperation and opportunities for merger and acquisition of properties of renewable energy power generation. We will selectively launch biomass energy and waste incineration power generation demonstration projects and energy storage projects.

Clean Energy Projects

As at 31 December 2019, the Company's clean energy sources (gas turbine, hydro, wind, photovoltaic and biomass power generation) installed capacity accounted for about 16.92% of the total installed capacity. In 2020, the Company will continue to focus on growth through acquisition and self-construction and increase the investment in the construction and acquisition of renewable energy projects. We will ensure project quality and profitability while we continue to improve the clean energy-based installed capacity.

Huaneng Dafeng 300,000-Kilowatt Offshore Wind Farm Project

On 29 September 2019, Huaneng Dafeng 300,000-Kilowatt Offshore Wind Farm (Phase 1), the farthest offshore wind farm in China, officially commenced its grid-connected operation.

The Dafeng offshore wind farm was located in the Maozhusha waters at Dafeng District, Yancheng, Jiangsu, with an offshore distance of about 55 kilometers. The installed capacity for phase 1 was 300,000 kilowatts, with 68 sets of wind turbines, including 48 sets of 4.2 MW unit and 20 sets of 5 MW unit. The project construction began on 20 December 2018; after nine months and ten days, it was complete with high quality and at a high standard, accumulating rich experience and laying a solid foundation for China's development and construction of remote offshore wind farm in the future.

The annual output of the phase 1 project was estimated to be 860 million kWh, equivalent to the annual saving of 23.61 ten thousand tons of coal equivalent and 92.88 ten thousand cubic meters of water as well as the annual reduction of emission of 63.11 ten thousand tons of carbon dioxide, 6.50 ten thousand tons of fly ash and cinder and 8.43 tons of soot, generating significant environmental benefits.

Dafeng Offshore Wind Farm

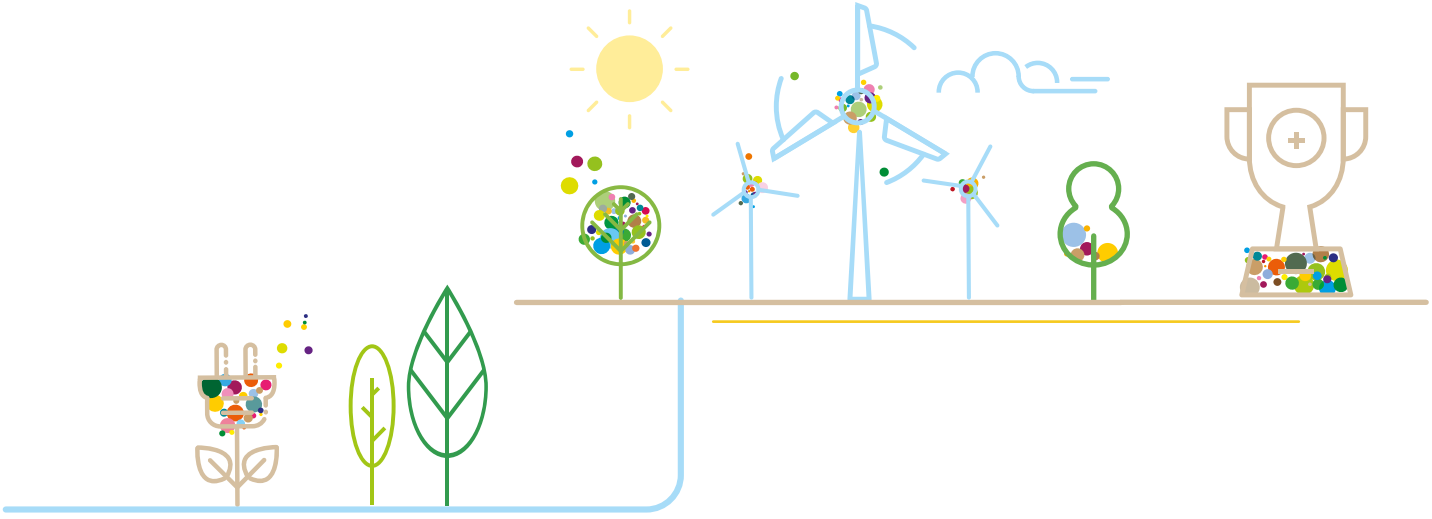
Puyang Phase 1 Wind Power Project – A Successful Demonstration of Technological Integration and Sino-Foreign Cooperation

Located in Puyang County, north-eastern of Henan province, Huaneng Puyang Phase 1 wind power project has the largest single-unit capacity among all onshore wind farms in China, featuring low wind speed, plains and large scale. The project was equipped with 200 sets of 2.5 MW wind turbine generators with a total installed capacity of 500 MW. The annual output was estimated to be 1.17 billion kWh, with 2,339 annual equivalent full-load hours on average, equivalent to the annual saving of 32.13 ten thousand tons of coal equivalent and 126.36 ten thousand cubic meters of water, as well as the annual reduction of emission of 85.57 ten thousand tons of carbon dioxide, 8.85 ten thousand tons of fly ash and cinder and 11.46 tons of soot. The Phase 1 of Huaneng Puyang Wind Power project has been partially put into production.

Since the project's commencement in March 2019, the Company had coordinated its human resources to establish six task forces at the Henan subsidiary level for handling issues such as construction and organization, power output line engineering, equipment supply and capital provision.

Design optimization and technical innovation were applied to address the issues such as low wind speed and high tower barrel at the proposal design phase of the project in an effort to build it into a demonstrative wind power project. In addition, as this was the largest project in China by using the General Electric Company's wind turbine, the Company can make good use of its R&D advantage to learn and absorb the technology and experience of the global leading company in areas of high tower barrel wind turbine flexible control and intelligent operation and maintenance, thereby improving the Company's technology level in these areas and establishing a successful demonstration of technological integration and Sino-foreign Cooperation.

Puyang Wind Power



5.2 Vigorously Promoting Innovation

Technological innovation drives business development. Huaneng International is committed to developing itself into an innovation-driven enterprise by improving technological innovation, continuously enhancing our innovation capability, earnestly investing in research and development, optimizing the systems for innovation decision making and management, and relentlessly developing innovation platforms to accelerate the development of the Company.

Innovation Management

In accordance with the Law of the People's Republic of China on Scientific and Technological Progress (《中華人民共和國科學技術進步法》) and other innovation policy incentives of various local governments, Huaneng International formulated a series of rules and regulations, including Regulations on the Management of Scientific and Technological Work (《科學技術工作管理規定》), Measures for the Management of Science and Technology Projects (《科技項目管理辦法》), Incentive Measures for Scientific and Technological Progress (《科學技術進步獎勵辦法》) and Measures for the Performance Evaluation of Scientific and Technological Innovation (《科技創新績效考核辦法》). Huaneng International is determined to realize demand-led growth through innovation, strive for short-term results and long-term goals, and capitalize on technological support and advancement. We drive technological innovation alongside our company systems and mechanisms while maintaining autonomy and seeking cooperation in innovation for higher efficiency.

In 2019, the Company further strengthened the cooperation between its regional branches and grassroots units with established scientific research institutes such as Xi'an Thermal Power Research Institute Co., Ltd. ("Xi'an Thermal") and Huaneng Group Clean Energy Technology Research Institute Co., Ltd. ("Huaneng Clean Energy Research Institute"), and with high schools such as Tsinghua University and Xi'an Jiaotong University, and leading manufacturers such as China Shipbuilding Industry Corporate Haizhuang Windpower Co., Ltd. and Shanghai Electric Group Co., Ltd. so as to form development teams, explore solutions to technical problems and complete subject matter R&D. The Company will facilitate grassroots units' role as the main force in "Dual innovation" and organize technological innovation activities in the spirits of safe production, energy conservation and emission reduction and new technology to improve the Company's production safety level.

In 2019, the Company Obtained

98 Patents

Including

67 Invention Patents

Innovation Achievements

(1) Municipal waste front carbonization treatment technology for coal-fired power plant

The Company's demonstration for municipal waste front carbonization treatment technology for coal-fired power plant ran successfully, with results of sludge and waste water treatment reaching its goals and treatment cost significantly lower than that of the conventional approach. The demonstrative system enabled treatment of multiple types of municipal wastes with a single system, which was the first of its kind at home and abroad. The system can process different forms of wastes, including municipal sludge, rubbish, waste water and municipal biomass wastes that cannot be disposed of in time. It adopted a full negative pressure and sealed operation, thereby blocking the odour emitted from the burning of rubbish and sludge. The system featured a low treatment cost, and would not result in secondary pollution such as liquid waste. The investment was one third lower than that of the conventional technology. The system can also use the biomass energy contained in wastes to generate heat and electricity, thus having a great cyclic economic benefit.

(2) High temperature-resistant coating materials for vapor circulation components of thermal power generator unit

The austenitic heat-resistant stainless-steel pipe is currently used in the high temperature section of the boiler system in ultra-supercritical power generator units. However, as the austenitic steel lacks oxidation resistance, its use is limited in components operating at a temperature higher than 620℃. The Company independently developed the steam oxidation-resistant coating for the austenitic steel pipe, which had been proven to be useful at the tube panels of superheaters for generator units.

(3) De-sulfurization waste water bypass flue gas vaporization technology

The Company independently developed the de-sulfurization waste water bypass flue gas vaporization technology and demonstrated it at Huangtai Power Plant in January 2019. The system ran smoothly after the construction was complete and passed the performance test in March, with all performance indicators reaching its design requirements. Compared to the conventional evaporative crystallization technique, this new system featured lower investment and operational cost, can recover and reuse flue gas heat and would not generate additional solid wastes. As at the date of this report, the Company was preparing the acceptance of the demonstrative project.

(4) Equipment malfunction diagnostic technology based on Industrial Internet of Things IOT 4.0

The Company imported, learned, absorbed and applied the advanced IOT 4.0 technology and algorithm to accurately measure the operating parameters (e.g. frequency and acceleration of vibration) of key boiler auxiliaries (e.g. induced draft fan), and then build detailed models to facilitate equipment overhaul and service life management, so that it can improve the precision and management level for equipment management and further enhance the reliability of the equipment and operation.

Development Directions

According to the Company's development strategy, our next R&D focuses would be proprietary heat-resistant materials for thermal power generation, intellectual heat supply, solid waste treatment and the independent operation and maintenance technology for coal-fired generator units, thereby ensuring a leading position in the domestic market and an advanced level in the international market in areas of materials, heat supply, environmental protection and operation and maintenance in the thermal power generation industry.

In addition, the Company has been actively promoting the integration of information technologies, such as AI, IoT, block chain, cloud and big data, with all aspects of the energy industry. With the implementation of the "Digital Huaneng, Intelligent Huaneng" strategy, the Company obtained a number of important technological achievements at home and abroad in the field of clean and highly-efficient power generation technology. The Company also carried out demonstration projects to expedite industrial restructuring and enhance core competitiveness.

5.3 Proactively Practicing Energy Saving and Emission Reduction

In 2019, in the spirit of the annual production conference, the Company implemented and achieved great results in R&D and integrated application of the new energy-saving technology, the review and certification of well-performing energy-saving and environmental-friendly coal-fired power plants, the management and clearance of minor indicators, the economic operation of environmental facilities and the coal power energy-saving upgrade and high-quality heat supply renovation. These jobs are done with the goals of improving major technical and economic indicators and realizing energy consumption index's "leading positions in overall energy consumption efficiency and ultra-supercritical unit energy consumption efficiency", under the principles of improving the quality of energy management work, focusing on energy consumption index benchmarking and ensuring key generator units' outstanding performance. In 2019, the Company did not incur any environmental accident that was defined as major or above grade.

5.3.1 Overall Planning

To implement the State Council's Program of Action for the Energy Development Strategy (2014-2020) (《能源發展戰略行動計劃(2014-2020年)》) and the National Energy Administration's Action Plans for the Upgrade and Renovation for Energy Saving and Emission Reduction in Coal Power Generation (2014-2020) (《煤電節能減排升級與改造行動計 劃(2014-2020年)》) and become an industry leader in overall energy consumption efficiency and ultra-supercritical unit energy consumption efficiency, Huaneng International has formulated regulations and work guidance such as the Measures for Energy Saving Management (《節能管理辦法》), Regulations on Environmental Protection Management (《環境保護管理規定》), Standards for Energy Saving and Environmentally Friendly Coal-Fired Power Plants (《節約環保型燃煤發電廠標準》), Acceptance Measures for Energy Saving and Environmentally Friendly Coal-Fired Power Plants (《節約環保型燃煤發電廠驗收考核辦法》), Incentive Measures for Achievement of Energy Efficiency Excellence and Enhancement in (Ultra-) Supercritical Power Units (《超(超)臨界機組能耗指標創優及能耗指標提升獎勵辦法》) and Pollution Prevention and Control Plan (《污染防治攻堅實施方案》). The Company actively promotes the Company's coal-fired power units' energy conservation and emission reduction, initiates pollution control plans related to ultra-low emission renovation, water saving and waste water treatment and coal field and ash field treatment, plans to carry out energy conservation and environmental protection year by year, and has successfully fulfilled the target and task of energy saving and emission reduction to solidify the competitive advantage of coal-fired generator units and ensure that the Company's coal-fired units takes continuous lead in energy conservation and environmental protection, and makes contributions on the reform of the nation's energy production and consumption revolution and the enhancement of the clean and efficient development of coal power generation.

5.3.2 Energy Consumption Management

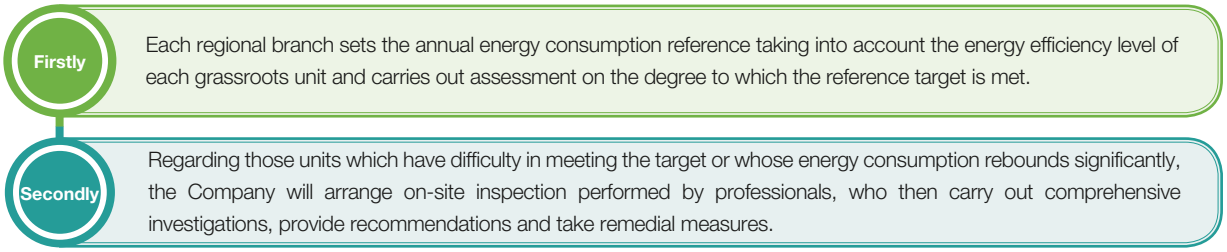
As an advanced power company, Huaneng International strictly abides by the Environmental Protection Law of the People's Republic of China (《中華人民共和國環境保護法》), Energy Conservation Law of the People's Republic of China (《中華人民共和國節約能源法》) and other relevant laws. The Company mainly consumes coal and natural gas in the power generation process, and consumes a certain amount of oil during the start-up ignition and production combustion process.

In 2019, the Company's average coal consumption rate for power sold was 307.21 g/kWh. The weighted average house consumption rate was 4.49%. The annual standard coal consumption amounted to 111.22 million tons. Oil consumption in production totalled 32,056.74 tons, while natural gas consumption was 4,780.15 million standard cubic metres.

Management Mechanism

Our regional branches are responsible for the energy saving management. In accordance with Energy Conservation Law of the People's Republic of China (《中華人民共和國節約能源法》) as well as the Action Plans for the Upgrade and Renovation for Energy Saving and Emission Reduction in Coal Power Generation (2014-2020) (《煤電節能減排升級與改造行動計劃(2014-2020年)》), and after taking into consideration the Company's actual conditions, we formulated regulations and work guidance related to energy saving, such as Measures for Energy Saving Management (《節能管理辦法》), Incentive Measures for Achievement of Energy Efficiency Excellence and Enhancement in (Ultra-) Supercritical Power Units (《超(超)臨界機組能耗指標創優及能耗指標提升獎勵辦法》), Standards for Energy Saving and Environmentally Friendly Coal-Fired Power Plants (《節約環保型燃煤發電廠標準》) Acceptance Measures for Energy Saving and Environmentally Friendly Coal-Fired Power Plants (《節約環保型燃煤發電廠驗收考核辦法》) and the Measures for the Selection of Advanced Energy Saving Units (《節能先進單位評選辦法》) and the Implementation Plan for the Comprehensive Upgrading and Retrofitting and Energy Saving Replacement of Coal-fired Power Plants (《燃煤電廠綜合升級改造及節能替代實施方案》), among other policies. By implementing the responsibility of energy conservation and consumption reduction, the Company vigorously promotes energy conservation and improves energy efficiency. Various systems of energy saving are specified by each unit of the Company according to their actual circumstances so as to carry out publicity, training, supervision and inspection in a timely manner.

Huaneng International enhanced the budget management of energy consumption and system construction, to ensure an optimal level of consumption of coal, electric power, oil and natural gas. The Company adopted an approach that combined goal management and process management to ensure a leading position in energy conservation in respect of coal-fired generator units:



Management Measures

In 2019, the Company continued to meet stringent the major energy consumption reference targets and focused on energy conservation and energy saving work in three areas, namely management, structure and technology. With the concerted effort of various units, the Company has maintained its industry-leading position in terms of the major energy consumption reference targets achieved both by the Company and by its major types.

On energy saving through management, we further improved the three-level energy saving management system, optimised the three-level energy saving supervision network for grassroots unit and introduced energy saving benchmarks into grassroots units' performance management. First, we strengthened the management of energy saving targets by following up with units that were behind the annual energy saving targets and holding dialogue with key units. Second, we enhanced the implementation and management of energy saving responsibilities by urging a breakdown of the responsibilities of all personnel in regional branches and basic-level thermal power plants by job nature for looking after energy saving-related techno-economic indicators to raise energy saving awareness. Third, we enhanced benchmark checking for power units of the same type to identify discrepancies against management, technology, safety, fuel and market benchmarks and improve energy saving management. Fourth, we initiated the selection of advanced energy saving units and benchmark power plants, promotion of the review and verification of energy saving and environmental protection excellence power plants, and a reward system for energy saving excellence and enhancement with incentive funds, and evaluation as well as encouragement of pioneering and improvement of energy consumption indicators.

