

HUANENG POWER INTERNATIONAL INC  
Form 6-K  
April 25, 2019

FORM 6-K

SECURITIES AND EXCHANGE COMMISSION  
WASHINGTON, D.C. 20549

Report of Foreign Private Issuer  
Pursuant to Rule 13a-16 or 15d-16 of  
The Securities Exchange Act of 1934

For the month of April 2019

(Indicate by check mark whether the registrant files or will file annual reports under cover of Form 20-F or Form 40-F.)

Form 20-F  Form 40-F

(Indicate by check mark whether the registrant by furnishing the information contained in this form is also thereby furnishing the information to the Commission pursuant to Rule 12g3-2(b) under the Securities Exchange Act of 1934.)

Yes  No

(If "Yes" is marked, indicate below the file number assigned to registrant in connection with Rule 12g3-2(b):

82-\_\_\_\_\_. )

N/A

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This Form 6-K consists of:

A copy of environmental, social and governance report for the year of 2018 of Huaneng Power International, Inc. (the Registrant”), submitted by the Registrant to the Hong Kong Stock Exchange.

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#### Chairman's Statement

2018 was a meaningful year for building China into a moderately prosperous society as well as for implementing the state's 13th Five-Year Plan. It marked the 40th anniversary of the reform and opening up of the People's Republic of China and it was the year when the Chinese government held its 19th National People's Congress. It was also a crucial year for developing Huaneng International into an international leading power generation listed company.

Serve the Country, Benefit Society, Seek Multilateral Benefits and Develop Together

Huaneng International came into existence amid a wave of reforms and continues to grow through relentless innovation. Growth, talent and innovation remain our top priorities to drive high-quality, efficient and sustainable development. We strive to maintain our position as the trailblazer for the reform and opening up of China's power industry and as the leader for the advancement of power generation technology to create more miracles for the domestic power sector.

As a responsible citizen enterprise, Huaneng International has persisted in the environment protection concepts of "energy conservation, emission reduction, and clean development" in the fight against pollution. In 2018, we ratcheted up our efforts to develop low-carbon and green energy and carry out pollution prevention work, such as ultra-low emission retrofits, coal field and ash field revamps and wastewater treatment projects. We continued to cement our industry-leading position in respect of environmental protection KPIs by reducing emissions of sulphur dioxide, nitrogen oxides, soot and other pollutants.

As a responsible citizen enterprise, Huaneng International always adheres to the production safety principles of "people first, safety first, prevention first and comprehensive management" and remains conscientious in implementing state policies on enhancing production safety. We also organised activities to instil "employee and production safety accountability" for optimising our production safety system. In 2018, we zeroed in on rectification of irregularities and treatment of dangerous chemicals. We strengthened safety management with respect to outsourced and overseas projects, and there were no reports of major accidents throughout the year. With these efforts, we were able to maintain stable production and operation during major events such as the FOCAC Summit, the SCO Summit and the China International Import Expo, and there were no reports of major accidents throughout the year. There had been no change to our political and reputational standing.

As a responsible citizen enterprise, 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 economic and social development. In 2018, we maintained effective communication with stakeholders through different channels and methods by thoroughly considering and promptly responding to their concerns and demands to create mutual benefit and shared values, while continuing to boost our corporate image and give back to society.

2019 marks the 70th anniversary of the founding of the People's Republic of China and 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 will steadfastly adhere to the "Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era" and embrace new development concepts. With high-quality development, supply-side structural reform, safety, environmental protection, quality and efficiency at the heart of our work, we will ride on the ongoing innovation push to optimise our corporate structure, improve our asset quality, increase our market value and further spur growth. There is no better achievement with which to celebrate the 70th anniversary of the founding of the People's Republic of China than our progress in developing Huaneng International into an international leading power generation listed company.

Shu Yinbiao

Chairman

Huaneng Power International, Inc.



## 02 About Us

As at 31 December 2018, the Controlling Generation Capacity is 105,991MW

The Equity-Based Generation Capacity is 93,755MW

### 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 coal-fired and gas turbine power plants, new energy power projects and related facilities, including ports, marine transportation and power distribution, so as to provide the community with electricity, heat and comprehensive energy services. It is one of China’s largest public power generation companies, as well as the first domestic power company that goes public 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 a world-class listed power generation company, committed to providing adequate, reliable and environmentally friendly power and high-quality energy services for the society, as well as to system, technology and management innovations. The Company has been the pioneer and has created various milestones within the domestic power industry in areas such as power technology advancement and power plant construction and management, which dramatically facilitated the great-leap forward development of the power business and technological advancement of the power station equipment manufacturing industry in China, and also greatly contributed to the improvement of technical and management standards of 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 2018, the controlling generation capacity of the Company is 105,991 MW and the equity-based generation capacity is 93,755 MW, and its domestic power plants are widely located in 26 provinces, autonomous regions and municipalities. The Company also has a wholly-owned power company in Singapore.

In 2018, the Company was awarded “Listed Company with Outstanding Contribution to the 40th Anniversary of Reform and Opening-up” in the China Securities Golden Bauhinia Awards. Mr. Zhao Keyu, President of the Company, won the “Best CEO of Listed Company” award in Sina Finance Golden Lion Awards. Besides, the Company was on the list of “Platts Top 250 Global Energy Listed Companies Award” for ten consecutive years and ranked 135th.

### 2.2 Corporate Governance

As a public company listed in three stock exchanges both domestic and overseas, the Company has been subject to regulation by securities regulatory authorities of the three domestic and overseas places of listing, and supervision from its vast shareholders. The Company has highly valued the importance of corporate governance by enhancing its corporate governance system, which comprises the general meetings, the Board, the Supervisory Committee and the operation team. It has established an operating mechanism with clear terms of reference among decision authority, supervisory authority and operation authority to enable each of them to perform their respective liabilities subject to balance and coordination among the same parties, so that the right of the Shareholders’ meeting and Board to make decision over material issues and the right of the Supervisory Committee to supervise relevant matters can be effectively exercised to ensure the operation team can deal with operational issues in an effective and regulatory way.

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 has assessed the applicability and effectiveness of the management system on a regular basis, carried out revision and improvement thereof timely, and has thus achieved the dynamic maintenance of the system.

### 2.3 Development Strategy

The Company is committed to innovative, coordinated, green, open and sharing development with the aim to create a clean, low-carbon, safe and efficient energy system. The Company would focus on quality and efficient growth which will be driven by reform and innovation, safeguarded by institutional mechanism, and led by supply-side structural reform, and therefore strive to become a world-class listed power generator with sound management, leading technologies, bests energy saving and environmental protection practices, reasonable

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structure, and excellent operations, corporate governance and market value.

The Company will respond to the needs of energy transformation and reform with strategic growth towards a green power producer, continue to focus on development and acquisition initiatives for building an integrated, large-scale clean energy base of production and distribution of renewable and thermal power as well as investment on offshore wind power base. The Company will enhance technological innovations on clean and efficient use of coal and make active efforts to develop a grid-source-load integrated co-generation network. The Company will comply with power market reform requirements to change from a business mainly engaged in power generation to a provider of integrated services ranging from power and heating generation, peak adjustment, power distribution and sale, energy storage, energy conservation and environmental protection; promote integration of industrial, supply and value chains, and strive to develop into an integrated energy service provider. With the upcoming era of artificial intelligence, the Company will carry out strategies towards digitalized operations, make consistent progress in building smart power plants, industrial Internet and online operation systems, and so as to increase the Company's overall market competitiveness. The Company will rise to the needs from innovation-led development with strategies to recruit and maintain talented employees, laying down solid human resources basis for the Company's business transformation and upgrading and high quality development.

Committed to the New Development Concepts of Innovative, Coordinated, Green, Open and Sharing  
The Company was on the List of "Platts Top 250 Global Energy Listed Companies Award" for Ten Consecutive Years

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#### Distribution of Power Plants of the Company

The controlled power generation capacity of the Company as at 31 December 2018 is 105,991 MW, distributed in areas as depicted in the chart (Unit: MW)

#### 2.4 Company Philosophy

##### Corporate Missions

- Being a “red company” that serves the socialism country with the special characteristics of China
- Being a “green company” that focuses on science, technology, and environment protection
- Being a “blue company” that keeps abreast of the latest development and is open world widely for innovative learning

##### 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 adequate, 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

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effectiveness of the system. 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

2019 is expected to see the shift of China's economy from high-speed growth to high-quality development characterized by accelerated optimization and upgrading of economic structure. The Chinese government will be consistently committed to supplyside, market-oriented structural reform, build upon the achievements from the initiatives of reducing overcapacity and excess inventory, deleveraging, lowering costs and identifying the underdeveloped sectors for improvement to make reinforced efforts on infrastructure development and promote energy production and consumption revolution, with the view to creating a clean, low-carbon, safe and efficient energy system. As local governments and competent authorities will actively comply with the requirements for stable investment, fixed assets investment is expected to maintain steady growth, which will provide strong support for power consumption growth.