On energy saving through structure, first, we organised power plants to explore their heat supply potential and tap into a wider heat supply market according to local conditions. Second, we urged regional branches to optimise their operating capacity through electricity transfers and enabled low energy consumption power units to absorb the additional power generation capacity. Third, we suggested that grassroots units modulated energy saving economics to increase the output coefficient of their power units where policies allow. Fourth, we stepped up fuel procurement work and management of blended coal as fired to ensure that the heating value of coal as fired is consistent across all power plants and that the heating value of coal as fired remained at a high level for ultra-supercritical power units.

On energy saving through technology, we focused on promoting the transformation of existing power units for thermoelectric power cogeneration, facilitating the environmentally friendly and efficient utilisation of coal, introducing and enhancing heat supply capability for all power plants in the northern part of the Yellow River and realising industrial steam supply in parts where conditions allow across the entire southern region. As a result, the Company's heat supply exceeded 240 million GJ, a testament to energy utilisation enhancement.

In 2019, the Company's overall energy saving index and the energy consumption indexes of seven key models (e.g. 1,000 MW ultra-supercritical wet cooling, 600 MW ultra-supercritical wet cooling, 600 MW supercritical wet cooling, 600 MW supercritical air cooling, 600 MW sub-critical wet cooling, 350 MW standard wet cooling and 300 MW standard wet cooling) maintained a leading position in the industry.

In the energy efficiency benchmarking for central enterprises in the power generation industry under the supervision of the State-owned Assets Supervision and Administration Commission, five generator units including Laiwu NO.7, Weihai NO.6, Rizhao NO.3, Ruijin NO.1 and Fuzhou NO.4 received the "most energy-efficient power unit with the lowest net coal consumption rate" award; and four generator units including Weihai NO.6, Ruijin NO.2, Nantong NO.2 and Shantou NO.1 received the "most energy-efficient power unit with the lowest station service power consumption rate" award. The Company led in the industry in terms of the number of awards received.

In the energy efficiency benchmarking contest organized by China Electricity Council, the number of generator sets receiving awards amounted to 66 sets, an increase of 11 sets compared to previous year, representing an industry leading position. In addition, two sets of 200 MW (or below) units received an honourable mention.

Awards Received by Some of the Generator Units

Changxing Power Plant – Realizing the Energy Saving and Consumption Reducing Potential to Improve the Management of Minor Indicators

Changxing Power Plant actively conducted operation optimization and adopted centralized management on technical and economic indicators such as boiler reheat steam cooling water consumption, exhaust temperature, power consumption of coal pulverizing system, power consumption of primary air fan and oxygen content of flue gas to realize the energy saving and consumption reducing potential in areas of generator set's heat cycle efficiency, flue gas heat recovery and station service power consumption, etc.

Changxing Power Plant sought breakthrough in the management approach by improving the energy saving awareness and proactiveness of operators through multi-dimensional and multi-angle stimulation to fully activate and optimize the performance parameters of generator sets, thereby achieving optimal results and driving the power plant's efforts in improving its energy consumption index:

- Quantify the impact of indicator change and equipment defect on the power plant, and enhance the staff's energy saving and emission reduction awareness, refine the consumption gap analysis sheet, improve the analysis of technical indicators, and communicate the result and provide training through internal instant message platform, OA system and intranet;
- Prepare a summary of the energy saving measures, document the adopted measures on work sheets, summarize and constantly improve the ongoing energy saving measures and continuously study and develop new energy saving measures;
- Fully utilize the energy saving monitoring network, regularly hold energy saving supervision meetings, timely communicate and analyse successful cases and experiences of other power plants in connection to energy saving, and develop suitable remedial actions and establish accountability;
- Constantly improve the benchmarking management of energy consumption index and normalize the benchmarking procedures through a comprehensive and thorough approach. Based on the benchmarking analysis, put forth remedial and control measures for defects such as high de-sulfurization power consumption.

Changxing Power Plant

5.3.3 Water Resources Management

Huaneng International has always been committed to the protection of water resources, strengthening water saving, deepening the recycling of water and improving water use efficiency, and striving to become a resource-saving and environmentally friendly enterprise. The Company performs water usage and water saving management in strict accordance with the existing national laws, regulations and standards. The water management system was set up in accordance with the national laws, regulations and standards, and meets the requirements of local laws and regulations of the power plants' regions.

The main water consumption of Huaneng International are for power units generating electricity, replenishing water for closed circulating water, and wet desulphurization, etc. Surface water, urban water, and a small amount of groundwater, etc. are used for generating power, and river water or sea water is used for circulating. In 2019, the overall water consumption of the Company was 18,268.44 million tons, the fresh water in power generation was 435.82 million tons, the open cooling circulation water was 17,832.62 million tons, and the performance value of consumption of fresh water in power generation was 1.08 kg/kWh. Currently the Company is pushing forward the power plant water saving and waste water treatment according to the requirements of the waste discharge permit and local environmental regulations.

Management Objective

In 2019, Huaneng International launched the water saving and water treatment work tasks in its power plants in accordance with Huaneng International Pollution Prevention and Control Implementation Plan 2018-2020 (《華能國際電力股份有限公司污染防治攻堅實施方案(2018-2020年)》). As at the date of the report, all its subordinate power plants were attending to the water saving and waste water treatment. After the renovation, the fresh water consumption for power generation will meet the criteria set out in Standards for Huaneng International Energy Saving and Environmental- friendly Coal-fired Power Plant (《華能國際電力股份有限公司節約環保型燃煤發電廠標準》), with sewage discharge meeting the requirements set out in the waste discharge permit and local environmental regulations.

Management Mechanism

The Company strictly followed the government's requirements for the protection of fresh water and set out the guiding opinions for thermal power plant's water saving and waste water treatment work to drive the plant-wide water saving and waste water treatment efforts.

In accordance with the Company's requirements, the various thermal power plants have established a set of water consumption management systems and procedures, which include:

A water management system has been established and managed by specific personnel, who shall formulate rules for water usage, instruments maintenance and management. All water usage sectors and professionals conduct regular maintenance and calibration for water metering, water quality testing instruments and water-usage equipment, etc., so as to eliminate unreasonable water usage;

An account management system has been constructed, including the whole plant account, drainage account, water quality monitoring, water metering instrument basic information table, equipment installation location and parameter table, records of instrument test/calibration and maintenance, etc. They also regularly calculate the water management index of the whole plant, and the water usage account is based on the actual monitoring data;

The thermal power plants also comprehensively utilised various wastewater of the plant area and reduced discharge rate, according to the principles of shunting sewage and clean water, classification and recovery, and disposal and reuse.

Management Measures

In 2019, the Company faces no imminent threats in terms of tapping water resources. To address the water shortage risk, the Company adopted a precise management approach for water supply and consumption based on the guiding opinion for thermal power plant's water saving and waste water treatment projects to refine the criteria for recycle of water and classification of use of water and reduce the fresh water consumption.

In 2019, the Company invested a total of RMB1.2 billion for the water saving and waste water treatment renovation projects in 48 power plants including Chaohu and Yangluo Power Plant. Most of these projects had begun. In particular, Chaohu Power Plant had commenced testing and commissioning.

Dezhou Power Plant – Water Saving Transformation Status

In recent years, Dezhou Power Plant adopted a series of water saving transformations: transforming the Phase-3 circulating water replenish pre-treatment system into a system without the need to replenish water; adding a circulating water sewage treatment system and clean water reuse and waste water replenish de-sulfurization system; upgrading the de-sulfurization waste water treatment system, optimizing de-sulfurization operation control strategy to significantly reduce the water consumption of the de-sulfurization system. These technical transformation and operation optimization efforts helped reduce the power plant's water consumption by 530 ten thousand cubic meters per year, and reduce waste water discharge by 410 ten thousand cubic meters per year.

In addition, Dezhou Power Plant launched a plant-wide water saving survey to enable the reuse of heat supply circulating water and waste water; it also adopted a high-efficiency integrated purifier to enable the recycling of coal feeding system flush water and coal field spray water, thereby saving over 35 ten thousand cubic meters of water per year.

Dezhou Power Plant

Shang'an Power Plant – Water Saving Transformation Status

Shang'an Power Plant strictly followed the Company's water saving and waste water treatment plan and completed a number of transformation projects for water saving, discharge reduction and pollution control in 2019:

1. The upgrade of the boiler feed water treatment system, reducing the discharge of acid-based regenerated waste water by about 14 ten thousand cubic meters per year;
2. The expansion of the recycled water advanced treatment system, improving the treatment capacity to 2,000 cubic meters per hour from 300 cubic meters per hour;
3. The expansion of the circulating water and waste water treatment system, improving the treatment capacity to 960 cubic meters per hour from 400 cubic meters per hour, increasing the concentration ratio of the circulating cooling water to 5.0 from 3.0, saving water by about 220 ten thousand cubic meters per year;
4. The improvement of plant-wide waste water reuse system, realizing the reuse of industrial waste water of 70 ten thousand cubic meter and sanitary sewage of about 26 ten thousand cubic meters per year, enabling the recycle and cascade utilization of water resource;
5. The intelligent water supply management platform, enabling the automatic adjustment of the concentration ratio of circulating water, the automatic optimization of process water for de-sulfurization and the automatic calculation and indication of plant-wide water consumption, realizing scientific control and management and centralized control of the use and discharge of water.

Boiler Feed Water Treatment System

Circulating Water and Waste Water Treatment System

Recycled Water Advanced Treatment System

Intelligent Water Supply Management Center

5.3.4 Emissions Management

In accordance with the applicable national policies and regulations for environmental protection, the policy papers related to ecological protection, energy saving and emission reduction within China's "13th Five-Year Plan" as well as requirements of relevant government organs, with our determination to develop into a world-class listed power generation company, we have launched a plan to build environmental protection excellence taking into consideration the Company's actual circumstances. In 2018, the Company formulated the Huaneng International Pollution Prevention and Control Implementation Plan 2018-2020 (《華能國際電力股份有限公司污染防治攻堅實施方案(2018-2020年)》), covering ultra-low emission transformation as well as coal field and ash field treatment;

With respect to emission performance, the Company's target of reducing the emissions of sulphur dioxide, nitrogen oxides, and soot by about 50% compared with those in 2015 by 2020 has been achieved. The Company required that environmental protection facilities should be designed and constructed alongside the construction of any new coal-fired power unit, and that the sulphur dioxide, nitrogen oxides and soot emissions of any new coal-fired power unit should be less than 35 mg/standard cubic metre, 50 mg/standard cubic metre and 5 mg/standard cubic metre respectively.

With respect to ultra-low emission, as at 31 December 2019, the power generation companies affiliated to the Company have carried out ultra-low emission transformation as planned and completed the ultra-low emission transformation tasks under the "13th Five-Year Plan".

With respect to carbon emission control, the intensity of carbon emissions from all power plants is expected to decrease by around 25% compared with 2005. Incremental steps will be taken to establish a carbon asset management system that addresses access to the national carbon market and reflects our international leading power generation listed company.

The Company attaches great importance to the discharge management of pollutants, all kinds of thermal power units are required to install desulfurization, denitrification and dust removal devices and wastewater treatment and other environmental protection facilities, strengthen the operation, maintenance and repairment of environmental protection facilities, strictly abide by the requirements of sewage permits, and the discharge of all kinds of pollutant meets national standards and territorial requirements.

5.3.4.1 Exhaust Gas Management

The exhaust gas discharged by Huaneng International is mainly carbon dioxide, sulphur dioxide, nitrogen oxides and soot generated from coal-fired power plants during the process of combustion in the coal-fired utility boiler. In 2019, the Company's emissions of sulphur dioxide, nitrogen oxides and soot were 25,355.58 tons, 52,501.67 tons and 3,583.00 tons respectively, with emission performance values of 0.06 g/kWh, 0.13 g/kWh and 0.01 g/kWh respectively.

Management Mechanism

In accordance with the applicable national policies and regulations for environmental protection, the policies related to ecological protection, energy saving and emission reduction within China's "13th Five-Year Plan" as well as requirements of relevant government organs, and in line with the requirement of promoting business enterprises' high-quality development, Huaneng International strictly executed the work assignments set out in the Huaneng International Pollution Prevention and Control Implementation Plan 2018-2020 (《華能國際電力股份有限公司污染防治攻堅實施方案（2018-2020年）》).

The Company formulated the Regulations on Environmental Protection Management (《環境保護管理規定》), Measures for Evaluation and Accountability for Environmental Protection Work (《環境保護工作考核及責任追究辦法》), Operation Management Rules (《運行管理規定》), Overhaul Management Rules (《檢修管理辦法》), Technical Supervision Management Measures (《技術監督管理辦法》) and Management Measures for Capital Expenditure in Electricity Generation (《電力生產資本性支出項目管理辦法》) to ensure the progress on the work related to ecological environment protection and air pollution prevention and control projects.

Ecological and environmental protection is an important part of the Company's performance assessment and accountability system. The Company specified that the chief of each business unit should be held accountable for the assignments related to ecological environment protection and pollution prevention and control. The emission compliance rates of sulphur dioxide, nitrogen oxides and soot were included in our annual performance assessment system and business units that failed to meet those targets should be vigorously assessed; the persons who neglected their duty to push forward the work related to ecological environment protection and pollution prevention and control and caused damage to the ecological environment should be held accountable.

Management Measures

To enhance waste gas management, the Company has taken the following measures:

1. Enhance the supervision and implementation of work tasks. Enhance the review management of environmental protection renovation projects, optimize review procedures, secure renovation investment, strengthen supervision and management of key process such as bidding process and inspect and supervise key work tasks to carry forward the pollution prevention and control tasks.
2. Ensure effective cleaning. Continuously maintain the safe and reliable operation of environmental protection facilities, strengthen real-time monitoring of pollutants discharge, ensure discharge compliance, effectively control pollutant discharge in accordance with requirements set out in the pollutant discharge permit to secure a leading position in terms of pollutant discharge in the industry.
3. Ensure good air quality during key hours and weathers with serious pollution, ensure effective pollution prevention and control in key regions such as Beijing-Tianjin-Hebei and neighboring region, Yangtze River Delta and Fen-wei Plain, fully adopt measures such as load reduction of diesel trucks, non-peak-hour transportation and control of inorganized emission, successfully complete the air quality assurance tasks during the opening of National People's Congress and Chinese People's Political Consultative Conference, the celebration of the 70th National Day, the 2nd Belt and Road Summit, Wuhan Military World Games and the 2nd Shanghai International Import Expo, thereby fulfilling our corporate social responsibility.
4. Continuously innovate environmental protection technology. Successfully demonstrate the de-sulfurization waste water bypass exhaust evaporation technology in Huangtai Power Plant and launch the R&D on the digital circulating water waste discharge reduction technology in Mianchi Power Plant to provide experience for the subsequent projects.

Work Achievements

In 2019, the power generation companies affiliated to the Company have carried out ultra-low emission transformation as planned and completed the ultra-low emission transformation tasks under the "13th Five-Year Plan". The emission of three major pollutants, namely sulphur dioxide, nitrogen oxides and soot, remained at the same level compared with the same period last year, indicating a stable ultra-low emission level. The Company's ability to control emission continued to outperform industry peers.

Dezhou Power Plant – Effective Ultra-low Emission Transformation

The ultra-low emission transformation for the two 330 MW generator sets and two 320 MW generator sets in Dezhou Power Plant (Phase 1 and 2) adopted several technologies, namely low NOx burner, selective catalytic reduction, low-low temperature electrostatic precipitator, dual-tower dual-cycle de-sulfurization and dust removal and wet type electrostatic precipitator, effectively reducing the emission concentration of sulfur dioxide, nitrogen oxides and soot in the treated flue gas to below 35 mg/standard cubic meter, 50 mg/standard cubic meter and 5 mg/standard cubic meter, respectively. Since November 2017, the Company had applied the operation optimization technology on ultra-low emission facilities of Generator Set No.2 for demonstrative purpose, which was a part of the "Coal-fired generator set ultra-low emission facilities operation optimization technology research" project carried out in cooperation with Xi'an Thermal Power Research Institute Co., Ltd., with the aim of improving operating efficiency and reducing energy consumption in operation.

The ammonia spray of the de-sulfurization system can effectively lower the discrete value and average escape concentration of the nitrogen oxides at the reactor outlet of the de-sulfurization system, thereby significantly improving the de-sulfurization efficiency and the operational adjustment of air pre-heater, enhancing operation reliability and heat transfer efficiency. The optimization of the joint operation of dust removal and de-sulfurization systems reduced their station service power consumption rate, limestone consumption and operational cost by 0.26%, 7% and 3%, respectively.

Future Plans

The Company will continue to drive its pollution prevention and control efforts, focus on environmental protection transformation projects in key regions, including close-down of coal field, waste water treatment and ash field treatment for power plants, while expediting pollution prevention and control projects such as ultra-low emission renovation for clean heat supply units in the northern region.

The Company will continuously promote clean production practices, enhance permit-based waste discharge management, ensure effective management and control for air quality in key hours and weathers with serious pollution, strengthen the inspection management for environmental protection supervision at different level and improve the prevention and response for public opinion risk related to environmental protection.

The Company will maintain a vigorous environmental protection supervision and management, strictly comply with the requirements set out in the Environmental Protection and Pollution Control Accountability Measures (《生態環境保護及污染防治攻堅工作責任追究辦法》), strengthen supervision and site inspection to ensure effective supervision and management of the implementation of air pollution prevention and control tasks.