Regarding the electricity market, considering market environment at home and abroad, assuming no occurrence of far-reaching extreme climate changes in 2019, total electricity consumption nationwide will grow by 5.5%, with newly installed generation capacity of approximately 110 million kW, of which thermal generation units will represent a slight increased percentage from last year. In 2019, annual utilization hours of thermal generating units are estimated to be 4,400 hours, representing slight increase from last year. In 2019, the Company will actively participate in the reform of power market, strengthen research and study of power supply and demand and market competition, and design flexible and effective marketing strategies. The Company will also actively participate in power market transactions, attach importance to power sales business, actively participate in the building of electricity trading market and auxiliary service market, continuously explore new business opportunities, make focused efforts to offer value-added services so as to consolidate high-quality client base and improve client stickiness, with the view to gradually transitioning from traditional energy vendor to integrated energy supplier, further enhancing the Company's market competitiveness, and strengthening the Company's position in the industry and market.

In the coal market, coal supply is expected to be sufficient with increased production from operation of new and expansion coal production projects which have been approved by competent Chinese government agencies, while the effect of environmental protection and safety production inspections, though continuing to weigh upon coal production, will be lessened in 2019. In spite of coal demand from large-scale infrastructure and other projects, consumption of coal by thermal power generators is expected to decrease due to the soft macro-economic conditions, uncertainty of China-U.S. trade relations, industrial transformation and upgrading, as well as increased supply of UHV-based clean energy and nuclear power. The railway capacity continues to increase as the operation of Menghua Railway is expected to ease the resources shortage in "two lakes and one river". The general supply and demand in the electricity and coal market in 2019 will be eased compared with the tight balance in 2018, with the price moving downward and volatility further reduced. The Coal prices will gradually move to the green range.

In terms of capital market, the Chinese government is expected to implement active fiscal policies and sound monetary policies. The fiscal policies would be focused on reducing taxes and other fiscal levies with the view to addressing, in collaboration with the implementation of monetary policies, funding difficulties and prohibitive funding prices encountered by business enterprises. The sound monetary policies would be implemented to underscore overall economic stability, strengthen counter-cyclical monetary administration, optimize credit structure, and maintain reasonably adequate liquidity. Accordingly, it is expected that the market would have reasonably sufficient funding in 2019 and funding costs are expected to be consistent with slight decline.

The Company would seize the important strategic opportunities arising from power market reform, redesigning of energy ecosystem, and cross-sector integration to accelerate transformation to quality and efficient development driven by innovation based on improved existing capacities and optimized added capacities. The Company will

develop from a business mainly engaged in power generation to a provider of integrated services ranging from power and heating generation, peak adjustment, power distribution and sale, energy storage, energy conservation and environmental protection, as well as highly value-added solutions and services, so as to promote growth of higher quality, efficiency and sustainability.

#### Promote Growth of Higher Quality, Efficiency and Sustainability

##### 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 on-site 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 ( ) ("ESG Rep issued by Hong Kong Exchanges and Clearing Limited (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

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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

Guided by the Board of Directors

ESG Work Leading Group

Participated by Many Departments

Led by the Company's Managements

## 2.6 Table of Key Performance Indicators in 2018

Based on the requirements of HKEx's ESG Reporting Guide and the Global Reporting Initiative (GRI)'s Sustainability Reporting Standards ( ), 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 2018. Please see the table below.

Performance Categories	Performance Indicators	2018	2017
Economy	Operating revenue <sup>1</sup> (100 million RMB)	1,695.51	1,524.59
	Sales of power and heat <sup>1</sup> (100 million RMB)	1,663.07	1,489.25
	Sales of coal and raw material <sup>1</sup> (100 million RMB)	8.64	11.43
	Port service <sup>1</sup> (100 million RMB)	1.45	2.32
	Transportation service <sup>1</sup> (100 million RMB)	0.53	0.74
	Others <sup>1</sup> (100 million RMB)	21.82	20.85
	Operating expenses <sup>1</sup> (100 million RMB)	1,576.47	1,419.00
	Net profit <sup>1</sup> (100 million RMB)	13.30	15.84
	Donation in the Company's name <sup>1</sup> (ten thousand RMB)	1,986.02	1,000.18
	Controlling generation capacity <sup>1</sup> (MW)	105,991	104,321
	Equity-based generation capacity <sup>1</sup> (MW)	93,755	92,003
	Domestic power generation (100 million kWh)	4,304.57	3,944.81
	Average annual unplanned outage (times/unit-annum)	0.40	0.30
Average coal consumption rate for power sold (g/kWh)	307.03	306.48	
Environment	Year-on-year change of average coal consumption rate for power sold (%)	0.18#	0.39\$
	Consumption of standard coal (ten thousand tons of standard coal)	11,710.00	10,885.99
	Oil consumption in production (tons)	34,031.00	29,951.27

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	Natural gas consumption (ten thousand of standard cubic meters)	482,147.00	340,735.00
	Weighted average house consumption rate (%)	4.34	4.66
	Overall water consumption (million tons)	19,742.20	19,344.24
	Fresh water consumption in power generation (million tons)	448.24	423.42
	Water consumption in open cooling circulation (million tons)	19,293.96	18,920.82
	Performance value of consumption of fresh water in power generation (kg/kWh)	1.04	1.07
	Performance value of emission of sulphur dioxide (g/kWh)	0.06	0.11
	Performance value of emission of nitrogen oxides (g/kWh)	0.13	0.15
	Performance value of soot emission (g/kWh)	0.01	0.02
	Sulphur dioxide emissions (tons)	26,104.17	43,392.91
	Nitrogen oxides emissions (tons)	56,043.93	59,789.73
	Soot emissions (tons)	4,070.97	6,247.77
	Total amount of energy-related direct greenhouse gas emissions (ten thousand tons of carbon dioxide equivalent)	34,810.51	33,559.30
	Greenhouse gas emissions generated by coal consumption (ten thousand tons of carbon dioxide equivalent)	33,674.61	32,629.28
Environment	Greenhouse gas emissions generated by natural gas consumption (ten thousand tons of carbon dioxide equivalent)	902.45	743.96
	Greenhouse gas emissions generated by fuel consumption (ten thousand tons of carbon dioxide equivalent)	10.13	9.27
	Greenhouse gas emissions generated by desulphurization (ten thousand tons of carbon dioxide equivalent)	223.32	176.79
	Energy-related direct greenhouse gas emission intensity (grams of carbon dioxide equivalent/kWh)	730.02	770.09
	Total amount of energy-related indirect greenhouse gas emissions (ten thousand tons of carbon dioxide equivalent)	11.91	38.42
	Energy-related indirect greenhouse gas emission intensity (grams of carbon dioxide equivalent/kWh)	0.25	0.88
	Total water discharge (million tons)	17,717.45	18,449.64
	Total discharge of sewage (million tons)	30.63	34.34
	Total discharge of open cooling circulation water (million tons)	17,686.82	18,415.30
	Hazardous liquid waste production (tons)	778.04	959.04
	Production of denitration catalysts (tons)	2,564.66	1,358.99
	Production of other hazardous solid waste (tons)	398.46	128.24
	Production of general solid waste (ten thousand tons)	4,194.05	4,002.46

Production of fly ash and cinder (ten thousand tons)	3,362.57	3,289.62
Production of desulphurised gypsum (ten thousand tons)	831.48	712.84
Comprehensive utilization rate of fly ash and cinder (%)	89.33	91.40
Desulphurization gypsum disposal utilization rate (%)	87.90	100
Amount of grievous (and above) environmental accidents (times)	0	0
Total amount of full-time contractual employees <sup>1</sup> (persons)	57,970	53,962
Number of employee deaths due to duty <sup>2</sup> (persons)	0	0
Number of contractor and subcontractor deaths due to duty <sup>3</sup> (persons)	0	0
Society 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 units (%)	94.51	94.55

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, Donation in the Company’s name, Controlling generation capacity, Equity-based generation capacity an Total amount of full-time contractual employees, takes Singapore Tuas Power Ltd., the wholly owned subsidiary of Huaneng International 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.

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

3 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
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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 <sup>4</sup> , 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

<sup>4</sup> China Electricity 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:

Identifying relevant issues: sources of issues include Environmental, Social and Governance Reporting Guide of HKEx, GRI Sustainability Reporting Standards ( ) and issues disclosed by domestic and international peers; 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;

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

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## Social Issues

### Environmental Issues

#### 03 Proactively Addressing the Power System Reform

Since the release of the Several Opinions of the CPC Central Committee and the State Council on Further Deepening the Reform of the Electric Power System

( [21270](#); [38651](#); [21147](#); [39636](#); [21046](#); [25913](#); [38761](#); [30340](#); [33509](#); [24178](#); [24847](#); [31309](#); [26997](#); [25512](#); [38651](#); [21147](#); [24066](#); [22580](#); [21270](#); [20132](#); [26131](#); [23436](#); [21892](#); [20132](#); [26131](#); [27231](#); [21046](#); [30340](#); [36890](#); [30693](#); ), which set out the detailed requirements for increasing the scale of electric power traded in markets, introducing various power generation companies to enter the markets and allowing eligible users to access the markets.

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 and jointly promoting the structural transformation and industry upgrading of the electric power industry.

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.

#### Our Targets

Management Mechanism

In 2018, in light of the new developments and new requirements of the current market-oriented reform of the electric power industry, the Company amended the Measures for the Single-Item Assessment of Power Market Business ( [29151](#); [37559](#); [26989](#); [21209](#); [21934](#); [38917](#); [32771](#); [26680](#); [36774](#); [27861](#); ) to optimise the structure of assessment measures, enhance assessments and rewards for market trading, improve the market share assessment for electric power sales as well as introduce power payment collection assessment, market trading assessment for new energy power generation units and rewards for obtaining government grants.

#### Management Mechanism

Management Measures

for trading decision making, the Company has taken the two measures below:

First, since the second half of 2018, monthly weather forecasts have been carried out. Subsequent power generation and trading strategies have been formulated and adjusted to reflect the forecast temperature and precipitation changes across the country and strike a more accurate balance between supply and demand.

#### Management Measures

Second, the Company is earnestly promoting the establishment of a marketing information system to support control and decision making in relation to marketing information.

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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:

First, operate with integrity in electric power trading to establish customer trust in the Company.

Second, maintain good relationships with customers to deepen mutual trust and understanding.

Third, further improve user satisfaction through electric power value-added services. The Company has 19 registered provincial-level electricity retailers and 16 registered regional electricity retailers.

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## 04 Maintaining Stable Power Supply and Emphasising Compliant Operation

### 4.1 Safe and Stable Power Supply

Huaneng International is committed to developing itself into a world-class listed power generation company and providing users with safe, efficient and clean energy as well as quality services. Each of the Company's power plants has put in place contingency plans and response measures to ensure safe and stable power supply even in the unlikely event of emergencies.

#### Safeguard Policies

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, various departments of the Company have formulated Emergency Plan for Thorough Power Failure ( 《 20840; 24288; 22833; 38651; 25033; 24613; 38928; 26696; 》 ), Emergency Plan for Black Start ( 《 40657; 21855; 21205; 25033; 24613; 38928; 26696; 》 ), Plan for Island Operation ( 《 23396; 23798; 36939; 34892; 26041; 26696; 》 ) 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 labor, rapid response and fluent communication. Besides, the Company 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.

The Company has 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". This includes the convening of six major-party conferences on "controlling unplanned power outages", the initiation of equipment management and risk investigation for 11 power units including the one in Jinling, the implementation of project planning and quality inspection for units in Grade A/B<sup>5</sup> maintenance, the full process management of reliability indicators for main and auxiliary power units, the strengthening of technical supervision and management, as well as the stepping up of efforts in launching technology transformation quality projects, to ensure both equipment safety and personal safety.

#### Stable Supply Under Extreme Weather Conditions

In 2018, the Company successfully maintained stable supply under very hot weather and in times of typhoon by planning ahead and making early preparations in accordance with the requirements laid down by the Safety Committee of the State Council, the National Energy Administration. We implemented timely contingency plans during the flood season and 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 step up our emergency response efforts and ensure our smooth weathering of the flood season. Our company branches in Guangdong, Fujian, Hainan and Zhejiang successfully prevented super typhoon Mangkhut from wreaking havoc.

#### Stable Power Supply During Major Events

In 2018, China successfully hosted several large conferences, including the Shanghai International Import Expo, the SCO Qingdao Summit and the Boao Forum for Asia. Our company branches in Shanghai, Shandong and Hainan had made every possible effort to ensure stable power supply during these major events, and our hard work finally paid off.

**An Unrivalled Track Record of Stable Power Supply**

In 2018, the utilization of the Company's thermal power generation units rose steadily and high-load operation was maintained throughout most of the year. 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-logging for their coal-fired power generation units to

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introduce more 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 been placing a lot of emphasis on the specification of operations as well as the standardization of repair and maintenance. The number of unplanned outages of the Company's thermal power units continued to stand at below 0.5 times per unit per year on average and there were only 0.40 times unplanned outages per unit per year recorded for its thermal power units in 2018. No unplanned outages were recorded throughout the year in 20 thermal power plants of the Company, such as Yuhuan and Chaohu. Shangan Unit 6 and Haikou Unit 8 achieved 714 days and 626 days of long cycle operation respectively. Five units, including Shangan Unit 6 and Dezhou Unit 2, were selected as national benchmarks for thermal power reliability.

Unified Leadership, Clear Division, Rapid Response and Fluent Communication

#### 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 thermal power plants in Yichun, Daqing, Changchun and Yingkou to formulate special plans for heat supply. With the coal-fired Unit 2 of the Beijing Thermal Power Plant connected to the grid on 7 November 2018, all four coal-fired units in the power plant were on standby in case of emergencies. As required by the Beijing municipal government, the four coal-fired units of the Beijing Thermal Power Plant with a total capacity of 845 MW in thermal and electrical outputs operated in full load during winter in 2018, equivalent to the power output by an estimated 864 million standard cubic meters of natural gas.

5 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.

The heat and power cogeneration units in the Beijing Thermal Power Plant not only had high standards of ultra-low emission performance, they were also equipped with the most advanced technologies to enhance the removal of mercury from flue gas discharges in a way that is on par with emission levels from natural gas power generation. This represented an encouraging achievement in the capital city's fight against air pollution and presented a solution to the natural gas supply shortage in winter.

#### 4.2 Corporate Governance in Accordance with the Law

The Company practices corporate governance in accordance with the law and insists on incorruptibility. While compliance management is crucial to corporate governance according to law, practicable rules and regulations and effective supervision are fundamental. Huaneng International is committed to ensuring compliance, regulated operation and risk prevention to continuously improve 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

( (2003;33775;20154;27665;20849;21644;22283;20844;21496;27861) ), the Law of the People's Republic of China on the State-Owned Assets of Enterprises

( (20013;33775;20154;27665;20849;21644;22283;20225;26989;22283;26377;36039;# and other laws and regulations, and implements the Articles of Association of the Company as a code of conduct to determine responsibilities and how authority is exercised.

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.

In 2018, the Company set up the Compliance Management Department tasked with system management, internal control management and legal affairs management. We will followed through with the implementation of the Group's "Huaneng Rule of Law" requirements and proposed to include the relevant provisions pertaining to general legal counsel in the Company's articles of association, and with the aim of forming a compliance management working group system chaired by the general legal counsel, led by the compliance management department and jointly governed by all departments of the Company.

#### 4.2.2 Advancing Incorruptibility

In 2018, the Company rolled out anti-corruption campaigns, 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.

#### 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.

First, the Company strictly effectuates responsibility system for the establishment of an incorrupt party, and party members of each level give a written undertaking thereof.

Second, the Company rigidly implements stipulations within the spirit of the "eight-point" guideline and Huaneng International's own 30 stipulations on improving working manners.

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Third, the Company attaches great importance to the work of handling complaints expressed in letters or visits. Fourth, the Company will seize upon critical periods, such as holidays, to publish documents and send out text messages to reiterate the relevant requirements, urge and remind people 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.

According to statistics, in 2018 the Company headquarters 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: Discipline education. The Company organised educational and training activities for party members to learn about and get familiar with the newly revised Regulations of the Communist Party of China on Disciplinary Actions ( ( &#20013;&#22283;&#20849;&#29986;&#40680;&#32000;&#24459;&#34389;&#20998;&#26781;&#20363; ) ). 32 cases of breaches of laws and regulations involving Communist party members within the Company were shared with all departments to serve as a deterrent. Discipline education conferences were held where the 7 issues concerning the deepening of the inspection and rectification work specified by the central government as well as the 5 typical cases of law and regulation breaches were reported to urge compliance with laws and regulations.

Special inspection. The Company inspected and supervised the work of Singapore Tuas Power Ltd., culminating in the formulation of the Trial Measures for the Implementation of Corruption Prevention and Control for Overseas Projects (

&#22806;&#38917;&#30446;&#24265;&#28500;&#39080;&#38570;&#38450;&#25511;&#23526;&#26045;&#36774;&#27000; aimed at enhancing the supervision and management of investment and operation activities involving overseas projects to prevent corruption.

Internal inspection. 3 rounds of regular inspections and 1 round of re-inspections of regional branches were carried out in Jilin, Heilongjiang, Anhui, Henan, Zhejiang, Hebei, Shanghai, Jiangxi, Fujian, Hunan and Chongqing, etc.

Disciplinary dialogue. The Company held more than 8,000 person times of routine disciplinary conversations with employees under normal circumstances, reminding them to comply with laws and regulations in carrying out their work and resolutely oppose corruption and bribery.

#### 4.2.3 Protection of Intellectual Property Rights

Huaneng International remains determined to advance scientific development and realise technology-driven growth strategy. We highly value intellectual property rights and patents and strictly abide by the Patent Law of the People's Republic of China

( ( &#20013;&#33775;&#20154;&#27665;&#20849;&#21644;&#22283;&#23560;&#21033;&#27861; ) ), the Copyright Law of the People's Republic of China

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( ( &#20013;&#33775;&#20154;&#27665;&#20849;&#21644;&#22283;&#21830;&#27161;&#27861; ) ) and other laws and regulations of China. We respect the results of knowledge and technology development, continuously innovate with technology, regulate the management of intellectual property and protect intellectual property rights in accordance with the law.

In 2018, we revised Huaneng Power International's Intellectual Property Management Regulations ( #33775;#33021;#22283;#38555;#38651;#21147;#32929;#20221;#26377;#38480;#20844;#21496;# to clarify the hierarchical approach to intellectual property management at the headquarters, regional and grassroots levels as well as the classified approach to the management of trademarks, font size, engineering designs, product design drawings and descriptions, and computer software.

The Company's compliance management department is the central unit that manages the Company's graphic trademarks. It is responsible for protecting the Company's exclusive right to "H-type" trademarks as well as handling the headquarters' intellectual property management work. Other departments, regional branches and their affiliated units are responsible for the corresponding intellectual property declaration and maintenance work depending on their business and terms of reference.