The Company will establish a sound environmental protection standard system, promote the research and development and application of technologies such as integrative removal of pollutants and comprehensive energy saving and environmental protection transformation, and summarize experiences from demonstrative projects to provide guidance to other projects.

5.3.4.2 Management of Greenhouse Gases

The Company actively engaged in carbon trade market and formulated the Management Rules on Greenhouse Gas Emission (《溫室氣體排放管理辦法》), and provide guidance and instructions as to carbon asset management, greenhouse gas statistics management, voluntary emission reduction project development and carbon asset trade.

In accordance with central and local governments' requirements on carbon emissions, our various regional branches are mainly responsible for carbon asset transaction and contract performance, greenhouse gas reporting and budgeting. Led by regional branches, project units and enterprises set up special bodies and assigned designated personnel to carry out emissions transactions, voluntary emission reduction projects, data monitoring and reporting.

Currently the Company is working on these two aspects to reduce carbon emission.

1. The Company seeks to reduce the carbon emission by reducing generator sets' coal consumption for power generation, through rigorous energy saving efforts by adjustments of management approach, structure and technology;
2. The Company seeks to improve the ratio of clean energy-based generator sets by adjustments of energy structure.

Carbon Emission Reduction

Carbon dioxide is the major greenhouse gas produced during the operation of the Company. It is mainly produced in the combustion process of coal, and a small amount is produced in the wet limestone-gypsum desulphurization process. In 2019, the Company's total energy-related direct greenhouse gas emissions amounted to 33,615.42 ten thousand tons of carbon dioxide equivalent, of which the total amounts of coal, natural gas and fuel consumption were 32,495.00 ten thousand tons, 915.40 ten thousand tons and 9.92 ten thousand tons of carbon dioxide equivalent respectively and the total volume of greenhouse gas emission generated by desulphurisation was 195.10 ten thousand tons of carbon dioxide equivalent. This transforms into a direct greenhouse gas emission intensity of 733.89 grams of carbon dioxide equivalent/kWh. The Company's energy related indirect greenhouse gas emissions amounted to 14.72 ten thousand tons of carbon dioxide equivalent, which translates into an indirect greenhouse gas emission intensity of 0.32 grams of carbon dioxide equivalent/kWh.

Daily Administration

The Company has entrusted Huaneng Carbon Asset Management Co., Ltd. (the "Carbon Asset Management") to formulate trading strategies, provide agency transaction and escalate compliance issues to higher authorities. After cooperating between regional branches and grassroots business units and taking into consideration the actual circumstances and market trends, the Carbon Asset Management conducts carbon asset transaction and contracts performance reporting.

Performance in Carbon Trade Pilot Regions

Regarding carbon asset transaction and contract performance, the Company's grassroots units in pilot zones such as Beijing, Chongqing, Fujian, Guangdong, Hubei, Shanghai and Tianjin appointed Carbon Asset Management to conduct carbon audits, carbon emissions transactions, and allowance and CCER swaps. Most of the pilot zones successfully met the annual carbon transaction and contract performance targets in accordance with the requirements of local lead departments.

Concerning developments of CCER projects, since the state had suspended CCER applications, no CCER projects were initiated in 2019.

Participation in National Carbon Trade Market

1. Continuously improve centralized and professional management of carbon asset. The Company has established a three-level carbon emission management system to specify the bodies and persons responsible for carbon asset management, and has formed a mechanism for work handover among the various levels of management staff to establish the division of labour and implementation responsibility. All grassroots business units of the Company have appointed Carbon Asset Management to provide one-on-one training and assist them in completing carbon audits and carbon transactions.

2. Actively participate in the policy study for the national carbon trade market. The Company actively participated in the policy study and discussions related to management rules and quota allocation plan for the national carbon trade market organized by the Ministry of Ecological Environment and China Electricity Council. It also closely monitored the policy development related to the construction of the national carbon trade market, carbon trade in pilot regions and voluntary emission reduction development and offset rules so as to keep ahead of the latest trend and mitigate the impact from the launch of the national carbon trade market.

3. Actively participate in the construction of the national carbon trade market and performance of carbon trade in pilot regions. In 2019, the Company carried out audits on thermal power companies' carbon emission in 2018, actively participated in and provided trainings related to the national carbon trade market, organized subordinate companies to perform trials on allocation of carbon emission quota, completed carbon trades in the pilot regions as required, conducted online monitoring and research of carbon dioxide flue gas and fulfilled the milestones in building the national carbon trade market.

Carbon Dioxide Capture Demonstration

The Company built the first post-combustion flue gas capture device in Beijing in 2008, with an annual process capacity of 3,000 tons, and built another one in Shanghai in 2009 with an annual process capacity of 12 ten thousand tons, which was the then-current world's biggest carbon dioxide capture device. The Company actively explored low-carbon development models by cooperating with Greengen Corporation Limited and scientific research institutes to develop a national "863" key technology supporting project, i.e. China's first Integrated Gasification Combined Cycle (IGCC) demonstration power station and the first set of pre-combustion carbon dioxide capture experimental device.

Future Plan

The Company will closely monitor the development of the national carbon trade market system, including the quota allocation plan, continuously improve the carbon asset management system and mechanism, strengthen routine management of carbon emission data, prepare budget for carbon asset management and trade, ensure effective implementation of carbon asset management works, estimate the carbon emission quota and prepare for trade system test and actively participate in preparations of the national carbon trade market.

5.3.4.3 Wastewater Management

Since a substantial portion of the Company's business involves thermal power generation, the industrial waste water is produced in the process of electricity production, including those from the concentration of steam turbine circulating cooling water, the wet de-sulfurization facilities, the auxiliary production facilities of the generator set, the coal field flush as well as sanitary sewage. In 2019, the total water discharge of the Company amounted to 17,237.21 million tons, the discharge of open cooling circulation system totalled 17,202.71 million tons, and the total discharge of sewage (including industrial and desulphurisation wastewater) was 34.50 million tons. Some of these waste water were allowed to be discharged when they reached a certain standard after treatment, e.g. waste water from circulating water; some were reused after treatment and cannot be discharged, e.g. those from de-sulfurization facilities and coal field flush; and certain power plants did not allow any waste water to be discharged to achieve zero discharge.

The Company adopted the following measures in the management of waste water treatment and discharge:

1. The Company rigorously implemented the applicable water pollution policies and sewage discharge licensing requirements. All thermal power plants of the Company obtained the corresponding sewage discharge licenses as scheduled;
2. Inspection and rectification were carried out against the sewage discharge licensing requirements. A company level comprehensive pollution control plan was formulated based on environmental protection requirements at various levels, and power plant water saving and wastewater treatment transformation projects were launched in an orderly manner in accordance with the requirements of local governments and environmental assessment;
3. The Company also performed on-site checks and inspections of environmental protection facilities, including wastewater treatment units;
4. The Company continuously improved its environmental protection system by formulating the Guiding Opinions on Water Saving and Wastewater Discharge Transformation to ensure the compliance with environmental protection requirements through research and optimization;
5. The Company actively adopted the latest wastewater treatment technology and launched wastewater transformation demonstrative projects.

In 2019, Huangtai Power Plant's de-sulfurization bypass flue gas evaporation demonstrative project received the "2019 Power Generator Company Technological Innovation Award". The Company provided project experience for companies to carry out wastewater treatment projects. Plant-wide water saving and wastewater treatment projects in power plants located in key regions including the Beijing-Tianjin-Hebei region and the neighbouring "2+26" cities, Yangtze River Delta and the Fen-wei Plain have entered the implementation stage.

Award Received by Huangtai Power Plant

Chaohu Power Plant – Circulating Water Discharge Transformation Project

To meet the high wastewater discharge standard, Chaohu Power Plant cooperated with Xi'an Thermal Power Research Institute to develop a water treatment approach that combined the aerobic biological fluidized bed technology (ABFT), coagulation and clarification, ozone-biological activated carbon filter and medium filtration. The ABFT can effectively remove the ammonia nitrogen in the water with microorganisms, and then the ozone-biological activated carbon filter removes the organics in the water. This water treatment system integrates denitrification, organics removal and sterilization and disinfection to achieve advanced purification of water.

The designed treatment capacity of this system was 400 cubic meters per hour. The project construction commenced in May 2019 and was put into operation in December 2019. The treated water generated from the system was sampled and tested by a third party, with indicators such as chemical oxygen demand, ammonia nitrogen, total phosphorus and suspended solids far lower than the limited values set out by the environmental protection departments.

This project mitigated the negative environmental impact of the power plant discharge on the natural water condition of the Chaohu Lake basin and relieved Chaohu Power Plant's wastewater discharge pressure. In addition, it set a precedent of using this technique in circulating water discharge treatment for power plants, which was a good demonstration and promotion for thermal power plant's realization of wastewater treatment transformation.

Chaohu Power Plant

Future Plan

The Company will continue to strengthen water pollution control and promote the enhanced treatment and comprehensive utilization of industrial wastewater and domestic sewage, as well as launch wastewater zero discharge transformation projects in an orderly manner in areas where specific environmental protection requirements apply.

With the gradual deepening of wastewater treatment work as well as the increased wastewater treatment technology research efforts by domestic tertiary institute, Xi'an Thermal Power Research Institute and Huaneng Clean Energy Research Institute, we will formulate a roadmap for developing practical, reliable and cost-effective wastewater treatment technology. We will gradually carry out thermal power plant water saving and wastewater comprehensive treatment transformation in key areas in order to eventually enable all thermal power plants to comply with the updated pollutant discharge licensing requirements, with some reaching even higher standards.

5.3.4.4 Waste Management

The Company's disposal of wastes strictly complies with the Law of the People's Republic of China on Prevention and Control of Solid Waste Pollution (《中華人民共和國固體廢棄物污染環境防治法》) as well as the Regulations on Environmental Protection Management (《環境保護管理規定》), Measures for Evaluation and Accountability for Environmental Protection Work (《環境保護工作考核及責任追究辦法》). The Company requires that the storage, discharge, and disposal of waste comply with national laws and local policies. It also cooperates with qualified third parties to deal with waste and strengthens waste recycling to minimize waste emissions.

Solid Waste

The main solid waste generated during the Company's power generation process includes fly ash and cinder produced during the combustion process of the boiler, and gypsum produced during the limestone wet desulphurization in power plants. The Company produced 3,949.59 ten thousand tons of solid waste, among them, 3,064.44 ten thousand tons of fly ash and cinder, and 885.15 ten thousand tons of desulphurised gypsum during the year of 2019. The rate of comprehensive utilization of fly ash and cinder stood at 89.97% and the rate of utilization of desulphurization gypsum disposal was 81.78%.

Fly ash and cinder, desulphurization gypsum and other solid waste can be sold as raw materials in related industries, such as cement, concrete, aerated blocks and gypsum board. The Company has established an environmental protection supervision and management system for solid wastes such as fly ash and cinder and desulfurization gypsum to effectively control the canning, stacking and marketing of cinder and desulfurization gypsum.

When loading cinder and gypsum, the Company rigorously follows the operational norm for load control, separates the cinder and gypsum and controls the load capacity during transportation and conducts thorough check and cleaning before vehicle entry to prevent "escape, spill over, dripping and leakage" of solid wastes. Most of the cinder and gypsum collected from boilers will be directly transported to the processing plants for secondary use. The Company closely monitors where the by-products of power generation are being transported and how they are going to be used to prevent environmental pollution and public issues that have a negative impact on society.

The power plants will temporarily place some fly ash and cinder on ash storage sites and the Company has implemented a rigorous control system to ensure the safety of ash dams and prevent seepage by carrying out regular assessment and inspection. In accordance with the requirements of local environmental protection authorities, construction and retrofitting of wind-proof and dust control facilities have been carried out to ensure that the storage of ash and gypsum is in line with local environmental protection standards. In 2019, the Company invested a total of RMB120 million in ash field treatment.

Hazardous Waste

The main hazardous waste produced by the Company during the process of power generation includes such hazardous solid waste as used de-nitration catalysts and ion exchange resin deactivated in wastewater treatment, as well as hazardous liquid waste like waste oil produced during the operation of power plant units. The Company regenerates the de-nitration catalysts which have reached their life limit and continues to charge them into de-nitration devices for use. Inactivated ion-exchange resin from chemical water treatment can be restored to its original state for reuse after being rinsed with mineral acids or alkalis of a certain concentration. The Company will hire qualified agencies to deal with de-nitration catalysts that could not be renewable anymore, ion exchange resins that cannot be reused and hazardous liquid waste such as lubricant and other waste oil during operations. Besides, through managing the accounts, we detailed statistics on the amount of waste generated, the amount of disposal, and the audit of the qualifications of disposal units, etc., and strictly managed the generation and disposal of waste.

In 2019, the Company in the process of production and operation generated 8,034.30 tons of denitration catalysts, 210.45 tons of ion exchange resin and other hazardous solid waste and 721.62 tons of waste oil and other hazardous liquid waste.

Yangliuqing Thermal Power Plant – 100% Disposal of Solid Wastes

Yangliuqing Thermal Power Plant has established a full-cycle solid waste management system covering the generation and sales of solid wastes, by establishing a sound solid waste management mechanism and developing policies such as Management Rules on Sales of Pulverized Fuel Ash (《粉煤灰銷售管理辦法》), Environmental Protection Supervision and Management Regulations (《環保監督管理規範》), Management Regulations on Treatment of Desulfurization By-products (《脱硫副產品治理管理規範》), Management Rules on Limestone Powder (《石灰石粉管理規範》) and Management Rules on Transportation Shift to Avoid Peak Load (《車輛錯峰運輸管理辦法》). The power plant has enhanced the control on the quality and output of solid wastes to control the sulphur content of coal supplies and minimize the generation of solid wastes. It holds monthly environmental index analysis meetings to report on the solid waste indexes. Where any index failed to meet the prescribed criteria, the power plant will urge responsible department to make corrections within a fixed period of time and adopt a close-loop supervision approach to improve market competitiveness. The power plant adopts a precise solid waste sales strategy and open tendering to ensure adequate competition. It has established a contractor elimination mechanism to target customer and ensure the generator sets' solid waste discharge safety. The power plant adopts a flexible sales strategy. When the market demand for coal ash, cinder and gypsum is low, the bundle sales strategy will be used where cinder, gypsum and coal ash are sold in bundle, thereby achieving a full utilisation of cinder, coal ash and gypsum.

Yangliuqing Power Plant

5.3.5 Noise and Other Environmental Impacts

As a responsible enterprise, Huaneng International always handles its operations with great care to minimise their impact on the environment, and performs noise and dust management in strict accordance with the Law of the People's Republic of China on Noise Prevention and Control (《中華人民共和國環境噪聲污染防治法》).

Noise Management

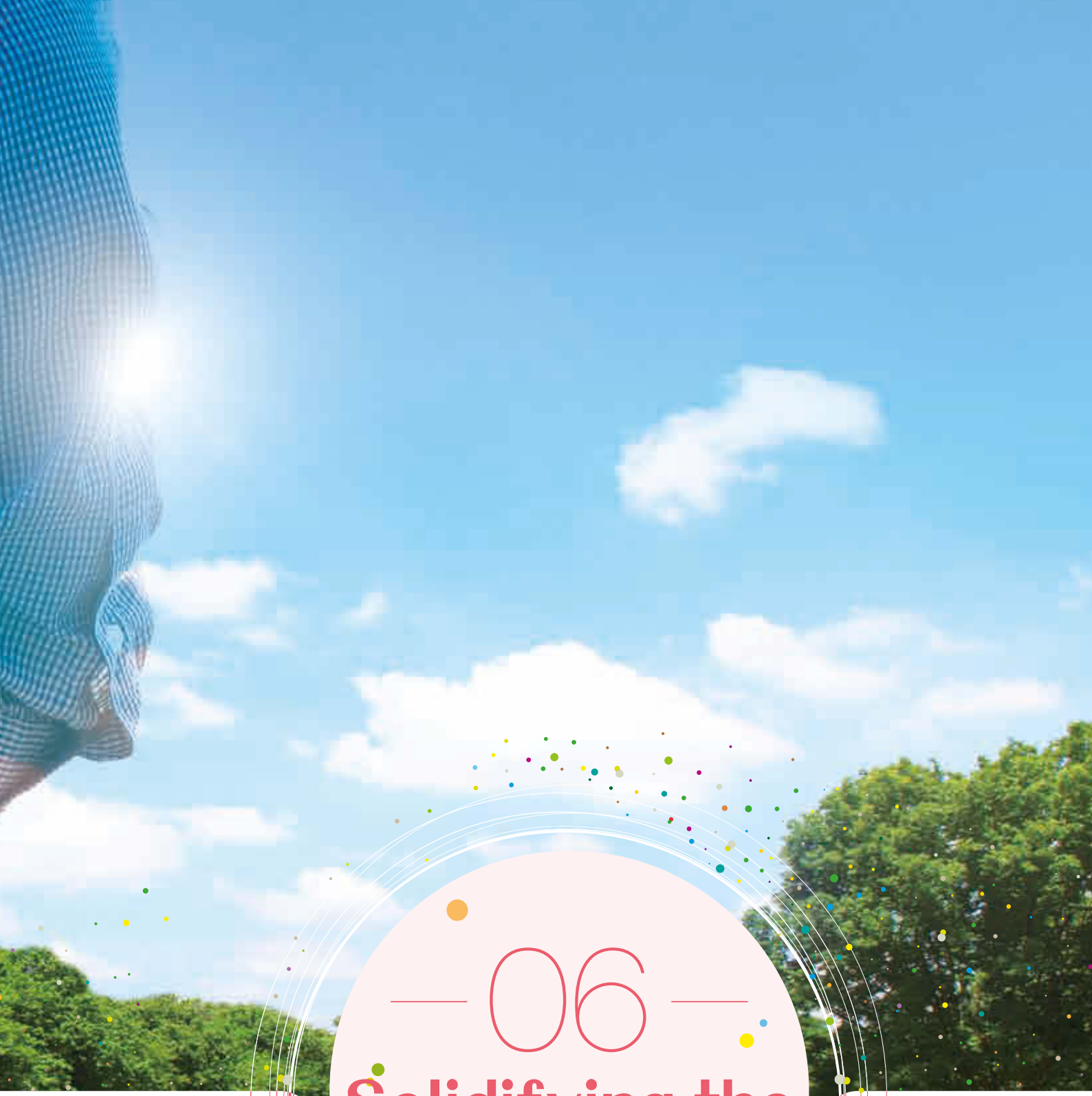
From the initial stage of the construction of power plants subordinated to the Company, relevant departments of environmental protection determined the sensitive points of noise within the boundaries of power plants and relevant noise control level, in accordance with environmental impact assessment approval requirements. In the environmental completion acceptance of the power units in all power plants, the environmental protection authorities will monitor according to the environmental impact assessment approval requirements, and only when the monitoring results are qualified will the acceptance concerning noise control pass. During the operation of power units, the power plants will monitor the noise control regularly in accordance with requirements of environmental protection authorities and published the results. The power plants installed noise coverings on equipment such as fans which are the noise sources in the plant area and built noise walls in key areas such as the cooling water tower area. When the power units are undergoing transformation or equipment failure which causes excessive noise, the Company will conduct noise reduction transformations accordingly.