In 2018, the annual fees for 9 patents were paid on time and the renewal applications for 13 "H-type" trademarks were submitted to the Trademark Office.

In 2018, there was no government penalty imposed on or litigation laid against the Company due to intellectual property issues.

#### Rizhao Power Plant #211; Measures for Protection from High Temperatures

To stave off the adverse effects of high temperatures in summer, Rizhao Power Plant had made efforts on four fronts, namely precaution, maintenance, cooling and protection, to ensure safe and stable power supply during the hot season.

In view of frequent thunderstorms, strong winds and deep convection weather during summertime, Rizhao Power Plant assigned special teams to step up inspection in key areas, organised emergency drills in preparation for possible floods, comprehensively identified and remedied deficiencies in flood prevention work, enhanced flood monitoring deployment, and worked seamlessly with local meteorological authorities to strengthen extreme weather warnings, emergency response and flood prevention.

During the pause periods of power units to make way for grid construction work, Rizhao Power Plant took the opportunity to carry out

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equipment upgrades, revamps, maintenance and repairs to enhance equipment reliability. We also stepped up real-time monitoring and fine-tuned adjustments, as well as formulating contingency plans and making preparations for emergency response.

To ensure the safe operation of ventilating and cooling equipment during the hot season, Rizhao Power Plant performed inspections of key equipment more frequently and made more focused efforts to clear sediments in blowers and primary air fan motor coolers. Bearings were oiled and additional cooling fans were installed to reduce the burden on equipment caused by continuous high temperatures.

Considering the volatility of the fuel market, Rizhao Power Plant had kept a close eye on market trends, optimised the supply structure and increased the inventory of coal. As frequent heavy rain and fog were expected in summer, the power plant had enhanced communication and coordination with Rizhao Port to facilitate the efficient shipping of coal and ensure sufficient reserve of coal in anticipation of high temperatures. Covers in coal yards were also fortified against heavy rainfalls. Efforts were made to enhance the effectiveness of fuel blending and ensure ultra-low emissions.

#### Yuhuan Power Plant &#8211; Full Preparation for Typhoons

Between June and September 2018, China's coastal areas were hit by a number of typhoons. The No. 14 typhoon "Capricorn" landed on the coast of Wenling, Zhejiang Province on the evening 12 August, bringing winds of up to magnitude 10 that made it a strong tropical storm. As Capricorn landed just 30 kilometres away from Yuhuan Power Plant and coincided with high tides, the three forces of wind, storm and tide brought as much as 50 millimetres of rainfalls.

Yuhuan Power Plant had been keeping a close watch on the typhoon and implemented contingency plans in a timely manner. The power plant monitored the typhoon's trajectory round the clock and shared real-time information on the typhoon via WeChat Groups in an effort to put in place comprehensive precautionary measures and clarify regional, system and equipment responsibilities. On-site risk investigation was stepped up, temporary construction workers resettled and open-air structures, passageways and large equipment fortified and sealed to ensure personal and property safety as well as the stability of major equipment, power generation and grid operation.

#### Hainan Branch &#8211; Full Protection from Heavy Rainfalls

Affected by a tropical depression in the South China Sea, heavy rainfalls occurred in the northern, western, eastern and central parts of Hainan Island on 8 August 2018 and more than 100 millimetres of rainfalls were recorded in 145 townships, with Wanling Town of the Qiongzong Li-Miao Autonomous County hit hardest by rainfalls measuring 448 millimetres. Located at the Gezhen Dam, the power plant was hit by an average of 329.2 millimetres of rainfalls within 48 hours and suffered a maximum of 1,819 cubic metres of rainwater inflows per second, which cause great pressure on the safe and smooth operation of the power plants. To ensure the safety of the dam, the power plant performed a comprehensive inspection of equipment ahead of schedule and employees stayed in the power plant seven days a week to take part in typhoon and flood preparation work. All power units operated at maximum capacity throughout the day and extra resources were arranged in anticipation of intense precipitation. During this period, Unit 1 and Unit 2 of the power plant generated an extra 38.4 ten thousand kWh within 48 hours.

Thanks to these precautionary measures, no production accidents were reported in Hainan Branch and power units were successfully loaded according to dispatch orders. Personal safety and property safety were ensured.

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#### 4.2.3 Protection of Intellectual Property Rights

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(《中华人民共和国著作权法》), the Trademark Law of the People's Republic of China

(《中华人民共和国商标法》) and other laws and regulations of China. We respect the results of knowledge and technology development, continuously innovate with technology, regulate the management of intellectual property and protect intellectual property rights in accordance with the law.

In 2018, we revised Huaneng Power International's Intellectual Property Management Regulations

(《知识产权管理办法》) to clarify the hierarchical approach to intellectual property management at the headquarters, regional and grassroots levels as well as the classified approach to the management of trademarks, font size, engineering designs, product design drawings and descriptions, and computer software.

The Company's compliance management department is the central unit that manages the Company's graphic trademarks. It is responsible for protecting the Company's exclusive right to "H-type" trademarks as well as handling the headquarters' intellectual property management work. Other departments, regional branches and their affiliated units are responsible for the corresponding intellectual property declaration and maintenance work depending on their business and terms of reference.

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In 2018, the annual fees for 9 patents were paid on time and the renewal applications for 13 “H-type” trademarks were submitted to the Trademark Office.

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Respect Innovation  
Regulation Protection

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## 05 Protecting the Environment

### and Advancing Green Development

Our planet provides us with the space upon which to service, and it is everyone's responsibility to protect the environment. As a responsible enterprise 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. To live up to our environmental responsibilities, we are committed to 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 reducing pollutant emissions.

#### 5.1 Promoting the Development of Clean Energy

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"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 and advance business transformation and upgrading by introducing low-carbon and clean energy power units. We 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 21%. The main development directions include:

1.  
Vigorously Developing Wind Power
-

The Company is going to further increase the reserves of resources of high-quality and energy-efficient wind power project, and adjust our regional wind power deployment strategy according to local resources and local conditions. We plan to expedite the construction of onshore wind farms in the north-eastern, northern, north-western and south-western parts of China where wind resources are abundant, whereas we will focus on developing low-speed wind power in the eastern and central parts where sufficient wind resources can be found. In addition, we will continue to develop offshore wind power in developed provinces in the eastern part of China.

2.

#### Accelerating the Development of Solar Power

The Company is going to vigorously promote the development of wind-photovoltaic power plants, make full use of its own land to build photovoltaic power plants, 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.

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

Actively seeking investment cooperation and opportunities for merger and acquisition of properties of new energy power generation. We will selectively launch natural gas power generation demonstration projects as well as biomass energy and waste incineration power generation demonstration projects.

Fuzhou Power Plant &#8211; Coal-Fired Sludge Co-Firing Power Generation Project as Part of the National Technological Transformation Pilot Programme

On 26 June 2018, the National Energy Administration and the Ministry of Ecology and Environment published the Notice on Launching the Pilot Programme for Coal and Biomass Co-Firing Power Generation Technology Transformation

( and the Fuzhou Power Plant’s coal and sludge co-firing power generation project was selected to be one of the 84 national technological transformation pilot projects.

The project proposes to build a 2×100 tons/day sludge drying system to fully utilise the waste heat of steam from coal-fired power units and realize the combustion of sludge in a completely closed and dry environment. The flue gas generated then underwent desulphurization, de-nitrification and dust removal procedures to achieve ultra-low emissions. Upon completion, the system can handle 66,700 tons of sludge per year for sludge detoxification and utilization, bringing both social and economic benefits.

In the first half of 2018, Fuzhou Power Plant used the direct blending method for the combustion of 7,831 tons of municipal sludge with a moisture content of below 60%, hence an average of 50 tons per day, effectively alleviating the current “sludge conundrum” in Fuzhou City. In future, our Fuzhou Branch will deepen the implementation of the coal and biomass co-firing power generation technology transformation pilot programme to fully cover the treatment of sludge with a moisture content of above 60% in Fuzhou City.

The project not only provides a solution to sludge problems, but also reduces the consumption of non-renewable energy as well as the emission of greenhouse gases and waste gases, representing a significant step in environmental protection.

#### Clean Energy Projects

As of 31 December 2018, the Company had a controlled generation capacity of 105,991 MW and an equity-based installed generation of 93,755 MW, of which 16.50% was from clean energy sources (gas turbine, hydro, wind, photovoltaic and other power generation).

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### Gaolongshan Wind Farm “Protection-Oriented Development”

Huaneng Gaolongshan Wind Farm is located along the Gaolongshan Mountains at the junction of Yongfeng County, Ji’an City and Le’an County, Fuzhou City, which stretch 14 kilometres with an altitude between 585-1,063 metres. The wind farm has twenty-eight 2.2 MW wind turbines and eight 2.3 MW wind turbines, with a total installed capacity of 80 MW. The annual average feed-in electricity amounted to 167 GWh and the annual average equivalent full-load operation totaled 2,088 hours. The project costs RMB654 million. Huaneng Gaolongshan Wind Farm (80 MW) came into full operation on 20 November 2018.

Since the inception of the project on 26 May 2017, the wind farm had been sticking to the guiding principle of “protection-oriented development” and had put forward four focuses, namely safety, environmental protection, benchmarking and national engineering excellence to achieve total compliance. The ecological vision of the project has been billed as the defining attribute of the “Huaneng Brand” by the international community. The wind farm insisted on the use of green and eco-friendly construction techniques and environmental protection facilities were designed, constructed and put into operation alongside the main structure. The construction work basically took place within the land expropriation area and there were no reports of lower slope cave-ins or soil degradation. The impact of the project on drinking water sources was minimised. The project put forward the “zero slope perturbation” road construction concept. All residual soil was transported to the soil field to protect the original vegetation and ecology of the slope.

### Chengmai Photovoltaics

The Huaneng Haikou Photovoltaic Power Station Ash Field Project had a total capacity of 65 MW, with the second phase accounting for 40 MW. The project was successfully put into operation on 21 June 2018, nine days ahead of schedule, and there were no reports of system failures, data errors or operational abnormalities. The project location receives a total of 1,561.19 kWh/m<sup>2</sup> of solar radiation per year and the annual average utilisation rate can reach 1,130 hours. The power station generates 46.32 GWh per year, saving 1.43 ten thousand tons of standard coal and 13 ten thousand m<sup>3</sup> of water each year as well as reducing emissions of carbon dioxide, sulphur dioxide, nitrogen oxides and soot by 3.91 ten thousand tons, 12 tons, 11.6 tons and 2.78 tons respectively each year<sup>6</sup>.

The power station was designed for “unmanned operation”. The power station’s comprehensive automation system mainly consists of a set of microcomputer protection and computer monitoring devices in addition to some other smart equipment. The power station is equipped with a computer monitoring system with telecontrol functions to control and regulate the power station according to the needs of dispatching operation.

The 30 MW Huaiyin Power Station Ash Field Project came into full operation on 21 June 2018. It is estimated that the power station’s annual average power generation amounts to 32.8648 GWh and its annual average utilisation rate totals 1,087.07 hours. The project is expected to provide funds for poverty alleviation in Huaiyin District, Huai’an City, bringing both economic and social benefits.

The 20 MW Jilin Zhenlai PV Poverty Alleviation Project came into operation on 27 June 2018. The project is located in Xinli Village, Zhenlai County, Baicheng City, Jilin Province, and is equipped with 300 Wp monocrystalline PV modules fixed at adjustable angles. The power station is a multi-purpose project that combines wind power generation, photovoltaic power generation, poverty alleviation and farming, and is connected to the grid via the newly constructed Zhenlai Mali Wind Farm 220 kV booster station, an arrangement that brings even greater economic benefit.

6 According to China Electricity Council’s 2018 China Power Industry Development Annual Report, the standard coal consumption of thermal power units with a capacity of 6,000 kW or above across the country in 2017 was 309 g/kWh, and emissions of major air pollutants such as carbon dioxide, sulphur dioxide, nitrogen oxides and

soot were 844 g/kWh, 0.26 g/kWh, 0.25 g/kWh and 0.06 g/kWh respectively.

## 5.2 Becoming an Innovation-Driven Enterprise

Innovation is the driving force for development and provides strategic support for the construction of modern economic systems. Innovation also serves as the mainstay of national and people development, and is the engine of societal development and enterprise growth. 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, optimising the systems for innovation decision making and management, and relentlessly developing innovation platforms to accelerate the development of the Company.

### Innovation Management and Investment

In accordance with the Law of the People's Republic of China on Scientific and Technological Progress

( [20013](#); [33775](#); [20154](#); [27665](#); [20849](#); [21644](#); [22283](#); [31185](#); [23416](#); [25216](#); [34899](#); [27861](#);

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

( [31185](#); [23416](#); [25216](#); [34899](#); [24037](#); [20316](#); [29702](#); [35215](#); [23450](#); ), Measures for the Management of Science and Technology Projects

( [31185](#); [25216](#); [38917](#); [30446](#); [29702](#); [36774](#); [27861](#); ), Incentive Measures for Scientific and Technological Progress ( [31185](#); [23416](#); [25216](#); [34899](#); [29518](#); [21237](#); [36774](#); [27861](#); ) and

Measures for the Performance Evaluation of Scientific and Technological Innovation

( [31185](#); [25216](#); [21109](#); [26032](#); [32318](#); [25928](#); [32771](#); [26680](#); [36774](#); [27861](#); ). Huaneng

International is determined to realise demand-led growth, strive for short-term results and long-term goals, and capitalise 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.

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The Company, 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") cooperate to discuss and solve technical problems. The Company has cooperated with universities, manufacturers and other external parties to form a powerful alliance in order to complete project research.

#### Innovation Achievements

##### (1) CO<sub>2</sub> capture technology

Taking into consideration the market potential and policy trends in carbon asset management and operation, we develop and build up CO<sub>2</sub> capture and related technologies in a planned and step-by-step manner. For CO<sub>2</sub> absorption using alkanolamine, the rich solution should be heated for lean solution regeneration, leading to significant energy consumption as a result of evaporation. To reduce energy consumption in CO<sub>2</sub> capture, we proposed to apply the aqueous phase concentration method to the CO<sub>2</sub>-rich solution and initiate the study of phase-change CO<sub>2</sub> capture technology. The Company has achieved technological breakthroughs in respect of phase-change CO<sub>2</sub> absorbents featuring automatic concentration and layering, phase-change CO<sub>2</sub> capture techniques and phase separation equipment.

##### (2) Roadmap for the construction of a smart power station system

Following a theoretical study on smart power stations, the structure of a smart power station system and its implementation roadmap have been formed, and some proposals have been put forward for the application of smart technologies. Our efforts have culminated in technological breakthroughs in power station smart technology applications, smart power station application conditions, smart power station economics, smart power station system structures, as well as studies related to the business structure, application structure, systemic structure, data structure, safety structure and standardisation structure of smart power stations. We seek to ensure effective interaction with the smart power grid and meet the various assessment requirements for local grid AGC and primary frequency control, in addition to making power stations more adaptable to changes in the external environment and improving the control of key parameters of power units. In this way, power station management and power unit reliability can be enhanced, thus lowering the costs for the inspection, maintenance and testing of power units.

#### In 2018, the Company Developed and Obtained 60 Patents Including 33 Invention Patents

##### (3) Techniques related to high-temperature alloy materials required for new-generation high-efficiency ultra-supercritical coal-fired power units

A study was launched to look into welding techniques for high-temperature steam pipes made of new-generation materials. We proposed to use new-generation austenitic stainless steels as alternative materials for components such as high-temperature steam pipes and headers used in 650°C high-efficiency ultra-supercritical power units based on the welding requirements for the manufacture, piping and installation of components. We have obtained breakthroughs in solder ability and welding consumables, welding methods, welding process parameters, welding stress removal, non-destructive joint testing and welding process evaluation. Regarding the welding techniques for high-temperature key components made of new-generation alloy materials used in 700°C ultra-supercritical power stations, we studied the theoretical basis for the design of welding consumables based on our own power unit verification platform and completed process optimisation. This has laid the groundwork and serves as precedent for the construction and operation of new-generation coal-fired power units.

##### (4) Ultra-low flue gas emission operation of coal-fired power units

After reviewing and analysing the Company's roadmap for ultra-low emission technology transformation, we conducted a systemic examination and analysis of the operation of the existing environmental protection facilities of standard-issue power units, and launched a research and demonstration project to look into the optimisation of environmental protection facilities with room for energy-saving and performance enhancement against their designed and operational ultra-low emission benchmarks. The project has given rise to breakthroughs in the examination and

analysis of environmental protection facility operation and performance, system solution optimisation, energy-saving potential exploration and inherent technical deficiency rectification. With these breakthroughs, the safety and stability of ultra-low emission facilities can be further enhanced, and more potential can be uncovered for the Company to secure the long-term, stable and cost-effective operation of ultra-low emission environmental protection facilities.

(5) High-efficiency coal-fired power plant wastewater treatment and water saving integrated technology

To strengthen the control of wastewater discharges and meet more stringent wastewater discharge targets, we conducted a research into thermal power plant wastewater discharge control technology, examined the wastewater treatment system of standard-issue power plants and studied the design, operation and maintenance of a demonstration project on power plant desulphurisation wastewater concentration reduction and hot flue gas evaporation technologies, with the aim of improving applicability and reliability. The project has secured breakthroughs in the examination of existing wastewater treatment systems, desulphurisation wastewater concentration reduction, wastewater hot flue gas evaporation, the trial and application of the demonstration project, the comprehensive utilisation of chlorine ion ashes and the coordinated development of water saving and wastewater treatment.

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## Development Directions

According to the 13th Five-Year Plan for Energy Development

(《能源发展“十三五”规划》), China's CO<sub>2</sub> emissions per GDP should be reduced by a further 18% by 2020 from the level laid out in the previous Five-Year Plan. The four major directions of the Company's technological development are summarized below:

First, the Company will vigorously develop low-carbon environmentally friendly renewable energy and optimize the industrial structure.

Second, we will conduct further research and develop high efficiency environmentally friendly high-parameter large-capacity thermal power units to further increase efficiency and reduce emissions.

Third, we will earnestly develop smart power plants with the technological support of new generation sensing, Internet of Things, artificial intelligence and virtual reality to maximize the safety, cost-effectiveness, efficiency and environmental friendliness of operation.

Fourth, the Company will explore energy storage technology, frequency modulation technology, distributed energy and the coordinated utilisation of multiple energy sources.