Other Impacts

Other environmental impact generated by power plants also includes coal field dust, ash field dust and unorganised emissions from non-road machinery. All power plants owned by the Company during their initial stage of construction are all required to pass the EIA approval by the relevant environmental protection departments, in order to avoid serious impact on the surrounding environment and natural resources during operations. During operations, the power plants strictly abide by national environmental emission standards, and discharge wastes within the standards. Some of the power plants actively responded when the requirements of surrounding environment changed, to ensure that the surrounding environment and natural resources are protected.

To enhance the management of unorganized emissions from coal yards, the Company has carried out coal field closure retrofits in key areas and introduced wind and dust suppression nets, covers and sprays to effectively control coal and dust pollution from coal fields and improve their surrounding environments.

Huaneng International regards safety as its own life, builds a solid foundation for safe production, pays attention to the inspection and remedial of safety hazards, has a zero tolerance policy for safety incidents, always adheres the production safety principles of "people oriented, safety first, prevention first, comprehensive management", upholds the safety conception of "safety is credibility, efficiency, competitiveness; responsibility of safety is of the greatest significance". The Company aims at achieving prevention of personal death, mishandling of operations with malicious intent, major equipment damage, major equipment incidents, fire outbreaks, traffic accidents for which someone is held responsible, environment pollution and other incidents that may adversely affect the Company's reputation. The Company places safety in the first place in any case, attaches great importance to the personal safety and occupational health of employee. We strengthened safety awareness and provided proper safety protection to effectively ensure safe production.



06

Solidifying the Foundation for Safe Production

According to the Company's Safety Production goal within the "13th Five-Year Plan" period, by 2020, the Company and each business unit regulates the operation of the intrinsic safety system, incorporates outsourcing into the scope of the Company's management and further enhances training on production safety for comprehensive control of on-site risk management, effective implementation of the accountability system and prevention of safety accidents and occupational diseases. The target is to achieve zero injury (minor or more serious injuries), zero (environmental) pollution, and zero (equipment) incident in grassroots business unit. Major production safety tasks during the "13th Five-Year Plan" period include strengthening outsourcing management, deepening the operation of the intrinsic safety system, deepening risk control, deepening the management of safety hazards, strengthening emergency response management, advancing production safety education for all, strengthening onsite monitoring, promoting the development of a safety management IT system and creating a corporate safety culture.

In 2019, the Company continued to adhere to the safety management principle and strictly abide by the applicable safety production laws and regulations to achieve the Company's management target. In 2019, there had been no significant violation identified in the Company related to the provision of safe working environment and protecting the employees from occupational hazards.

6.1 Establishing an Intrinsic Safety System

According to laws and regulations on production safety stipulated by the state, the Company, taking into consideration actualities of its subsidiaries, has established its own fourfold Intrinsic Safety System ("ISS"), which comprises intrinsic safety of personnel, process equipment, environment and management.

Ensuring Intrinsic Safety of Personnel

Intrinsic Safety of personnel includes management staff and all employees' safety awareness, safety conception and safety management knowledge and skills. Management staff were required to have safety management knowledge and skills and lead by example, while employees were required to ensure safe operation by carrying out effective controls. We urged employees to take proactive steps and act in accordance with rules and regulations.

Ensuring Intrinsic Safety of Equipment

Intrinsic safety of equipment refers to the fact that equipment, facilities, or process technologies contain inherent functions that prevent accidents from occurrence. We adhered to high standards of design and manufacturing, and conducted systemic safety risk analysis of process, equipment, inspection and maintenance. We also put forward and implemented risk control measures to ensure the safe, stable and normal operation of equipment and systems within the prescribed operating period in addition to maintaining effective control.

ISS

Ensuring Intrinsic Safety of Environment

Environment includes space environment, physical and chemical environment, the natural environment, etc. Environment safety thus means to meet all kinds of requirements. For the intrinsic safety of the spatial environment, we made sure that the production space, layout, various safety and sanitation facilities and passages complied with the state's relevant regulations and national standards. For the intrinsic safety of the physical and chemical environment, effective measures were taken to manage and control lighting, ventilation, temperature and humidity, noise, dust and toxic and harmful substances in compliance with national standards to ensure workers' health and safety. As for the intrinsic safety of the natural environment, we enhanced the disaster resistance and prevention capabilities of process and equipment, and implemented emergency response and precautionary measures.

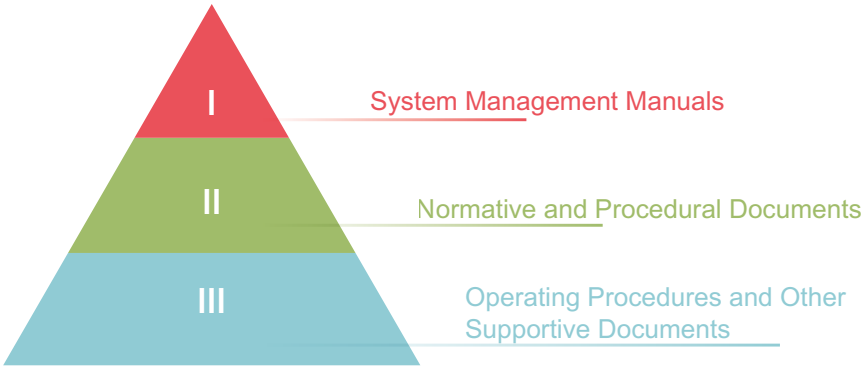
Ensuring Intrinsic Safety of Management

Intrinsic safety of management requires, under the condition of fulfilling national laws and regulations, companies' formulation and implementation of higher standards on safety, norms, and regulations, as well as their development of a comprehensive management system. In respect of safety management, we were transitioning from post-incident-based to identification-based in addressing safety issues, and we are placing more emphasis on process controls rather than remedial efforts in responding to safety incidents. We also sought to apply safety system engineering principles and conduct scientific analysis in formulating pre-emptive measures.

The PDCA Management Model of Intrinsic Safety System

The Company's intrinsic safety system follows the PDCA management model, i.e. PLAN, DO, CHECK, and ACTION, establishing circulation and improves continuously. The management model consists of six key elements: leaders' commitments, policies of safety, health and environment, planning, implementation and operation, inspection and corrective measure, and management review.

The Company's Intrinsic Safety System's documents consist of system management manuals, standards and procedural documents, as well as operating procedures and other supportive documents.



Ongoing Effort to Establish an Intrinsic Safety System (ISS)

The Company continues to develop its ISS, refines the safety evaluation rules for power generation companies, further defines the management responsibilities of different levels of staff, specifies the frequency and cycle for safety evaluation and focuses on the close-loop management of safety evaluation. At the same time, the Company engages experts with rich experience in precise management to conduct safety evaluation on power plants such as Hegang Power Plant and take these cases as examples to further improve the safety management, equipment management and technology management of regional branches and grassroots business units.

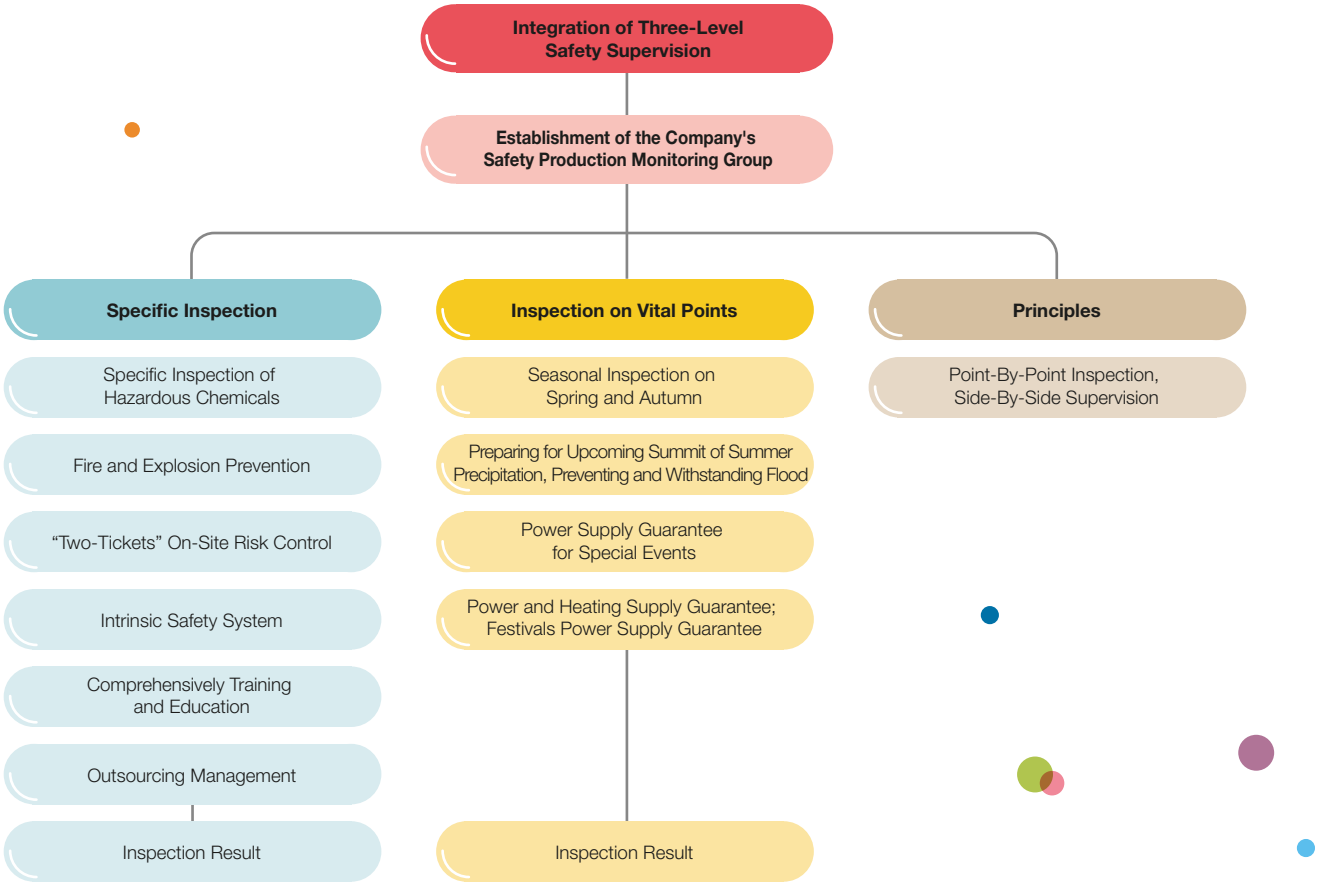
6.2 Building a Sound Safety Mechanism

The establishment and improvement of safety management system is key to the safety production of production and business units, and crucial to occupational safety and health. The Company and all its affiliated units have established a robust safety management structure as well as a complete set of safety supervision mechanisms to fulfil safety supervision responsibility. As the management, construction and operation maintenance team and other business functions incorporate the safety production principle with their own lines of business to form a safety production protection system. The interaction of safety supervision and protection ensures the accomplishment of safety production targets.

Establishing a Three-Level Safety Supervision System

Huaneng International has set up a Committee of Safety, Occupational Health and Environmental Protection, which mainly aims to adhere the policy of "safety first, prevention first, comprehensive management", implement the national, industrial, and Huaneng Group's own guidance and arrangements on safety production, organize and guide the Company's work of production safety, analyse and propose important decisions and measures concerning production safety, and coordinate and solve key problems therein.

Under the leadership of the Committee of Safety, Occupational Health and Environmental Protection, the Company establishes and improves management and organizational institutions of production safety, and has built a three-level security inspection system made up of "headquarters – regional branches – grassroots business units". The Company took charge of system design, business strategy, on-site supervision and work assessment, whereas regional branches were responsible for implementing the Company's various safety management requirements, work plans and deployment decisions as well as specifying the major responsibilities of their affiliated grassroots units. Grassroots business units were tasked with implementing the standards on the Fulfilment of Production Safety Responsibilities (《各級人員安全生產責任到位標準》) ensuring all personnel's fulfilment of their respective safe production responsibilities.



Safety Production Target Responsibility System

The Company and its subsidiaries apply a target responsibility system concerning production safety. Every year the Company's management and their subordinate unit's person in charge signs a concerning Safety Production Target Responsibility memorandum (《安全生產目標責任書》) to carry out monthly pre-assessment and yearly final assessment, and guarantee the implementation of responsibility at every level. The Company's target of safety production abides by "one vote veto", which refers to a quantitative evaluation on production safety performance of each unit with starting score of 100 points. If there is any injury or death accident of employees, injury accidents of contracted personnel in which the Company is responsible, serious equipment accidents in which the Company is responsible, fire disasters, environmental pollution and damage accidents, 100 points will be deducted.

6.3 Effectively Implementing Safety Measures

Huaneng International sees safe production and employees' occupational safety and health as paramount. The Company has taken comprehensive and effective measures, continuously updated methodology, and contributed to the continuous enhancement of the level of safety production.

Overall Production Safety

In 2019, the Company redoubled its efforts in deepening the implementation of "Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era" and the work spirit of the 19th National People's Congress, following President Xi Jinping and Premier Li Keqiang's instructions on safety production, carrying out the deployment decisions of the Central Communist Party and the State Council on safety production work to strengthen production safety accountability assessment and promote the establishment of a safety production accountability system. A dual prevention mechanism was put in place to enhance the prevention and control of safety risks and facilitate the construction of a risk prevention and control system. The Company also improved its occupational health management to maintain the overall stability of its safety production situation. The Company solidified the foundation for production safety management by enhancing the safety management of outsourced projects and actively pushing forward the construction of the safety protection system.

Safety Responsibility Assessment and Accountability System Establishment

The Company strictly complied with the requirement put forth by the Chairman at the annual conference, i.e. "the solidification of a safety production foundation should be regarded as the basis for high-quality development", by continuously enhancing accountability and implementation of responsibilities. The Company stipulated the Methods for Questioning related to Safety Supervision (《安全監管約談辦法》) to systematize the questioning related to safety supervision. The Company continued its safety production accountability evaluation and completed the accountability evaluation on subordinate power plants such as Yingkou Thermal Power Plant and Changchun Thermal Power Plant. Through these inspections, the Company identified and corrected nearly a thousand issues of various natures. The Company also supervised the close-loop management of regional branches and grassroots units' remedial work to improve the implementation of the accountability system.

Classified Risk Control and Risk Investigation and Mitigation

Through the strengthening of on-site risk control, the Company's safety risk control capability has been enhanced.

1

We urged each business unit to conduct on-site risk investigation and analysis to "identify potential dangers and quantify risks" from the perspectives of personal safety, equipment safety and environment safety based on the "Two Tickets" policy, as well as putting together a risk identification database and standardising the "Two Tickets" management process.

We also launched pilot projects for the construction of a dual prevention mechanism combining classified risk control and hazard inspection and clearance at thermal power plants in Weihai, Yantai and Changchun. Based on the experiences from these pilot projects, we revised the Rules for the Inspection and Clearance of Safety Production Hazards for Power Generation Company (《電力企業安全生產事故隱患排查治理辦法》) and formulated the Implementation Guidance on Classified Control and Management of Safety Production Risk (《安全生產風險分級管控實施導則》), thereby systematizing and standardising hazard inspection and classified risk management and control. The risk identification, analysis and control of grassroots business units were further improved.

2 Based on the construction of the dual prevention mechanism, we strengthened risk investigation, risk mitigation and on-site supervision, while standardising the "two-ticket, three-policy" management process for grassroots units. We took a zero-tolerance attitude towards noncompliance and imposed stringent controls on key areas, key procedures, key event periods, key positions and key persons to strengthen safeguards and prevent casualties. We focused on the investigation of fire risks in power supply, coal transportation, boiler fuel oil, lubricating oil, desulfurization, hydrogen and other systems as well as the management of liquid ammonia tanks to prevent accidents such as explosions of the four major pipelines and pressure vessels to minimize the risk of major accidents.

3 The Company continued a series of special treatment projects and special inspections, covering dangerous chemicals and major hazards, fuel systems, outsourcing standardized acceptance, metal supervision, flood prevention and control, fire safety and fall prevention. In the spirits of the instruction and direction of President Xi Jinping and Premier Li Keqiang on the "3·21" significant explosion in Xiangshui, Jiangsu, the Company issued the Notice on Strengthening Safety Production Measures (《關於進一步加強安全生產工作的通知》) to regulate the safety management of hazardous chemicals launch special inspections on the safety of hazardous chemicals to prevent occurrence of accidents.

In addition, the Company launched special inspections on the safety of hazardous chemicals to prevent occurrence of accidents; continued the construction of the safety production risk monitoring and warning system for hazardous chemicals, urged business units to sort out and classify their existing risk sources and connect to the government's safety production risk monitoring and warning system for hazardous chemicals in accordance with local governments' requirements and time limits.

4 The Company enhanced the safety management for natural gas pipelines and issued the Notice on Enhancing the Safety Management of Natural Gas Pipelines (《關於加強天然氣管道安全管理的通知》), strengthened the tour inspection on equipment pipelines, vigorously controlled the third party construction risk, established accountability for the safety management of natural gas pipelines, enhanced pipeline corrosion control and management and facilitated the implementation of internal and external inspection to ensure effective risk control for gas pipelines. At the same time, the Company organized experts to conduct special safety inspections in Suzhou Thermal Power Plant and Guilin Gas Turbine Power Plant.

Yuhuan Power Plant–Successful Defence against the Super Typhoon Lekima

At a quarter to two on 10 August 2019, Lekima, the 9th typhoon landed in Chengnan County, Wenling, Zhejiang, just 35 kilometers away from Yuhuan Power Plant. The wind speed near the center of the typhoon reached Grade 16, i.e. 52 meters/second, making it the strongest typhoon ever landed in Taizhou region since the founding of the PRC. During the landing of the typhoon, generator sets No. 2 and No. 3 in Yuhuan Power Plant were shut down according to the power grid adjustment plan while generator sets No. 1 and No. 4 were safely operating. 1,026 persons were evacuated from the power plant, with 307 persons staying on duty. No personal injury or significant equipment damage occurred in the power plant at that time.

In response to the upcoming attack of the rare super typhoon Lekima, the typhoon response office in Yuhuan Power Plant released related information in real time. The office issued a plant-wide notice on pre-warning inspection for Lekima on 5 August and initiated the typhoon response contingency plan, requiring all departments and external parties to prepare for personnel evacuation, communication protection and other protection measures to ensure effective implementation of the contingency plan. Within 36 hours before and after the landing of the typhoon, the typhoon response office held six deployment meetings consecutively, with the goals of "Protecting Personnel, Ensuring Safety and Safeguarding Equipment", to plan the typhoon response under the principles of "Prevention, Avoidance and Anticipation".

Through cooperation and fulfilment of responsibilities by all departments of Yuhuan Power Plant, site information was released at real time through WeChat group and intercom system. The departments such as power generation, operation and maintenance, coal delivery and environmental protection enhanced the on-site inspection for safety loophole. The marketing and purchase departments communicated with external parties such as those in charge of dispatch, port and shipping and maritime affairs to receive the latest information related to typhoon and flood, thereby ensuring the safe and orderly implementation of power plant's typhoon and flood response measures.

All Teams Standby for the Landing of Typhoon

On-site Equipment Reinforcement

Enhancing Safety Risk Awareness, Improving Staff's Emergency Response

The Company revised the Emergency Management Rules (《應急管理辦法》), General Contingency Plan (《總體應急預案》) and six special contingency plans in accordance with the Management Rules on Contingency Plans for Production Accidents (Order No. 2) (《生產安全事故應急預案管理辦法》(2號令)) and Rules on Response for Production Accidents (Order of the State Council No. 708) (《生產安全事故應急條例》(國務院令第708號)) issued by the Ministry of Emergency Management of China to further improve the compliance and feasibility of the policy and contingency plans.

The Company acknowledged that theory and practice should be united. Therefore, it established related management rules and conducted a series of emergency exercises to further improve the emergency response capability. During the safety production months, the Company formulated contingency plans and conducted emergency drills for emergencies such as natural disasters, geological disasters, gas pipeline leaks, liquid ammonia leaks and confined space environments. These emergency drills included the natural gas leakage in Suzhou Thermal Power Plant and liquid ammonia leakage in Pingliang Power Plant, which not only improved staff's on-site emergency response and their ability to save themselves and others but also further refined the contingency planning by improving its rationality and feasibility.

Suzhou Thermal Power Plant Carried Out Emergency Response and Rescue Exercise for Natural Gas Pipeline Leakage Explosion

On 20 September 2019, Suzhou Thermal Power Plant carried out an emergency response and rescue exercise for natural gas pipeline leakage explosion in cooperation with the Safety Commission and Oil and Gas Pipeline Committee of Suzhou High-tech Zone.

The emergency exercise targeted at the natural gas leakage and explosion arising from the partial damage of natural gas pipeline caused by the illegal operation of a third-party contractor, which resulted in the interruption of power and heat supply of the gas turbine power plant as well as hazard warning to nearby area. The exercise also included rescue actions taken by Suzhou Thermal Power Plant and related government organs to prevent personal injury, escalation of accident and secondary accident.

At the time of the accident, the staff were able to respond quickly and effectively to prevent the escalation of the accident, thereby minimizing personal injury and property loss, protecting people's lives and properties and social stability as well as minimizing losses arising from the accident. The exercise and its preparation improved the safety awareness and sense of responsibility of the management personnel responsible for the operation and maintenance of natural pipeline and enhanced their emergency response and rescue capability so as to continuously refining the natural pipeline contingency plan and counter measures.

Kick-off Meeting and Rescue Exercise

Pingliang Power Plant Carried Out a Liquid Ammonia Leakage Emergency Exercise

On 21 November 2019, Pingliang Power Plant carried out a liquid ammonia leakage emergency exercise. The general manager of the power plant acted as the commander-in-chief for the exercise and the deputy general manager acted as the field commander. The exercise comprised six scenarios, namely emergency warning, personnel evacuation, emergency response, personnel rescue and post-emergency recovery. The exercise fully mobilized all the resources and power available. Controllers, supporting personnel and rescue teams demonstrated good cooperation and the goals to test the contingency planning and train the emergency team were accomplished.

Ammonia Leakage Emergency Exercise

6.4 Vigorously Safeguarding Occupational Health

The occupational health of our employees has always remained Huaneng International's top concern. On the basis of compliance with the Labour Law of the People's Republic of China (《中華人民共和國勞動法》), the Production Safety Law of the People's Republic of China (《中華人民共和國安全生產法》) and other laws and regulations, Huaneng International's affiliated units formulated the "occupational disease and hazard management standards" and the "occupational health supervision and management standards" in accordance with the requirements of the Company's intrinsic safety management system. We always put our employees' health and safety first by raising awareness of work safety and preventing hazards from taking place.

All grassroots business units have set up occupational disease prevention organizations to implement occupational disease prevention responsibilities as well as identify and evaluate workplaces with occupational hazards against relevant standards to rate the hazards. Employees are provided with training on occupational disease prevention, while clear warnings are put up in workplaces with potential occupational hazards where regular inspection is carried out. Regular occupational health examinations, i.e. chest X-ray and hearing test, were conducted for employees in relevant production positions such as fuel supply, boiler operation and overhaul, and an occupational health management database was established. To ensure occupational health, the Company provided climbers or elevators in all new projects to reduce the possibility of typical occupational diseases (such as lumbar disc herniation) from the wind power industry. Projects already put into production were also required to have these equipments in place to reduce the staff's climbing exercise intensity and reduce the inducing factor for diseases.

The Company strictly implemented regular safety hazard inspection, hazard notification, prevention and control and offered regular health checks for positions with occupational disease and established a health monitoring file management system for positions at different levels to ensure that the occupational health and safety were controllable and under control.

6.5 Continuously Improving Safety Practices

Raising employees' safety awareness is key to the Company's safety management. To develop and encourage employees to participate in the Company's all kinds of security activities in order to establish good security behaviours is the key guarantee to create an intrinsic safety enterprise.

Safety Training Management Mechanism

Huaneng International has incorporated safety education and training into the Company's annual and long-term plan, established double-level and triple-level educational and training mechanisms, and ensured the implementation of required coaches, funds and materials. The Company's safety department is responsible for the preparation of training plans according to the safety education outline, organisation of safety education and training, and sorting well the records and archives of safety trainings. All business units of the Company ensure that employees receive adequate training, adjust safety education plan and organize training for power plants, departments, and teams according to the characteristics of departments' and teams' production.

Provision of Safety Training

In 2019, the Company actively offered diversified education and training programs to improve the safety skills of its staff.

In order to improve the Company's safety management level, the Company organized and offered safety training classes to the heads of subsidiaries. These trainings have improved the safety awareness and management level of company heads and safety management personnel, thereby mitigating safety management risks.

In order to improve safety supervision personnel's professional skills and practices, the Company provided special trainings to safety supervision personnel. To regulate the qualification of safety management personnel, the Company organized two sessions of trainings, namely certified safety engineer continuing education and safety management personnel qualification training, to 581 employees.

To address the difficulties and key points in the safety supervision of grassroots business units, the Company organized the internal safety experts to provide three sessions of company-wide video trainings under the themes of "Interpretation of inspection evaluation criteria for the safety production accountability system", "Management and contingency response for major hazard sources in the ammonia section" and "Safety management key points for hoisting equipment", with the aim of improving operators' safety skills and management capability.

In addition, the Company notified the grassroots business units of internal and external accidents in a timely manner, focused on the analysis of recent accidents at home and abroad such as falling from a high altitude, crane injury, poisoning and choking and electric shock and urged the grassroots business units to enhance warning and education, learn from the accidents and strictly follow the working ticket, operating ticket and working shift system to strengthen the on-site supervision and ensure that effective prevention measures are in place.

In 2019, the Company and regional branches organized 464 rounds of assessments by job function based on the "one function, one standard" principle, assessing a total of 34,655 person times employees; provided 11,491 sessions of trainings to grassroots business units, with 359,619 person times attending; and grassroots business units have completed the review of historical production accidents and prepared 3,772 pieces of training materials.

Grassroots Units Training

11,491
Sessions

359,619
Person Times

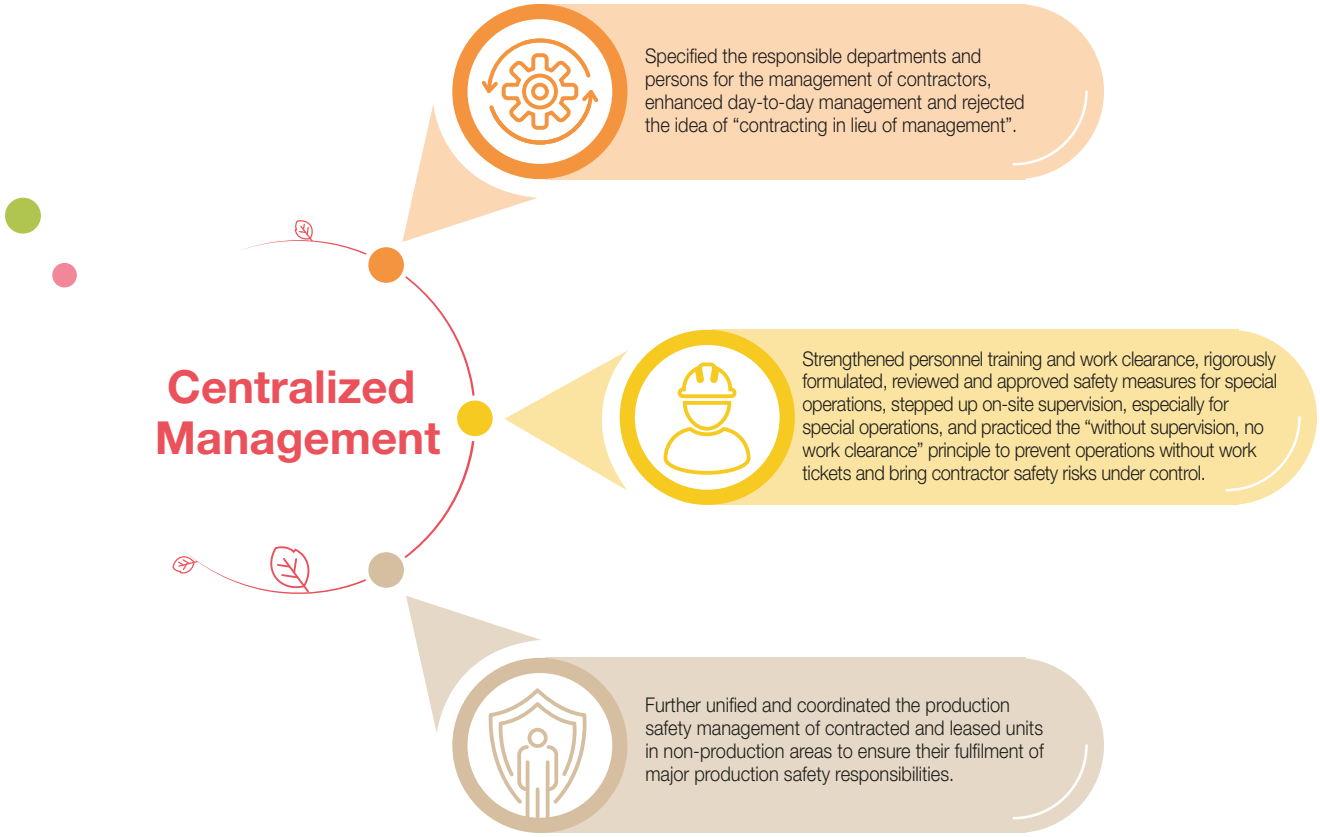
6.6 Comprehensive Regulation of Outsourcing Management

We require that contractors fulfil their major production safety responsibilities, implement the Company's various safety regulations and carry out day-to-day safety training to ensure safety production.

Strengthening the Management of Contracted Projects to Ensure Safety

In 2019, the Company edited and revised the Safety Management Measures on Bidding and Contract Construction (《發承包工程安全管理辦法》) to regulate the five key processes, namely tender for outsourcing projects, qualification vetting, pre-construction preparation, operation site supervision and management, and contractor evaluation, and further specify the management procedures. The Company has developed a contractor safety management information system to manage and control the full-process work of the contractor, including the qualification and attendance of contractor personnel. The Company implemented the closing and the face recognition-based access control for production area, thereby completely resolving the issue of inadequate management on contractor.

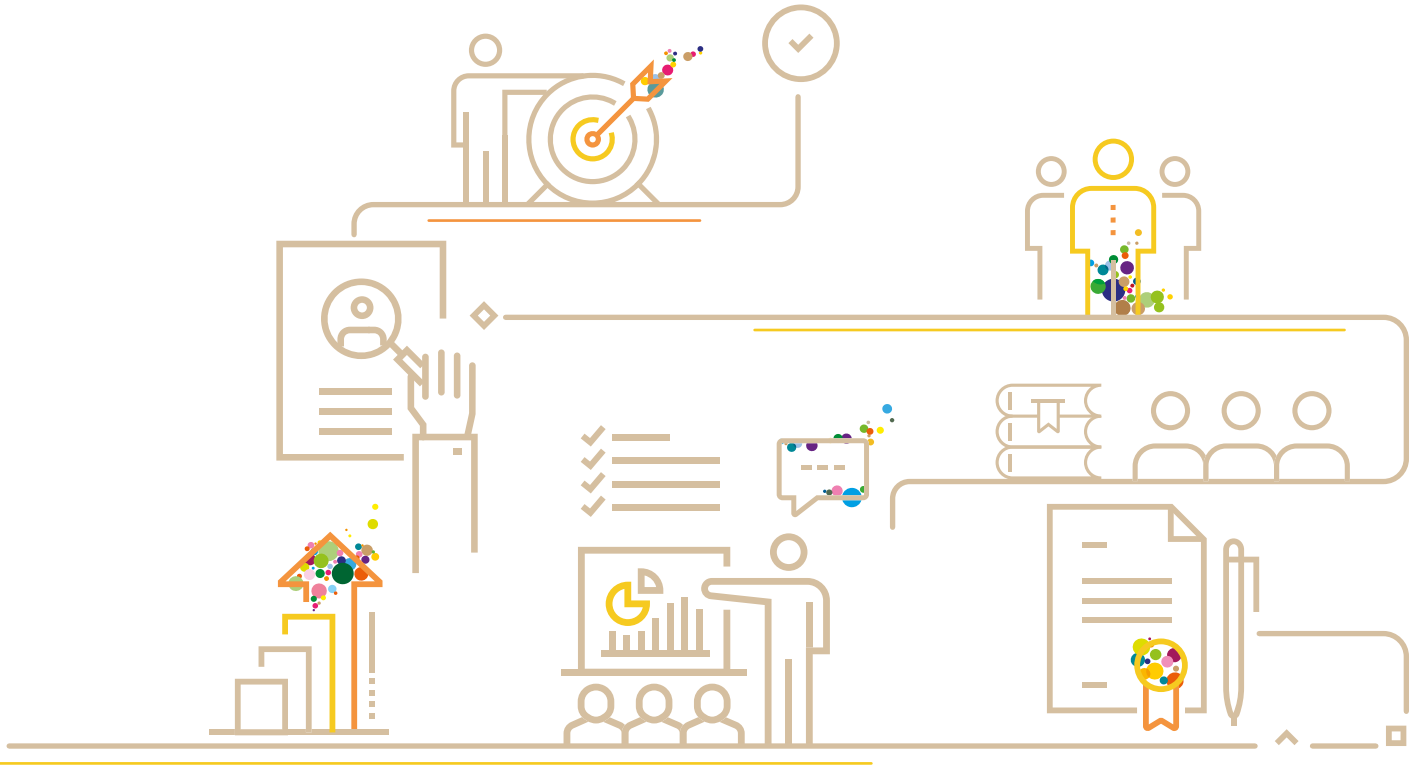
In addition, the Company has incorporated the outsourcing teams into the power plant production and management system to enable centralized management:



Enhancing Safety Education and Training for Outsourced Personnel

Based on the requirements of Huaneng International personnel training standards, the Company's various units formulated training plans which require outsourced personnel to understand the basics and fundamentals of their position, provide outsourced personnel training in line with employee training, and engage them in activities like spring and autumn checks, Safety Month and safety inspection, so as to continuously enhance their technical skills and safety awareness.