## China's CO<sub>2</sub> Emission

Down by 18%

by 2020

### 5.3 Leading the Clean and Efficient Utilization of Coal

Natural resources are crucial to the development and advancement of humanity. Since natural resources are in limited supply, it is therefore paramount to reduce the consumption and rationalise the utilisation of non-renewable energy, as well as reducing the generation and discharge of wastes and pollutants, so that we can live in harmony with nature.

Huaneng International attaches great importance to environmental protection, strictly abides by the latest environmental laws and regulations of our country, takes the initiative to take environmental responsibility, actively promotes energy conservation, optimizes the energy structure, continuously improves the efficiency of resource use, and creates, through "efficient environmental protection and green ecology", the world-class listed power generation company, leading the industry's green development. In 2018, the Company did not experience any serious accidents.

#### 5.3.1 Overall Planning

To implement the State Council's Program of Action for the Energy Development Strategy (2014-2020)

(《能源发展“十三五”规划》) and become an industry leader in overall energy use efficiency and ultra-supercritical unit energy use efficiency, Huaneng International has formulated the Measures for Energy Saving Management, Regulations on Environmental Protection Management, Standards and Acceptance Measures for Energy Saving and Environmentally Friendly Coal-Fired Power Plants and Incentive Measures for Energy Efficiency Excellence and Enhancement in (Ultra-) Supercritical Power Units, among others. The Company actively promotes the Company's coal-fired power units' energy conservation and emission reduction, plans to carry out year by year energy conservation and environmental protection, and has successfully fulfilled the target and task of energy saving and emission reduction, ensures that the Company's coal-fired units takes continues lead in energy conservation and environmental protection, ensures competitive advantage of coal-fired power generation units, and makes contributions on promoting revolution on the nation's energy production and consumption, enhancing the clean and efficient development of coal power level.

#### 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

(《环境保护法》), Energy Conservation Law of the People's Republic of China

(《节约能源法》) and other relevant laws. The Company continues to implement energy saving transformation projects and energy

saving technologies like Low-pressure cylinder zero output technology for heat supply units and fluegas waste heat recovery, roll out energy conservation and environmental protection activities, enhance management of the operation and maintenance of environmental protection facilities, and step up supervision and assessment relating to energy conservation and environmental protection.

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 2018, the Company's average coal consumption rate for power sold was 307.03 g/kWh and its weighted average house consumption rate was 4.34%. The annual standard coal consumption amounted to 117.10 million tons. Oil consumption in production totalled 34,031 tons, while natural gas consumption was 4,821.47 million standard cubic metres.

Being an Industry Leader in Overall Energy Use Efficiency and Ultra-Supercritical Unit Energy Use Efficiency

#### Management Mechanism

Our regional companies are responsible for the management of energy saving projects. In accordance with the state's environmental protection laws and regulations as well as the 2014-2020 Coal-Fired Power Energy Saving and Emission Reduction Upgrading and

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Retrofitting Action Plan ( 2014-2020

&#24180;&#29028;&#38651;&#31680;&#33021;&#28187;&#25490;&#21319;&#32026;&#33287;&#25913;&#36896;&#34

and after taking into consideration the Company's actual circumstances, we formulated the Measures for Energy Saving Management ( &#31680;&#33021; &#29702;&#36774;&#27861; ), the Incentive Measures for Ultra-Supercritical Power Unit Energy Saving Excellence and Enhancement

( &#36229;&#65288;&#36229;&#65289;&#33256;&#30028;&#27231;&#32068;&#33021;&#32791; &#27161;&#21109;&

the Implementation Plan for the Comprehensive Upgrading and Retrofitting and Energy Saving Replacement of Coal-fired Power Plants

( &#29123;&#29028;&#38651;&#24288;&#32156;&#21512;&#21319;&#32026;&#25913;&#36896; &#31680;&#33021;&

the Measures for the Standards and Acceptance Assessment of Energy Saving and Eco-Friendly Coal-Fired Power Plants

( &#31680;&#32004; &#20445;&#22411;&#29123;&#29028; &#38651;&#24288;&#27161;&#28310; &#39511;&#25910

and the Measures for the Selection of Energy Saving and Advanced Units

( &#31680;&#33021;&#20808; &#21934;&#20301;&#35413;&#36984;&#36774;&#27861; ), 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.

To enhance the budget management of energy consumption, Huaneng International has formulated the special purpose assessment requirements for energy conservation and emissions reduction to ensure an optimal level of consumption of coal, electric power, oil and natural gas. By combining goal management and process management, the Company first sets the annual energy consumption reference taking into account the energy efficiency level of each grassroots unit and carries out assessment on the degree to which the reference target is met. Second, regarding those units which have difficulty meeting the target or whose energy consumption rebounds severely, the Company will arrange on-site inspection performed by professionals, who then carry out comprehensive investigations, provide recommendations and take measures to ensure that the energy conservation and emissions reduction targets set by the state and the Company are met. By doing so, the Company can maintain its leading position in energy conservation.

#### Management Measures

In 2018, 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 improved the three-level energy saving management system, optimised the three-level energy saving supervision network for grassroots units and introduced energy saving benchmarks into grassroots unit 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 companies and grassroots 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, the review and verification of 28 energy saving and environmental protection excellence power plants, and a rewards system for energy saving excellence and enhancement with incentive funds.

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. For example, we pushed for heat supply network regulation

and optimisation as well as regional heat supply network interconnectivity in Shandong, and performed heat supply network economic modulation to enhance cost-effectiveness and reduce losses. Second, we urged regional companies 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 power plants 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.

Promote Energy Conservation,  
Improve Energy  
Efficiency

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 191 million GJ, a testament to energy utilisation enhancement. A number of high-parameter pure backpressure power units with highest energy utilisation rates for heat supply have come into operation, such as the Guanyun Thermal Power Plant, as part of our efforts to advance energy cascade use-oriented heat supply optimisation transformation. A total of 22 power units in Luoyang Yangguang, Linyi, Huangtai, Jining, Yangliuqing and Yingkou adopted different technology solutions to increase energy utilisation and thus further enhance the comprehensive efficiency of their heat supply systems; Rizhao Power Plant completed energy cascade use transformation to significantly reduce energy consumption, bringing significant economic benefits. The Company has been relentlessly exploring its main power units' potential for lower energy consumption and pushing ahead with environmentally friendly ultra-low emission transformation by introducing practical and advanced technologies such as low-temperature economizers, fan integration, air preheater flexible seals and automatic control strategy optimisation to further reduce energy consumption. The completion of the energy saving integrated transformation of Luohuang Unit 6 attested to our push in this direction. In 2018, the Company completed 56 energy saving technology transformation projects.

The Company Completed 56 Energy Saving Technology Transformation

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## Projects

Through a series of effective management measures, as at the end of December 2018, the Company has maintained its leading position in energy saving for coal-fired power generation by its major unit models, such as 1,000 MW ultra-supercritical wet cooling, 600 MW ultra-supercritical wet cooling, 600 MW super-critical wet cooling, 600 MW super-critical air cooling and 600 MW subcritical wet cooling, as benchmarked against competitors in China.

Fifty-five power units of the Company managed to gain a spot in the energy efficiency competitor benchmark list compiled by the China Electricity Council. Of the awardees, 12 units including Laiwu No.7 received the first prize; 13 units including Jinling No.1, received the second prize; 14 units including Haimen No.4 received the third prize; 5 units including Laiwu No.6 received the “Optimal Coal Consumption Power Unit” award; and 7 units including Weihai No.6 received the “Optimal Energy Consumption Power Unit” award.

## Luohuang Power Plant’s Real energy saving results

Turbine No.5 of Luohuang Power Plant was originally manufactured by Harbin Turbine. In 2018, Alstom performed flow path retrofitting for the turbine. When operating in 600 MW, the heat consumption of the retrofitted turbine amounted to 7,864.2 kJ/KWh, a decrease of 316.4 kJ/kWh that reduced coal consumption by around 13 grams/kWh.

### 5.3.3 Water Resources Management

Huaneng International has always been committed to the protection of water resources, strengthen water saving, deepen the recycling of water and improve water use efficiency, and strive to become a resource-saving and environmentally friendly enterprise. The Company performs water usage and water saving management in strict accordance with the Water Law of the People’s Republic of China ( 2002, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030 ). 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.

In 2018, the overall water consumption of the Company was 19,742.20 million tons, the fresh water in power generation was 448.24 million tons, the open cooling circulation water was 19,293.96 million tons, and the performance value of consumption of fresh water in power generation was 1.04 kg/kWh.

### Management Mechanism

The main water consumptions of Huaneng International are for power units generating electricity, replenishing water for closed circulating water, and wet desulphurization, etc. Mostly, surface water such as rivers, urban water, a small amount of groundwater, etc., is used for generating power, and river water or sea water is used for circulating.

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.

With reference to the water consumption properties of our coal-fired power plants and guided by the principle of coordinated treatment, our various companies have integrated water saving and wastewater treatment with sewage discharge reduction work, engaged in extensive cooperation with authoritative research institutes such as the Xi'an Thermal Power Research Institute and adopted a "one power plant, one policy" approach to clarify water supply and water consumption procedures and optimise conditions for water recycling and water usage classification, with the aim of advancing the coordination of water saving and sewage treatment and ensuring the effectiveness of the comprehensive treatment.

#### Management Measures

In 2018, the Company launched a series of water saving measures in response to water shortage risks. The Company faces no imminent threats in terms of tapping water resources.