In addition to the three-level safety induction training, contract workers were required to attend safety training and technical training on a day-today basis. The training focused on discussing the Group's previous accident cases to make sure that "lessons were learnt from past experience" and that a deterrent effect was achieved by educating personnel with "everyday examples". Contractors were assessed in terms of their knowledge on annual operating procedures, maintenance procedures and safety standards to enhance their ability to fulfil safety responsibilities and identify safety risks alongside their sense of ownership and vigilance in guarding against accidents.



07

Building a Platform for Growth

Human resource is the primary resource and key to the success of the Company. The sustainable development of talents is the driving force to the Company's sustainable development. Huaneng International regards its employees as the foundation for its long-lasting prosperity. Therefore, it is dedicated in building professional teams, prioritizing employees' rights and interests, recognizing employees' value and building a development platform to promote joint development of the company and its employees.

7.1 Protecting Employment Equity

We are committed to the principle of " lawful employment and equal employment opportunity", as well as the goal of "maintaining long-term, stable and good relationships with its employees". We create an environment where everyone has a chance to contribute and achieve career development and self-realization. We are dedicated in improving employees' sense of fulfilment and happiness while continuously enhancing unity within the Company.

Equal Employment Opportunity

The Company adheres to two major principles, namely lawful employment and equal employment opportunity, strictly abides by the Labour Law of the People's Republic of China (《中華人民共和國勞動法》), the Labour Contract Law of the People's Republic of China (《中華人民共和國勞動合同法》) and the Provisions on the Prohibition of Use of Child Labour (《禁止使用童工規定》), signs employment contracts with all staff and prohibits the employment of any minor under the age of 16. The Company provides equal opportunity and protection to staff with different nationalities, races, genders, religious beliefs and cultural backgrounds. We offer equal terms to male and female employees, oppose forced labour and job discrimination and adopt an equal employment policy through the entire employment period of each employee. As at the end of 2019, the Company had a total of 58,263 employees, of whom 78% had received college qualifications or above.

In 2019, no labour dispute arising from breaches of laws and regulations occurred.

Protection of Employee Rights and Interests

Upholding our "people oriented" principle, the Company regards its employees as the primary resource and has established a comprehensive and robust system for the protection of employees' basic rights and interests. We strive to be a caring employer and improve employees' loyalty and we take employees' concerns to heart.

Basic Protection In strict accordance with the requirements of the Labour Law of the People's Republic of China (《中華人民共和國勞動法》) and the Social Insurance Law of the People's Republic of China (《中華人民共和國社會保險法》) concerning employees' rights and obligations, the Company has set up a number of social insurances including basic pension, basic medical insurance, work-related injury insurance, unemployment insurance and childbirth insurance as well as housing provident funds, annuities and supplementary medical insurances to ensure that employees' rights are protected in the event of retirement, medical treatment, work-related injuries, unemployment or child birth. At the same time, we have a set of well-established policies governing employees' leave of absence to protect their rights to take leaves and vacations. In 2019, the Company did not have any social insurance violations or defaults.

Compensation System Employee compensation is determined based on the employee's "position, performance, work efficiency and the principle of equality". Under an effective incentive mechanism, employee's compensation is linked to the Company's operating result and the employee's individual performance. An employee's total compensation includes basic salary, bonus and allowance, which are paid on time and in full amount by the Company.

Right for Leave and Vacation The Company and its subsidiaries have established sound leave systems in accordance with the state policy and local policy. Standard working hour system or flexible and aggregated working hour system is adopted based on the Company's production condition and the employee's position to protect the employee's right to take leave. The leave system specifies that leaves shall include official holiday, paid annual leave, home leave, marriage leave, funeral leave, maternity leave, sick leave and personal leave, thereby protecting staff's right to take vacation.

Democratic Management

In 2019, the Company successfully held the 2019 annual employee representatives' meeting and work conference. Proposals were solicited from the employee representatives and all of them were replied by the Company, which fully activated employees' proactiveness and enthusiasm in participating in the Company's management.

Huaneng International continued to make our business more open and transparent by setting up a notice board on our website to provide business updates, thus protecting employees' rights to know, participate, express and supervise, and fully stimulating their passion and innovation to promote joint development of the Company and its employees.

Caring for Employees

The Company spares no effort to push ahead with the poverty relief work and focuses on helping employees with financial difficulties, thereby serving the company's staff, contributing to its development and facilitating social harmony.

7.2 Establishing Channels for Career Development

In the spirit of "human resource as the primary resource of the Company", Huaneng International continues to implement its talent-driven development strategy, strengthens the recruitment, development, engagement, evaluation and incentive of talents, continuously optimizes talent structure, improves talent development mechanism and expedites the fostering of management talents, professional experts and technical talents to ensure a solid talent support for the Company's long-term development.

Training and Development

To strengthen talent development, the Company continuously improves the three-level training system consisting of "headquarter – regional branches – grassroots business units". The Company has established eight group-level training bases (training classrooms) and three regional-branch-level training bases. All grassroots business units have training centres to actively carry out trainings related to production technology and operating skills.

The Company strictly follows the Regulations on Team Leader Training (《班組長培訓規定》) and the Regulations on Production Worker Training (《生產人員培訓規定》) and makes full use of our internal and external training resources to facilitate trainings at the regional branch and grassroots business units. The Company develops the 2019 training plan according to its annual development priorities and actual production and business needs. We then organize and offer various kinds of professional skills training, on-the-job training and management training and guide regional branches to formulate their own training plans according to their actual needs. We also review the implementation of the annual training plan to summarize experience and analyze weakness so as to improve the training quality.

In 2019, the Company, regional branches and grassroots business units enhanced the development of human resources and rigorously implement the annual training plan. The regional branches and grassroots business units coordinated and organized onboard training for new recruits, business management training and production skill training. They also carried out various skill contests, technical competitions and on-the-job exercises where 16 employees were awarded with the "Huaneng Group Technical Expert" title, 17 employees were awarded with the "Huaneng Group Outstanding Operator" title and two were awarded with the grand prize and secondary prize in the "ARC Cup" International Welding Competition. They also organized occupational skill appraisals where 228 employees received technician certification and 976 employees received senior technician certification. These activities have effectively improved staff's management capability, standards of business and production skills.

Career Development

The Company focuses on employees' career development. The Company continues to optimize the talent environment, provides diversified career development paths and further promotes the dual hierarchical promotion mechanism whereby employees can move up the corporate ladder either by post or job function. The system is aimed at encouraging employees to work hard and injecting vitality into the Company.

The Company refines its management mechanism on technicians and improves the recruitment procedure and evaluation mechanism for professional and technical positions. The Company promotes employees with outstanding skill sets and performance or those who are well recognized by their peers. Through this approach, the Company has built a great platform for talents to showcase their potential.

The Company continues to strengthen its core management team. Under CPC's roadmap in the New Era, the Company focuses on developing a qualified and professional management team fit for its business development. Focusing on employees' political stance and whether they are career-oriented, the Company promotes the management staff with correct political ideology, strong sense of duty and great performance to establish a correct orientation for the promotion and use of people. The Company improves management's expertise and performance by practices and trainings and continuously drives core management's work towards standardization and rationalization.

In 2019, the Company actively carried out talent development and management work, strengthened staff trainings to improve core management and professional teams' comprehensive skills and management capability, thereby facilitating talent flow and optimizing human resource structure. Going forward, the Company will deepen the talent system reform, further improve talent cultivation mechanism, optimize talent development environment, strengthen talent resource development and encourage staff to continuously improve themselves in their own positions to achieve self-realization and joint development of the Company and staff.

7.3 Ensuring Work-Life Balance

To build a work-life balance culture, the Company held a reading event called "Shuxiang Huaneng" ("書香華能"), organized staff to participate the 6th National Calligraphy Exhibition by people from the power generation industry, the National Art Exhibition and Art Performance by people from the power generation industry for the celebration of the 70th anniversary of the founding of the People's Republic of China and a social activity for Beijing-based companies owned by the central government. The Company also participated in sports events such as the Group company's "New Improvement and New Breakthrough" Walkathon for Beijing subsidiaries, as well as the female employee work conference in celebration of the International Women's Day and the "Shuxiang Sanba" ("書香三八") reading activity. These activities enriched the staff's cultural lives and played a key role in boosting staff's enthusiasm for work, improving teamwork and facilitating the Company's high-quality development.

The 6th National Calligraphy Exhibition by People from the Power Generation Industry

National Art Exhibition by People from the Power Generation Industry for the Celebration of the 70th Anniversary of the Founding of the People's Republic of China

"New Improvement and New Breakthrough" Walkathon

Female Employee Work Conference in Celebration of the International Women's Day

08

Sharing the Fruits of Development

8.1 Enhancing Supply Chain Management

Building trusted and cooperative relationships with suppliers is crucial to realising the Company's strategy. It is our policy to remain open, fair and just in working with suppliers, and we emphasise effective communication to strive for suppliers' understanding and recognition of the Company's corporate values and culture. We hope to maintain long-term and mutually beneficial relationships with suppliers and jointly promote the stable and sustainable development of the industry.

The Company's supplier management approach emphasises the importance of classification, rigorous acceptance control, quantitative assessment and dynamic maintenance. In 2019, the Company revised the Supplier Management Measures (《供應商管理辦法》) and abolished the grassroots business unit's supplier library system, making regional branches solely responsible for establishing the regional-branch-level supplier library and conducting the acceptance, daily management and assessment of suppliers. Regional branches and basic-level companies were required to file the supplier information with the Company. According to the supply category, the Company classified the suppliers into materials suppliers, services suppliers and engineering suppliers.

Supplier Development

The Company solicits suppliers through various channels, such as procurement guides, mass media, product launches, product showcase (sales) events, industry associations, employee recommendations, public tenders and supplier liaison. We conduct supplier stocktakes and analyses each year to try to identify more high-quality suppliers.

Supplier Acceptance

The Company's business units at all level shall impose stringent controls on supplier acceptance. Suppliers are assessed in four areas, which include reputation, technological sophistication, product performance and the ability to fulfil a contract. Only high-quality suppliers are accepted, and accepted suppliers are scrutinised for the legality of their business operations and the authenticity of their qualifications, among other things.

Supplier Selection

We select suppliers in an open, fair and just manner, taking into consideration their environmental and social impact. Procurement activities are classified into two categories, namely tendering procurement and non-tendering procurement. Tendering procurement includes open tender and invitation to tender, while non-tendering procurement includes competitive negotiation, quotation and single source procurement. In strict accordance with state requirements, all procurement activities that are required to be conducted publicly will be put out to public tender. The Company requires that all suppliers taking part in a tender have the ISO 14001 environmental management systems certification and the ISO 9001 quality management systems certification, and that they have no records of safety incidents arising from quality issues.

Supplier Assessment

Supplier assessment is based on the "user assesses" principle. The Company's various business units conduct quantitative, qualitative, real-time and regular assessments of suppliers with which they have contractual relationships. Suppliers will receive annual assessment feedback, which serves as important reference for future procurement.

Supplier Monitoring

In the event of supplier quality issues or issues relating to supplier integrity, deliverables and services arising during solicitation, procurement or contract performance, the Company will impose penalties such as lower ratings, suspension of bidding and discontinuation of supplier relationships for a certain period, depending on the severity of those issues.

Coal Procurement

As a large power company, Huaneng International places a lot of emphasis on fuel supplier management. The Company formulated the Huaneng Power International Fuel Supplier Management Measures (《華能國際電力股份有限公司燃料供應商管理辦法》), which specify the classifications of suppliers and their corresponding management measures and regulate the supply channels and procurement activities for fuel purchase. Suppliers are generally divided into four categories: A: strategic suppliers, B: general long-term suppliers, C: key market suppliers, and D: general market suppliers.

The Company selects suppliers with great care and carries out the authorised approval procedures for shortlisted suppliers. Priority is given to state-owned large mine operators and large coal mine operators, and a "plant-mine direct supply" model is adopted. It is of our view that state-owned large mine operators are more able to fulfil a contract, have more stringent product quality controls, are more compliant with laws and regulations and are more likely to take social and environmental responsibilities. On the other hand, large coal mine operators are subject to stringent environmental protection requirements imposed by the state concerning their planning, design, infrastructure, exploitation and goaf management. Only those coal mine operators that meet these requirements are allowed to do business. After phasing out unproductive coal mine operations in recent years, coal production work has improved substantially in terms of quality, environmental protection standards, safety and labour protection. The state also has certain requirements on the hiring of large coal mine workers, and no child labour is used by the Company. By selecting state-owned large mine operators and large coal mine operators, we ensure that suppliers fulfil their social, environmental and labour protection responsibilities and obligations.

Regarding the monitoring and management of suppliers, the Company's subsidiaries assess suppliers each year in terms of coal supply stability, contract performance, contract fulfilment, production volume, procurement pricing and dispute resolution. The Company's fuel supplier assessment principles include: (1) Classified management; (2) Proposer takes responsibility; (3) Regular assessment; (4) Dynamic management with an exit mechanism. The Company's various business units perform fuel supplier management inspections from time to time, examining: (1) Whether there are specific supplier management standards; (2) Whether fuel supplier management is carried out rigorously in accordance with such standards; (3) Whether fuel supplier assessments are objective and accurate; (4) Whether dynamic management of suppliers is carried out based on assessment results; and (5) Whether the exit mechanism is put in place.

8.2 Developing and Solidifying Customer Relationship

Huaneng International is committed to providing power grid companies and other downstream enterprise consumers with quality power products and services to ensure safe and stable power supply in sharing the Company's achievements with clients.

Solidifying the Traditional Client Relationships

Currently, power grid companies are still Huaneng International's major clients, which account for the centralized procurement and sales of most of the power generated, and are responsible for settlement. The Company has maintained a long-term and friendly partnership with power grid companies.

Expanding End Users

With the deepening of the power system reform, the Company abolished the control on the power supply to business users in a progressive manner. While solidifying the existing clients in the market trade, the Company keeps expanding its sales channels to develop major industrial clients and small-sized and medium-sized enterprise clients. The Company also learned from the global leading electricity retailers, explored scientific and diversified marketing strategies to improve client service capability and satisfy different client needs.

Developing Heat Supply Market

The Company continues to optimize the heat supply industrial structure and encourages direct heat supply to end users to increase market share, develops incremental market and excavates the potential of the saturated market. We also strengthen our communication with local governments, seek policy support to raise heat supply price to continuously improve the Company's strength and market competitiveness.

8.3 Fulfilling Corporate Social Responsibilities

As a responsible citizen enterprise, Huaneng International upholds its commitment to "serve the Country, benefit the society, seek multilateral benefits and develop together" by fully considering and effectively responding to stakeholders' demands, actively engaging in our business and operations, working with our stakeholders to promote economic and social development, participating in precise poverty alleviation called for by the state, supporting community infrastructure construction, fulfilling our social responsibilities and fostering social harmony.

Interaction with the Community

Huaneng International highly values enterprise-community relations and much of our success is attributable to the community's support. We attach great importance to communicating with the community, giving back to society, helping the vulnerable, promoting harmonious social development and sharing economic achievements with the people.

Donation for Poverty Alleviation

In accordance with the relevant poverty alleviation work documents of the Group Company and the State-Owned Assets Supervision and Administration Commission as well as the Company's actual condition and local government requirements, and based on the actual circumstances, Huaneng International formulated the Management Measures for Donations (《對外捐贈管理辦法》), which provide guidelines for regional branches and grassroots units to carry out poverty alleviation work and manage donations in a "lawful, practicable, honest, transparent and targeted" manner.

In 2019, the payment for donation made in name of the Company within China for poverty alleviation amounted to RMB23.727 million. Various activities for donations in kind were also held by subsidiaries of the Company.

The New "E-Commerce + Poverty Relief" Model

The Company's Hainan subsidiary and Jiangxi subsidiary adopted the "E-commerce + Poverty Relief" Model, which developed new poverty relief channels such as poverty relief through consumption and e-commerce platforms such as Hainan Fupin website (海南愛心扶貧網) and Jiangxi poverty relief online shopping mall, thereby making up for the deficiency of the traditional poverty relief channels. As the trading efficiency in the rural area is relatively low, farmers in the poverty-stricken areas find it difficult to connect to the market. E-commerce can not only eliminate the intermediate links between farmers and consumers, thereby reducing distribution costs and improving farmers' profitability, but also keep farmers informed of the latest market condition, so that farmers can sell their produce to the whole country and increase income.