The Company initiated the selection and assessment of "energy saving and environmental protection" double excellence enterprises, required its various power plants to perform water saving management, and gathered statistics and conducted assessments against the new water consumption standards for power generation. After a comprehensive water saving retrofit, Jingmen Thermal Power Plant's water consumption decreased from 2.5 kg/kWh in 2016 to 2.1 kg/kWh, a higher standard compared to power units of the same model. Upon completion of water saving work on industrial and household wastewater recycling, Yingkou Power Plant was able to save more than 30 ten thousand tons of water each year. In areas plagued by water shortages, enhanced water saving technology transformation was implemented in addition to wastewater zero discharge technology transformation for some power plants.

In 2018, 13 power plants of the Company completed or underwent water saving transformation to reduce reliance on water resources.

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Performance Value of Consumption of Fresh Water in Power Generation was 1.04kg/kWh  
Jiutai Power Plant; Water Saving Transformation for Circulating Water

To further reduce fresh water consumption and wastewater discharges without affecting the operating efficiency of the cooling system, Jiutai Power Plant made use of circulating water biotreatment technology which does not add chemical agents to or discharge circulating water, but introduces composite biological agents and nutrient regulators to circulating water, thus creating a dynamically balanced microbial system. This significantly reduced the consumption of fresh water and achieved zero discharge of circulating water. Based on the power plant's operation in 2018, it is estimated that the power plant can save 1.3-1.5 million tons of water each year.

Jining Thermal Power Plant; Transformation for the  
Comprehensive Treatment of Reverse Osmosis Concentrates

A reverse osmosis concentrates comprehensive treatment system was established to recycle and reuse 50% of the concentrated brine originally discharged by the chemical reverse osmosis system, with the remaining serving as supplement water for wet desulphurisation absorption. During the cold season, the power plant can reuse 49 tons of reverse osmosis concentrates per hour; during other periods of the year, the power plant can reuse 44 tons of reverse osmosis concentrates per hour. A total of 29.7 ten thousand tons of reverse osmosis concentrates can be reused each year.

Upon completion of the transformation, all reverse osmosis concentrates were recycled and reused, and there would be no direct discharges. On the other hand, the total volume of wastewater discharges decreased, with significantly lower salinity, thus reducing the impact on water and soil in the surrounding environment.

Jinggangshan Power Plant; Water Saving Work

Coagulation and sedimentation were originally used by Jinggangshan Power Plant for coal-containing wastewater treatment, which resulted in poor water quality and non-recyclability. In August 2018, the power plant completed a 50 tons/h coal-containing wastewater electrocoagulation project that reduced water turbidity to meet recycling standards. Upon completion of the ongoing coalfield spray water transformation project, around 438,000 tons of water can be saved each year; after advanced enhancement of the desulphurisation wastewater treatment process, water can be recycled at 3 tons/h to the desulphurisation water tank and around 2.6 ten thousand tons of water can be saved each year, with sewage discharges reduced by about 4.4 ten thousand tons annually.

#### 5.3.4 Emissions Management

In accordance with China's 13th Five-Year Plan for Ecological and Environmental Protection

( 《 十三五生态环境保护规划 》 ),

13th Five-Year Comprehensive Work Plan for Energy Conservation and Emissions Reduction

( 《 十三五节能减排综合工作方案 》 ),

13th Five-Year Work Plan for the Control of Greenhouse Gas Emissions

( 《 十三五控制温室气体排放工作方案 》 ),

as well as the relevant requirements of the National Development and Reform Commission, the Ministry of Ecology and Environment and the State-owned Assets Supervision and Administration Commission of the State Council, the requirements put forward to fight pollution and the Blue Sky Battle, and 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 2018-2020 Pollution Prevention and Control Plan

( 《 2018-2020 污染防治工作方案 》 ), which includes ultra-low emission transformation, power plant water saving and wastewater treatment, and coal field and ash field

treatment;

In respect of emission performance, by 2020, the Company's sulphur dioxide, nitrogen oxides, and soot emissions will go down by about 50% compared with the data of 2015. As environmental protection facilities are designed and constructed alongside new coal-fired power units, sulphur dioxide, nitrogen oxides and soot emissions will be less than 35 mg/standard m<sup>3</sup>, 50 mg/standard m<sup>3</sup> and 5 mg/standard m<sup>3</sup> respectively.

In respect of 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 world-class listed power generation company.

#### 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 2018, the Company's emissions of sulphur dioxide, nitrogen oxides and soot were 26,104.17 tons, 56,043.93 tons and 4,070.97 tons respectively, with emission performance values of 0.06 g/kWh, 0.13 g/kWh and 0.01 g/kWh respectively.

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### Management Mechanism

Ecological and environmental protection is an important part of the Company's performance assessment, and therefore the emission levels of sulphur dioxide, nitrogen oxides and soot and their emission compliance rates serve as performance indicators in our annual performance assessment. According to the 2018-2020 Pollution Prevention and Control Plan ( 2018-2020 ), persons assuming primary responsibility for environmental protection and pollution control are specified for each power plant. Those persons assuming primary responsibility may face disqualification, transfer, demotion, dismissal, or "one-vote veto" once held accountable. Core members accountable for severe ecological and environmental damage would face heavy and long-term penalties. Based on the statistics of the Company's monthly, quarterly and annual pollutant emissions, as well as the analysis of the causes and patterns of emission changes, the Company leads its various power plants to conduct risk investigation and implement remedial measures in an effort to achieve the annual performance targets.

### Management Measures

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

Environmental protection facility operation and management optimisation. The Company continued to refine the scope of environmental protection facility operation and management as well as enhance the real-time supervision and control of pollutant emissions as part of its efforts to prevent and control air pollution, especially under choking air conditions and during major events.

Ultra-low emission transformation. The Company sought to further enhance the management of ultra-low emission transformation projects and vigorously advance ultra-low emission transformation work.

Green and low-carbon technology development and application. The Company strived to improve environmental protection standards compliance, formulate technical guidelines for optimising the ultra-low emission operation of coal-fired power units, create an ultra-low emission technology transformation roadmap for medium- and small-sized coal-fired power units and heating boilers, and guide enterprises to substantiate their transformation proposals and technology selections in terms of cost and operational effectiveness.

Currently, all coal-fired power units of the Company are equipped with desulphurisation, de-nitrification and dust removal devices and all emissions are compliant with environmental protection standards. We have also implemented ultra-low emission transformation as planned. As at 31 December 2018, sulphur dioxide, nitrogen oxides and soot emissions from the Company went down by 45%, 13% and 50% year on year respectively, which are among the lowest emission levels in the industry.

### Emissions of Sulphur Dioxide,

### Nitrogen Oxides and Soot

26,104.17 tons

56,043.93 tons

4,070.97 tons

### Emission Performance Values

0.06 g/kWh

0.13 g/kWh

0.01 g/kWh

### Future Plan

In future, the Company will double down on its efforts to implement pollution prevention and control measures as well as specify major responsibilities in the fight against pollution.

Scaling up investment in air pollution treatment. The Company plans to invest RMB2.9 billion in air pollution treatment in the fiscal year 2019-2020.

Implementing air pollution emergency management. The Company will conscientiously carry out environmental protection contingency plans during periods of "major events" and "choking air conditions" to fulfil the obligations of a

central enterprise. We will step up supervision and management in anticipation of inspections by central and local authorities, especially focusing on cases of emission levels in excess of the prescribed emission standards, and strengthen environmental protection risk prevention and emergency response to pre-empt environmental pollution incidents and protect the Company's image as an eco-friendly enterprise.

Environmental protection supervision and inspection. The Company will continue to ensure that all pollutant emissions are in compliance with emission standards and licensing requirements. We will rigorously implement the Environmental Protection and Pollution Control Accountability Measures

( step up work supervision and on-site

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inspection and facilitate both the Party and the government's undertaking of pollution prevention and control responsibilities in performing their official duties and upholding clean governance. The monitoring and management of air pollution prevention and control work will be rigorously performed through escalation, supervision, dialogue and assessment.

Optimising air pollution control standards. An ultra-low emission technology transformation roadmap for medium- and small-sized coal-fired power units and heating boilers will be formulated to advance the development and promotion of air pollutant removal and energy saving integrated technology for more options and alternatives with a view to further reducing emissions and lowering costs.

#### 5.3.4.2

##### Management of Greenhouse Gases

In order to actively support the national carbon trade market, Huaneng International has consecutively introduced the Management Methods of the Company's Carbon Asset ( 《 碳资产管理办法 》 ), Management Regulations on Greenhouse Gases' Emission Statistics ( 《 温室气体排放统计管理办法 》 ), Management Regulations on the Development of the Company's Voluntary Emission Reduction Projects ( 《 公司自愿减排项目开发管理办法 》 ) and Management Regulations on Performance and Transaction of the Company's Quota ( 《 公司配额履约和交易管理办法 》 ), which provides detailed guidance and regulations of carbon asset management, greenhouse gases' statistics management, voluntary emission reduction projects and carbon asset transactions.

In accordance with central and local governments' requirements on carbon emissions, our various regional companies are mainly responsible for carbon asset transaction and contract performance, greenhouse gas reporting and budgeting. Led by regional companies, 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.