Tree Planting – Developing Village Economy, Following Lei Feng – Facilitating Targeted Poverty Alleviation

On 12 March 2019, the CPC member volunteers and CCYL (short for China Communist Youth League) committee volunteers in Qinbei Power Plant visited the assigned poverty-stricken village, i.e. Tanzhuang Village Wangwu Town, to carry out tree planting and "Following Leifeng" poverty alleviation education activity. The CPC member volunteers successfully completed the tree planting activity and proceeded to the construction site of Tanzhuang Party Service Center supported by Qinbei Power Plant to carry out "Following Leifeng" voluntary activity. More than one hundred walnut trees were planted at Tanzhuang Village at this tree planting activity, which would bring fruitful rewards in three years, creating a great opportunity for the village to develop commercial crops and planting the seed of hope for out of poverty.

Qinbei Power Plant Carried Out Voluntary Tree Planting Activity

Voluntary Service Provided by Jinling Power Plant

In 2019, young volunteers in Jinling Power Plant launched the "Learning from Lei Feng, Helping others and Improve Ourselves" activity.

Firstly, focus on energy saving and do substantive work to help others. The volunteers targeted the elderly persons with no family in the Wufu Home community in Qixia District, Nanjing as people who needed their help. They contacted with the community's social workers to arrange visits to the elderly's homes where they helped the elderly change energy-saving light bulbs and do some cleaning, among other things.

Secondly, pay visit to those in need and offer help and support. On major holidays such as Spring Festival, volunteers reached out to volunteer service stations in Nanjing South Railway Station and Nanjing Bus Station to provide handyman services to the public. Volunteers would also pay regular visits to Ai De Ren Gu Nursing Home to celebrate festivals such as Chung Yeung Festival and Mid-Autumn Festival with the elderly.

Thirdly, apply the spirit of voluntary service to their own jobs. The safety of power supply concerns the lives of many people. Therefore, volunteers regularly invited teenagers living in the Wufu Home community in Qixia District, Nanjing to the Company to listen to safety lectures. The teenagers also visited the power generation site to know more about the power generation, thereby establishing the safety awareness in using electricity.

The volunteers in Jinling Power Plant showcase their selfless actions under the new era by demonstrating the voluntary spirit of devotion, friendship, mutual help and improvement, and follow the foot-step of Lei Feng with their actions.

Youth Volunteer

Sent Best Wishes for Spring Festival

On 24 January 2019, Jiangxi Branch visited the specified village for poverty alleviation, i.e. Longkou Village, Lianhu Town, Poyang County, to send out their best wishes for the Spring Festival. They gave rice and cooking oil as gifts to the poverty-stricken families, got to know their difficulties, encouraged them to improve the situation and seek to get rid of poverty under the guidance of the village CPC branch and the village committee.

Jiangxi Branch also met with the village CPC branch and the village committee as well as Huaneng's village working crew to discuss the poverty alleviation plan. Huaneng's village working crew coordinated and provided real support to the villagers and encouraged them to start their own business and became a role model to others by leading other villagers to improve their livelihood, so as to facilitate Longkou Village to win the battle against poverty.

Local Government Presents a Silk Banner to Jiangxi Branch

09

Building an International Brand

In 2008, Huaneng International successfully acquired 100% equity in Singapore Tuas Power Ltd. ("Tuas Power"). Tuas Power is one of the three major power generating companies in Singapore and one of Singapore's major public utility and environmental service providers.

About Tuas Power

Tuas Power is one of the three largest power companies in Singapore and owns and operates Tuas Power Station and Tembusu Multi-Utilities Complex (TMUC). In 2019, the total market share of Tuas Power in power generation market was 20.7%.

Tuas Power Station has been providing safe, reliable and efficient electricity supply to Singapore since 1999. The Station has five Combined Cycle Gas Power (CCP) generator units and one fuel generator unit that contribute to the country's energy demands at a high reliability performance of over 99%.

The Tembusu Multi-Utilities Complex was completed in 2013, and it serves the petrochemical industries in the Tembusu area of Jurong Island. TMUC is composed of Biomass Clean-Coal (BMCC) thermoelectric cogeneration plant, water treatment plant and wastewater treatment plant, which provides different types of electricity, steam, high-quality industrial water and softened water for industrial customers. In respect of the provision of steam, the power plant can provide steam at different pressure levels according to customers' varied needs, which is a leading technology in Singapore.

Going beyond energy, Tuas Power enlarged its operations to cover multi-utility, environmental, oil terminals and storage and oil tank lease services – all of which harness cutting-edge technologies and world-class practices to power today's industries.

Tuas Power emphasises efficient and environmentally responsible energy solutions for modern business and industrial needs. Tuas Power insists on conducting operations in an environmentally responsible manner through maximizing plant efficiency, resource conservation, reducing waste and controlling emissions. The systems of both Tuas Power Station and TMUC for the management and planning of its environment, occupational health and safety have been certified by OHSAS 18001 (Occupational Health and Safety Assessment Series) certification and ISO 14001 (Environmental Management System) certification. While ensuring that laws and regulations are complied with, these certifications can also help to identify and scrutinize those key procedures and safety issues that need to be improved and addressed in order to reduce health and safety risks and prevent safety incidents.

In 2019, Tuas Power has had no reportable environment-related incidents. Tuas Power will continue to enhance environmental protection and safeguard work.

Energy Conservation

Energy Conservation Efforts at Tuas Power Station

Tuas Power Station initially used fuel oil generator with a unit efficiency of only 34%. Through the expansion, the Station has now achieved a strategic transformation to a more energy-efficient and cleaner power generation. The Station has now owned five most advanced F-class CCP generation units with an average efficiency of 48.5%. In respect of the two less efficient oil-fired unit, one has been decommissioned and the other on standby mode.

Through a study on the impact of different generator load combinations, assuming the power output is the same, on the power plant's overall power generating efficiency, Tuas Power Plant developed a software named "Load Optimizer", capable of automatically calculating the load of each generator unit based on the overall load required during a specific trading period and the monthly updated efficiency curve of each generator unit to minimize fuel consumption. The trading department has been using the load optimizer to calculate the generator units' actual loads for price quotation since March 2019. After the use of load optimizer, the overall efficiency of the power plant improved by about 0.1%.

In August 2019, after a thorough study and research, Tuas Power Plant shut down seven sets of equipment, including the sea water circulating pump for sustaining the standby mode of the fuel oil generator set and one closed cooling water pump and air compressor, thereby saving 1,104 MWh of electricity per day.

Tuas Power Plant also plans to have exchange and experience sharing session with Huaneng Group's domestic power plants to improve its staff's capabilities in power plant performance monitoring and analysis.

In November 2019, Tuas Power Plant has certified by the ISO 50001 energy management system audit.

Tuas Power Plant

Energy Conservation Efforts at TMUC

"Located on Jurong Island, Tembusu Multi-Utilities Complex is the first coal-fired power plant in Singapore built by Huaneng International whose surrounding environment remains free of pollution."
- Tembusu Multi-Utilities Complex

"By bringing its world-leading technology and industry experience in coal-fired power generation to the Tembusu Multi-Utilities Complex, Huaneng International has made history and transformed Singapore's power development."
- Comments made by Zijian Liang, the Former Director of Energy and Chemical Industry Department of the Economic Development Board of Singapore.

In 2019, TMUC launched the Phase-2 digitalization project to improve efficiency and reduce heat loss. The project includes:

1. Apply the online performance monitoring and production optimization system to improve the power plant's performance and heat efficiency.

2. Monitoring of the performance of steam trap in the steam pipe network and performing technical transformation to reduce steam/heat loss. Install a bypass at the backup boiler (BUB)'s main steam header to enable BUB to generate a stable steam flow in the backup period and reduce the discharge loss of condensate water. In addition, modify and shorten the drain pipe of the steam trap between the main steam header and BUB steam header to minimize heat loss and discharge loss.

Through the above modifications, TMUC will continuously improve its efficiency level.

To demonstrate TMUC's commitment in energy saving and compliance efforts, it obtained the ISO 50001 Energy Management System certificate in November 2018.

Tembusu Multi-Utilities Complex

Emission Management

Greenhouse Gas Management

With the installation of 5 CCP generator units, Tuas Power Station's carbon emission factor decreased and is now lower than that of the national average of all power plants in Singapore.

The usage of 20% carbon-neutral biomass (Palm Shell & Woodchips) is a mandatory requirement by the local authority to lower the carbon. By co-firing 80% coal with 20% biomass, TMUC has lowered the carbon emission and thus lowered the carbon tax.

To remain competitive, TMUC gradually increased the proportion of wood chips in its fuel mix. An increased usage of wood chips provided greater flexibility for fuel mix ratios to maintain a higher percentage of carbon-neutral types of biomass fuel and reduce fuel costs.

In accordance with the measurement and reporting requirements for greenhouse gas emissions of Singapore's National Environment Agency, Tuas Power and TMUC submitted their plans and supporting documents for the measurement of greenhouse gas emissions to the Singaporean authorities and got approvals in December 2018. Starting from 2019, Tuas Power and TMUC will submit their annual emissions reports based on these approved documents and pay the relevant carbon taxes accordingly.

Exhaust Gas Management

In 2019, Tuas Power Plant only operated five units of natural gas CCP generators and shut down all oil-fired generator units for the whole year to achieve zero emission of sulfur dioxide.

TMUC reduces NO_x and SO_2 emissions by using advanced Circulating Fluidized Bed (CFB) boiler, reducing the use of coal and purchasing low sulfur coal. The low furnace temperature of CFB boilers and the use of low-sulfur low-ash coal have ensured a low NO_x and low SO_2 emission. SO_2 monitoring devices are also in place to achieve a low emission. TMUC is able to meet the stringent air emission limits set by "the Air Impurities Regulation of the Singapore Environmental Protection and Management Act" (《環境保護和管理法案》).

Ash Recycling and Utilization

In Singapore, the landfill of the ash generated in industrial process is prohibited. TMUC has achieved 100% comprehensive utilization of ash (the fly ash and the bed ash) by cooperating with local building materials company.

Tuas Power had initially conducted the clean coal-biomass combustion pilot trials in 2008 to gather fly ash samples for companies to explore feasibility of use. In 2014, the fly ash application on blended cement finally got approval from local authorities, the Building and Construction Authority (BCA) and the National Environmental Agency (NEA).

In 2016, TMUC manage to collaborate with cooperation companies to use the bed ash in a sustainable concrete application that was approved by the authorities such as BCA and NEA. The bed ash from TMUC are used as an alternative to fine aggregates or sand in concrete production, complied withEN12620:2008 Specifications of Aggregate for Concrete standard.

Wastewater Management

In the case of water treatment, the TMUC project has established wastewater treatment facilities to treat the wastewater produced internally and the wastewater generated by the petrochemical industry in the Denpasar region to ensure that the drainage is in line with the relevant regulations.

To leverage on the well-designed water cycle and demonstrate TMUC's effort for water conservation, customers are incentivized for returning clean condensate for TMUC's steam production. High temperature return condensate from customers is used to pre-heat deaerator feed water. Water cleaning is also replaced with vacuum cleaning. Boiler blow down water is recycled back to the Water Treatment Plant as an alternative source of raw water. Treated water from the Industrial Waste Water Plant is being reused for plant washing and process usage in TMUC Site 2.

Customer Service

Since 2003, Tuas Power has been serving customers with high-quality service. These customers range from individual businesses to developers and landlords of commercial buildings.

The Tuas Power Green Programme

The Singaporean government earlier announced that starting from 2019 onwards, a carbon tax of SGD 5 per ton of carbon dioxide equivalent would be imposed on greenhouse gas emissions. In response to Singapore government's attention to greenhouse gas emission, Tuas Power has stepped up energy saving and emission reduction efforts. The Tuas Power Green Programme is designed to provide customers with a wide range of various energy solutions, including green consultancy service and lighting solution.

The green consultancy service is customer focused, and encourages companies to undergo energy audits to maximize energy efficiency. It also helps them identify the basic design of their buildings and suggesting the functional improvement, and bring incremental value to customers. The lighting solution helps customers achieve significant energy-saving effects through changing simple details, such as using energy-saving lighting system instead of current traditional lighting systems, so as to reduce energy consumption and lower costs for the customers.

Integrated Energy Management System (IEMS)

Tuas Power started a comprehensive energy management system service in January 2016, with its business highlight of automated meter readers. This instrument can detect the amount of electricity consumed by the target company for half an hour and conduct it to the portable side in real time, so that customers can view the data in real time through the mobile application, enabling immediate management and immediate adjustment. As part of the integrated energy management system, the automated meter reader provides an automated meter reading function that provides better service to customers, reduces human input, improve efficiency, and improves billing accuracy. After researches and studies in Europe, the employees of Tuas Power improved this intelligent meter to better meet the needs of local customers.

In handling customer information, Tuas Power enters into an agreement with the contractor to protect customer information. Its own employees are subject to the same requirements as the contractor, and comply with the Company's governance policies that protect customer information.

Community Building

Tuas Power is closely linked to the community and actively provides public services, financial supports and cooperation for government statutory committees, charity organizations and nonprofit organizations. Cooperative institutions include Singapore Children's Association and preschool students' educational organizations, etc. The Tuas Power also works with the Singaporean Energy Market Authority (EMA) to provide student sponsorships for local universities and polytechnics, and supports the horticultural research and conservation through the Garden City Fund in order to protect Singapore's green environment.

Communication with the Company

There is a frequent interaction and mutual assistance between Tuas Power and the Company, personnel from two sides have carried out a number of related business exchanges.

Several groups of technical and engineering employees from Tuas Power have finished trainings in the Company's operational experiences. Tuas Power have also consulted with technical experts from the Company to further improve and strengthen operational efficiency of the Tuas Power Station and TUMC.

Through Tuas Power's own experience with navigating the gradually deregulated power market in Singapore, the Company has given many in-depth talks to various departments within the Huaneng Group and the Company. Tuas Power has shared the experience of Singapore's power market reform with relevant Chinese government agencies and the Company's business partners such as Singapore's market structure and operations the retail competition, competitive differentiation from competitors and so on.

10
Looking Forward to the Future

We look forward to the future, and continuously accumulate experience for a time of use. Electric power industry is closely related with international development and people's lives. Although it has existed for around a hundred years, it is still vibrant. It requires responsible enterprises to continuously tap their own potentials and improve their self-requirements. Facing the current situations of risks and opportunities coexisting, Huaneng International adheres to steady progress, promotes transformation and upgrading, actively reforms and innovates, and has established practical stage targets of the year 2020 and through our continuous hard work, we have seen meaningful achievements.

Scale of the Company	To achieve a controllable installed capacity of more than 112 million kilowatts, and further strengthened synergies.
Business Performance	To significantly improve our operating efficiency, ensure profitability to approach close to or surpassed the international leading power generation listed companies.
Company Operation	Power generation business comprehensively achieves excellent operations, and our operating indicators generally reach the international industry-leading level. Use of hours maintains the domestic industry-leading level, and power efficiency indicators continued to maintain the international industry-leading level. Cost of installation per unit and safe production level reach the international leading level.
Development Potential	Transformation and upgrading achieve significant results, installed capacity of low-carbon clean energy account for more than 20%. Financial situation and operating strength further enhance, with further improvement of development potential.
International Business	To further expand the scale of overseas business. International business operating level ranks among the international leading power generation listed companies.
Overall Management	To further expand the overall management further of all fields and form a scientific and complete modern management system and mechanism, to enhance ability of management innovation, to continuous consummate management mechanism, to promote the performance management, financial management, risk management and other overall managements of the Company and its subsidiaries, and to reach the standard of international leading power generation listed companies.
Talent Management	To build an international leading talent team around 200 of senior managers, 400 of senior professionals, and 3,000 of senior technical employees. Innovate personnel, labour and distribution system, mechanisms of talents selection and appointment, assessment and evaluation, assembly and deployment, incentive and insurance, and training and development tend to be perfected.
Brand Reputation	Significantly improve the Company's branding ability, enhance Huaneng brand awareness and reputation. To be evaluated as "well-known brands" by the authoritative agency. Further strengthen the Company's social responsibility system and internal communication system to be an internally harmonious enterprise.
Company Governance and Risk Management	Complete company system, normative company governance, and harmonious relationship with investors, which make the Company a good model for domestic listed companies. Sound risk control system, maturely grasping and flexibly adapting to changes in policies and markets, a steady growth of operation performance.
Party Building	The Company upholds Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era, strictly follows the spirits reflected in CPC's 19th National Congress as well as in the second, third and fourth Plenary Session of the 19th Central Committee and implements CPC's general requirements for building the New Era. We will push forward the Company's high-quality development through high-quality Party building work under the instructions of the CPC branch of the Group Company, its political guidance, the improvement the quality of Party building work, focusing on solidifying the foundation, and persisting on services, production and operation.

11 Appendix

11.1 About this Report

This report is the fourth "Environmental, Social and Governance Report" released by Huaneng International. This report focuses on the Company's efforts and contributions to the environment, society and governance, as well as our outlook for the future. We hope that through the publication of this report, we can strengthen communication and liaison with our stakeholders.

The Board of Directors and all the Directors hereby warrant that the contents of this report do not contain any false representations, misleading statements or material omissions and take joint and several liabilities for the authenticity, accuracy and completeness of the contents.

The Scope of the Subject of this Report

Huaneng International and its domestic and overseas affiliated branches and its wholly owned and controlled companies. Unless otherwise stated, the data disclosed in this report are about Huaneng International and its affiliated domestic subsidiaries and its wholly-owned and controlled companies.

Reporting Period

The Company's "Environmental, Social and Governance Report" is an annual report for the period from January 1, 2019 to December 31, 2019, and some of the statements and data are traced back to the previous year.

Reference Remarks

In order to facilitate the presentation and be easy to read, "Huaneng Power International, Inc." in this report is referred to as "Huaneng International", "the Company" or "we". "China Huaneng Group Co., Ltd." in this report is referred to as "Huaneng Group".

Content Compiling

The contents of this report are prepared in the light of the HKEx's "Environmental, Social and Governance Reporting Guide", the Global Reporting Initiative (GRI) Sustainability Reporting Standards (GRI Standards) and its supplementary guidelines for power generation industry. Currency used in this report is expressed in RMB unless otherwise specified.

Access to this Report

You can download the Chinese and English version of this report on Huaneng International's website at http://www.hpi.com.cn. This report is published in both Chinese and English. In case of any discrepancies among the different versions, the Chinese version shall prevail. If you have any questions or suggestions, please call 010-63226582.

11.2 Contents Index of Environmental, Social and Governance Reporting Guide of The Stock Exchange of Hong Kong Limited

Environmental, Social and Governance Reporting Guide		Page Number	Report Content
Subject Area A: Environment			
Aspect A1 : Emissions			
A1	General disclosure	44-51	5.3.4 Emissions Management
A1.1	The type of emissions and respective emission data	44-51	5.3.4 Emissions Management
A1.2	Greenhouse gas emissions in total (in tonnes) and, where appropriate, intensity (e.g. per unit of production volume, per facility).	46	5.3.4 Emissions Management
A1.3	Total hazardous waste produced (in tonnes) and, where appropriate, intensity (e.g. per unit of production volume, per facility).	50	5.3.4 Emissions Management
A1.4	Total non-hazardous waste produced (in tonnes) and, where appropriate, intensity (e.g. per unit of production volume, per facility).	50	5.3.4 Emissions Management
A1.5	Description of measures to mitigate emissions and results achieved.	44-51 83-84	5.3.4 Emissions Management 9 Building an International Brand
A1.6	Description of how hazardous and non-hazardous wastes are handled, reduction initiatives and results achieved.	50-51 83	5.3.4 Emissions Management 9 Building an International Brand
Aspect A2: Use of Resources			
A2	General disclosure	37-40 40-43	5.3.2 Energy Consumption Management 5.3.3 Water Resources Management
A2.1	Direct and/or indirect energy consumption by type (e.g. electricity, gas or oil) in total (kWh in '000s) and intensity (e.g. per unit of production volume, per facility).	37	5.3.2 Energy Consumption Management
A2.2	Water consumption in total and intensity (e.g. per unit of production volume, per facility).	40	5.3.3 Water Resources Management
A2.3	Description of energy use efficiency initiatives and results achieved.	37-40 80-82	5.3.2 Energy Consumption Management 9 Building an International Brand
A2.4	Description of whether there is any issue in sourcing water that is fit for purpose, water efficiency initiatives and results achieved.	40-43	5.3.3 Water Resources Management

Environmental, Social and Governance Reporting Guide		Page Number	Report Content
A2.5	Total packaging material used for finished products (in tonnes) and, if applicable, with reference to per unit produced.	–	N/A
Aspect A3: The Environment and Natural Resources			
A3	General disclosure	31-51	5 Commitment to Environmental Protection
A3.1	Description of the significant impacts of activities on the environment and natural resources and the actions taken to manage them.	31-51	5 Commitment to Environmental Protection
Subject Area B: Social			
Employment and Labour Practices			
Aspect B1: Employment			
B1	General disclosure	66-67	7.1 Protecting Employment Equity
Aspect B2: Health and Safety			
B2	General disclosure	52-63	6 Solidifying the Foundation for Safe Production
B2.1	Number and rate of work-related fatalities.	13-15	2.6 Table of Key Performance Indicators in 2019
B2.3	Description of occupational health and safety measures adopted, how they are implemented and monitored.	57-60 60 69	6.3 Effectively Implementing Safety Measures 6.4 Vigorously Safeguarding Occupational Health 7.3 Ensuring Work-Life Balance
Aspect B3: Development and Training			
B3	General disclosure	61 68-69	6.5 Continuously Improving Safety Practices 7.2 Establishing Channels for Career Development
AspectB4: Labour Standards			
B4	General disclosure	66-67	7.1 Protecting Employment Equity
Operating Practices			
AspectB5: Supply Chain Management			
B5	General disclosure	72-73	8.1 Enhancing Supply Chain Management
B5.2	Description of practices relating to engaging suppliers, number of suppliers where the practices are being implemented, how they are implemented and monitored.	72-73	8.1 Enhancing Supply Chain Management

Environmental, Social and Governance Reporting Guide		Page Number	Report Content
Aspect B6: Product Responsibility			
B6	General disclosure	24-27	4.1 Stable and Efficient Power Supply
B6.1	Percentage of total products sold or shipped subject to recalls for safety and health reasons.	–	N/A
B6.2	Number of products and service-related complaints received and how they are dealt with.	74	8.2 Developing and Solidifying Customer Relation
B6.3	Description of practices relating to observing and protecting intellectual property rights.	29	4.2.3 Protection of Intellectual Property Rights
B6.4	Description of quality assurance process and recall procedures.	–	N/A
Aspect B7: Anti-Corruption			
B7	General disclosure	28-29	4.2.2 Advancing Incorruptibility
B7.1	Number of concluded legal cases regarding corrupt practices brought against the issuer or its employees during the reporting period and the outcomes of the cases.	28-29	4.2.2 Advancing Incorruptibility
B7.2	Description of preventive measures and whistle-blowing procedures, how they are implemented and monitored.	28-29	4.2.2 Advancing Incorruptibility
Community			
Aspect B8: Community Investment			
B8	General disclosure	75-77 85	8.3 Fulfilling Corporate Social Responsibilities 9 Building an International Brand
B8.1	Focus areas of contribution (e.g. education, environmental concerns, labour needs, health, culture, sport).	75-77 85	8.3 Fulfilling Corporate Social Responsibilities 9 Building an International Brand
B8.2	Resources contributed (e.g. money or time) to the focus area.	75-77	8.3 Fulfilling Corporate Social Responsibilities

11.3 Contents Index of GRI Sustainability Reporting Standards (GRI Standards) of Global Reporting Initiative

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
GRI 101: Foundation 2016			
GRI 102: General Disclosures 2016			
102-1	Name of the organization	6	2.1 Company Profile
102-2	Activities, brands, products, and services	6	2.1 Company Profile
102-3	Location of headquarters	102	11.4 Readers' Feedback
102-4	Location of operations	6	2.1 Company Profile
102-5	Ownership and legal form	6	2.1 Company Profile
102-6	Markets served	6	2.1 Company Profile
102-7	Scale of the organization	6 13-15	2.1 Company Profile 2.6 Table of Key Performance Indicators in 2019
102-8	Information on employees and other workers	66-67	7.1 Protecting Employment Equity
102-9	Supply chain	72-73	8.1 Enhancing Supply Chain Management
102-10	Significant changes to the organization and its supply chain	89	11.1 About this Report
102-11	Precautionary Principle or approach	7 10-12	2.2 Corporate Governance 2.5 ESG Responsibility Management
102-12	External initiatives	10-12	2.5 ESG Responsibility Management
102-13	Membership of associations	16	2.7.1 Information about and Communication with Stakeholder
102-14	Statement from senior decision-maker	2-3	1 Chairman's Statement
102-16	Values, principles, standards, and norms of behavior	7 10	2.3 Development Strategy 2.4 Company Philosophy

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
102-18	Governance structure	7	2.2 Corporate Governance
102-40	List of stakeholder groups	16	2.7.1 Information about and Communication with Stakeholder
102-41	Collective bargaining agreements	66-67	7.1 Protecting Employment Equity
102-42	Identifying and selecting stakeholders	16	2.7.1 Information about and Communication with Stakeholder
102-43	Approach to stakeholder engagement	16	2.7.1 Information about and Communication with Stakeholder
102-44	Key topics and concerns raised	16	2.7.1 Information about and Communication with Stakeholder
102-45	Entities included in the consolidated financial statements	89	11.1 About this Report
102-46	Defining report content and topic Boundaries	89	11.1 About this Report
102-47	List of material topics	17	2.7.2 Processes of Identification of Material Issues
102-48	Restatements of information	-	No previous reports have been rewritten
102-49	Changes in reporting	–	No major changes
102-50	Reporting period	89	11.1 About this Report
102-51	Date of most recent report	89	11.1 About this Report
102-52	Reporting cycle	89	11.1 About this Report
102-53	Contact point for questions regarding the report	89	11.1 About this Report
102-54	Claims of reporting in accordance with the GRI Standards	–	Core suitable plan
102-55	GRI content index	93-101	11.3 Contents Index of GRI Sustainability Reporting Standards (GRI Standards) of Global Reporting Initiative
102-56	External assurance	–	No external review temporarily

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
EU1	Install capacity by primary energy and regulatory mechanism	6 13-15	2.1 Company Profile 2.6 Table of Key Performance Indicators in 2019
GRI 200 Economic			
Economic Performance			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	6-17	2 About Us
103-2	The management approach and its component	6-17	2 About Us
103-3	Evaluation of the management approach	6-17	2 About Us
GRI 201: Economic Performance 2016			
201-1	Direct economic value generated and distributed	13-15 75-77	2.6 Table of Key Performance Indicators in 2019 8.3 Fulfilling Corporate Social Responsibilities
Anti-Corruption (Material Issue: Management by Law and Anti-Corruption)			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 28-29	2.7.2 Processes of Identification of Material Issues 4.2.2 Advancing Incorruptibility
103-2	The management approach and its component	28-29	4.2.2 Advancing Incorruptibility
103-3	Evaluation of the management approach	28-29	4.2.2 Advancing Incorruptibility
GRI 205: Anti-Corruption 2016			
205-1	Operations assessed for risks related to corruption	28-29	4.2.2 Advancing Incorruptibility
205-2	Communication and training about anti-corruption policies and procedures	28-29	4.2.2 Advancing Incorruptibility
205-3	Confirmed incidents of corruption and actions taken	28-29	4.2.2 Advancing Incorruptibility

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
GRI 300 Environmental			
Energy (Material Issues: Energy Use, Clean and Sustainable Energy)			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 31-51	2.7.2 Processes of Identification of Material Issues 5 Commitment to Environmental Protection
103-2	The management approach and its component	32-34 35-36	5.1 Continuously Optimizing Energy Structure 5.2 Vigorously Promoting Innovation
103-3	Evaluation of the management approach	32-34 35-36	5.1 Continuously Optimizing Energy Structure 5.2 Vigorously Promoting Innovation
GRI 302: Energy 2016			
302-1	Energy consumption within the organization	37-40	5.3.2 Energy Consumption Management
302-3	Energy intensity	37-40 24-27	5.3.2 Energy Consumption Management 4.1 Safe and Stable Power Supply
Water			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 40-43	2.7.2 Processes of Identification of Material Issues 5.3.3 Water Resources Management
103-2	The management approach and its component	40-43	5.3.3 Water Resources Management
103-3	Evaluation of the management approach	40-43	5.3.3 Water Resources Management
GRI 303: Water 2016			
303-1	Water withdrawal by source	40-43	5.3.3 Water Resources Management
303-3	Water recycled and reused	40-43	5.3.3 Water Resources Management

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
Emissions (Material Issues: Reduction of Carbon Dioxide Emission and Emission of Control Components)			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 44-51	2.7.2 Processes of Identification of Material Issues 5.3.4 Emissions Management
103-2	The management approach and its component	44-51	5.3.4 Emissions Management
103-3	Evaluation of the management approach	44-51	5.3.4 Emissions Management
GRI 305: Emissions 2016			
305-1	Direct (Scope 1) Green house gas (GHG) emissions	46-47	5.3.4.2 Management of Greenhouse Gases
305-2	Energy indirect (Scope 2) GHG emissions	46-47	5.3.4.2 Management of Greenhouse Gases
305-4	GHG emissions intensity	46-47	5.3.4.2 Management of Greenhouse Gases
305-7	Nitrogen oxides (NO_x), sulphur oxides (SO_x), and other significant air emissions	44-46	5.3.4.1 Exhaust Gas Management
Effluents and Waste			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 48-49 50-51	2.7.2 Processes of Identification of Material Issues 5.3.4.3 Wastewater Management 5.3.4.4 Waste Management
103-2	The management approach and its component	48-49 50-51	5.3.4.3 Wastewater Management 5.3.4.4 Waste Management
103-3	Evaluation of the management approach	48-49 50-51	5.3.4.3 Wastewater Management 5.3.4.4 Waste Management
GRI 306: Effluents and Waste 2016			
306-1	Water discharge by quality and destination	48-49	5.3.4.3 Wastewater Management
306-2	Waste by type and disposal method	50-51	5.3.4.4 Waste Management

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
Environmental Compliance (Material Issues: Energy Use, Emission of Control Components and Reduction of Carbon Dioxide Emission)			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 37-51	2.7.2 Processes of Identification of Material Issues 5.3 Proactively Practicing Energy Saving and Emission Reduction
103-2	The management approach and its component	37-51	5.3 Proactively Practicing Energy Saving and Emission Reduction
103-3	Evaluation of the management approach	37-51	5.3 Proactively Practicing Energy Saving and Emission Reduction
GRI 307: Environmental Compliance 2016			
307-1	Non-compliance with environmental laws and regulations	37-51	5.3 Proactively Practicing Energy Saving and Emission Reduction
Supplier Environmental Assessment			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 72-73	2.7.2 Processes of Identification of Material Issues 8.1 Enhancing Supply Chain Management
103-2	The management approach and its component	72-73	8.1 Enhancing Supply Chain Management
103-3	Evaluation of the management approach	72-73	8.1 Enhancing Supply Chain Management
GRI 308: Supplier Environmental Assessment 2016			
308-2	Negative environmental impacts in the supply chain and actions taken	72-73	8.1 Enhancing Supply Chain Management

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
GRI 400 Social			
Occupational Health and Safety (Material Issue: Safe Production and Occupational Health)			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 60 61 62-63	2.7.2 Processes of Identification of Material Issues 6.4 Vigorously Safeguarding Occupational Health 6.5 Continuously Improving Safety Practices 6.6 Comprehensive Regulation of Outsourcing Management
103-2	The management approach and its component	60 61 62-63	6.4 Vigorously Safeguarding Occupational Health 6.5 Continuously Improving Safety Practices 6.6 Comprehensive Regulation of Outsourcing Management
103-3	Evaluation of the management approach	60 61 62-63	6.4 Vigorously Safeguarding Occupational Health 6.5 Continuously Improving Safety Practices 6.6 Comprehensive Regulation of Outsourcing Management
GRI 403: Occupational Health and Safety 2016			
403-2	Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	60	6.4 Vigorously Safeguarding Occupational Health
Training and Education (Material Issue: Staff Training and Development)			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 68-69	2.7.2 Processes of Identification of Material Issues 7.2 Establishing Channels for Career Development
103-2	The management approach and its component	68-69	7.2 Establishing Channels for Career Development
103-3	Evaluation of the management approach	68-69	7.2 Establishing Channels for Career Development
GRI 404: Training and Education 2016			
404-2	Programs for upgrading employee skills and transition assistance programs	68-69	7.2 Establishing Channels for Career Development

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
Child Labor			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 66-67	2.7.2 Processes of Identification of Material Issues 7.1 Protecting Employment Equity
103-2	The management approach and its component	66-67	7.1 Protecting Employment Equity
103-3	Evaluation of the management approach	66-67	7.1 Protecting Employment Equity
GRI 408: Child Labor 2016			
408-1	Operations and suppliers at significant risk for incidents of child labor	66-67	7.1 Protecting Employment Equity
Forced or Compulsory Labor			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	66-67	7.1 Protecting Employment Equity
103-2	The management approach and its component	66-67	7.1 Protecting Employment Equity
103-3	Evaluation of the management approach	66-67	7.1 Protecting Employment Equity
GRI 409: Forced or Compulsory Labor 2016			
409-1	Operations and suppliers at significant risk for incidents of forced or compulsory labor	66-67 72-73	7.1 Protecting Employment Equity 8.1 Enhancing Supply Chain Management

GRI Standards Indicator	GRI Standards Description	Pages	References and Remarks
Supplier Social Assessment			
GRI 103: Management Approach 2016			
103-1	Explanation of the material topic and its Boundary	17 72-73	2.7.2 Processes of Identification of Material Issues 8.1 Enhancing Supply Chain Management
103-2	The management approach and its component	72-73	8.1 Enhancing Supply Chain Management
103-3	Evaluation of the management approach	72-73	8.1 Enhancing Supply Chain Management
GRI 414: Supplier Social Assessment 2016			
414-2	Negative social impacts in the supply chain and actions taken	72-73	8.1 Enhancing Supply Chain Management

11.4 Readers' Feedback

Dear readers:

Hello! Thank you for reading this report. We particularly wish to listen to your comments and suggestions, and your comments and suggestions are the driving force behind our continuous improvement of our report. Please help to complete the relevant questions raised in the feedback form and mail it to the headquarters of the Company (headquarters address: Huaneng Building, Fuxingmennei Street 6, Xicheng District, Beijing).

1. Your overall assessment of the Company's "Environmental, Social and Governance Report" is:

○ good ○ fair ○ poor

2. Do you think this report reflects the Company's significant impacts on the environmental, social and governance?

○ good ○ fair ○ poor

3. What do you think of the information, and the accuracy and completeness of the indicator data disclosed in this report?

○ good ○ fair ○ poor

4. What do you think of the Company in serving its customers and protecting the interests of its stakeholders?

○ good ○ fair ○ poor

5. Which part of the report do you concern the most?

_____

_____

6. Is there any content that you are looking for but not found in this report? If yes, please write down what you are concerned about.

_____

_____

If you wish, you are welcome to provide personal information to facilitate further communication with you:

Name:	Occupation:	Organization:	Contact Address:
Postal Code:	Tel:	Fax:	E-mail:

華能國際電力股份有限公司

Huaneng Power International, Inc.