##### 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 2018, the Company's total energy-related direct greenhouse gas emissions amounted to 34,810.51 ten thousand tons of carbon dioxide equivalent, of which the total amounts of coal, natural gas and fuel consumption were 33,674.61 ten thousand tons, 902.45 ten thousand tons and 10.13 ten thousand tons of carbon dioxide equivalent respectively and the total volume of greenhouse gas emission generated by desulphurisation was 223.32 ten thousand tons of carbon dioxide equivalent. This translates into a direct greenhouse gas emission intensity of 730.02 grams of carbon dioxide equivalent/kWh. The Company's energy-related indirect greenhouse gas emissions amounted to 11.91 ten thousand tons of carbon dioxide equivalent, which translates into an indirect greenhouse gas emission intensity of 0.25 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 communicating with regional branches and grassroots units and taking into consideration actual circumstances and market trends, the Carbon Asset Management conducts carbon asset transaction and contract performance reporting.

##### Performance in Carbon Trade Pilot Regions

Regarding carbon asset transaction and contract performance, the Company's grassroots units in 8 pilot zones (Beijing, Shanghai, Tianjin, Chongqing, Shenzhen, Hubei, Guangdong and Fujian, of which Fujian was newly included as a pilot zone in 2017) appointed Carbon Asset Management to conduct carbon audits, carbon emissions transactions, and allowance and CCER swaps, and 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 2018.

#### Responding to the Start of National Carbon Trading Market

According to the overall work plan of the Ministry of Ecology and Environment, the power industry was among the first batch to enter the national carbon market. Based on our business nature as well as our experience in the pilot markets, we have formulated the following measures to address market access:

On organisational structure, 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 clarify the division of labour and implement responsibility. All grassroots 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.

On carbon audit, in 2018, in accordance with the national carbon market construction work arrangements, the Company's grassroots units completed the carbon accounting and audit work for the two fiscal years 2016 and 2017 specified by the state in cooperation with local carbon transaction lead departments and third-party institutions for accessing the national carbon market.

On policy, to ensure the Company's smooth access to the national carbon market, we are keeping a close eye on policy trends related to national carbon market construction, carbon transaction in pilot zones, voluntary emission reduction scale and offset rules to mitigate the impact brought about by the introduction of the national carbon market. We will also work hard on carbon transaction and contract performance in the pilot zones to reduce costs.

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#### 5.3.4.3 Wastewater Management

In accordance with national and local environmental protection standards and policies, various power plants of Huaneng International considers wastewater treatment one of our key focuses. The Company has established an environmental protection supervision and management system to improve management mechanisms and contingency plans, and impose strict controls on the production, treatment and discharge of sewage with the aim of reducing environmental pollution.

Since a substantial portion of the Company's business involves thermal power generation, we have run a tight ship in industrial wastewater discharges from steam turbine circulating cooling systems and wet desulphurisation facilities. In 2018, the total water discharge of the Company amounted to 17,717.45 million tons, the discharge of open cooling circulation system totalled 17,686.82 million tons, and the total discharge of sewage (including industrial and desulphurisation wastewater) was 30.63 million tons.

The Company rigorously implements the state's water pollution policies and sewage discharge licensing requirements. All thermal power plants of the Company obtained the corresponding sewage discharge licenses as scheduled. Inspection and rectification were carried out against the sewage discharge licensing requirements, a company-level comprehensive sewage treatment plan was formulated based on the various environmental protection requirements to put in place the annual wastewater discharge upgrading and retrofitting projects and launch power plant energy saving and wastewater treatment transformation projects in an orderly manner. The Company also performed on-site checks and inspections of environmental protection facilities, including wastewater treatment units. To optimise water resource utilisation and improve our environmental protection performance, the Company formulated the Guiding Opinions on Water Saving and Wastewater Discharge Transformation for coal-fired power plants to ensure compliance with environmental protection requirements through research and optimisation.

The Company took proactive steps to launch wastewater treatment technology transformation projects. In 2018, the Company initiated comprehensive water saving and wastewater treatment transformation projects for 32 of its power plants, including Qinbei Power Plant and Luoyang Thermal Power Plant, with a total investment of RMB250 million. The Company spared no effort in promoting wastewater treatment technology development and trial projects. For example, Huangtai Power Plant started the RMB18 million bypass flue gas evaporation transformation project for desulphurisation wastewater treatment, and the project entered the commissioning test stage at the end of December 2018. In collaboration with Xi'an Thermal Power Research Institute, and on the basis of our energy saving and wastewater treatment implementation work in recent years as well as the latest technological developments within the industry, we formulated a roadmap and technical guidelines for the energy saving and wastewater comprehensive treatment technology transformation of coal-fired power plants.

#### Future Plan

The Company will continue to strengthen water pollution control and promote the enhanced treatment and comprehensive utilisation of industrial wastewater and domestic sewage, as well as launching wastewater zero discharge and comprehensive utilisation trial projects in areas where specific environmental protection requirements apply.

With the gradual deepening of wastewater treatment work as well as 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 fully comply with the updated pollutant discharge licensing requirements and hopefully meet even higher standards.

Huangtai Power Plant &#8211; Environmental Protection Key Trial Project

The “Unit 10 desulphurisation wastewater bypass flue gas evaporation” project was Company’s most important environmental protection pilot project in 2018. The critical technical data obtained after the completion and operation of the project provided an empirical basis for the Company in seeking zero wastewater discharge through technology. Harmful heavy metal ions are first extracted from desulphurisation wastewater through chemical flocculation and then the wastewater enters the softening and reverse osmosis systems for further concentration and reduction before entering the evaporator where it is totally evaporated by the waste heat of flue gas. With this technique, desulphurisation wastewater zero discharge was achieved. As desulphurisation wastewater is at the lowest level of water cascade use, the success of the project has laid the foundation for zero pollutant discharge. The key equipment of the project has completed the test of smoke ventilation and spraying industrial water, which indicates that this project is currently undergoing the commissioning test.

#### 5.3.4.4 Waste Management

Huaneng International has implemented a stringent waste management system, which requires that the storage, discharge, and disposal of waste comply with national laws and local policies, cooperates with qualified third parties to deal with waste, strengthens waste recycling, and strives to minimize waste emissions.

#### 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 any more, 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

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strictly managed the generation and disposal of waste.

In 2018, the Company in the process of production and operation generated 2,564.66 tons of denitration catalysts, 398.46 tons of ion exchange resin and other hazardous solid waste and 778.04 tons of waste oil and other hazardous liquid waste.

#### 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 4,194.05 ten thousand tons of solid waste, 3,362.57 ten thousand tons of fly ash and cinder, and 831.48 ten thousand tons of desulphurised gypsum during the year of 2018. The rate of comprehensive utilization of fly ash and cinder stood at 89.33% and the rate of utilization of desulphurization gypsum disposal was 87.90%.

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. In accordance with national and local environmental protection standards and policies, the Company has established an environmental protection supervision and management system to effectively control the canning, stacking and marketing of fly ash and cinder and desulfurization gypsum.

When loading fly ash, cinder and gypsum, the Company rigorously follows the operational norm for load control and conducts thorough check and cleaning before entry to prevent "escape, spill over, dripping and leakage". 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 Company will temporarily place the unsold fly ash and cinder on ash storage sites and 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 environmental protection departments, 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 environmental protection standards. In 2018, the Company invested a total of RMB210 million in ash field treatment.

The Company has developed an ash storage field management information system with safety assessment and operation management functions. The establishment of the system represents breakthroughs in ash field dynamic monitoring, mobile application and GPS positioning, and realises ash field drone inspection and safety management enhancement.

#### Changchun Thermal Power Plant 100% Comprehensive Utilisation of Ash

Changchun Thermal Power Plant is located in the north-eastern part of China where the building materials industry is substantially susceptible to the climate. In winter, due to a slump in market demand for ash, the power plant was short on options for the comprehensive utilisation of ash. Living by the motto of "resilience and perseverance" in upholding professionalism at times of hardships, Changchun Thermal Power Plant oriented its business policy towards integrity, reliability, long-term partnerships and key accounts, and practiced flexible pricing strategies based on market conditions to ensure that sales ran smoothly. The power plant also made use of technical means to strengthen sales management and minimise interference by human factors. Through regulated management, the power plant sought to implement stringent controls on the quality of fly ash and rigorously comply with the relevant technical standards in accordance with fly ash comprehensive utilisation regulations and policies, with the aim of tapping into the fly ash markets in the vicinity of Changchun City. With 100% comprehensive utilisation of fly ash becoming a reality, the

power plant has successfully built the image of an eco-friendly enterprise.

### 5.3.5 Noise and Other Environmental Impacts

As a responsible citizen 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

( 《中华人民共和国环境噪声污染防治法》、《中华人民共和国噪声污染防治法》、《中华人民共和国环境噪声污染防治法》、《中华人民共和国环境噪声污染防治法》 ) on Noise Prevention and Control.

#### Noise Management

From the initial stage of construction to the operation period of the power plants, Huaneng International continued to pay attention to noise management to prevent the noise pollution.

On the initial stage of construction, relevant departments of environmental protection determined the sensitive points of noise between plants and the 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 monitoring department will monitor according to the environmental impact assessment approval requirements, and only when the monitoring results are qualified will the acceptance concerning noise pass. During the operation of power units, the power plants, complying with requirements of environmental protection departments, regularly commissioned relevant monitoring departments to monitor and published the reports in various ways.

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 the Liangshuita area. When the power units are undergoing transformation or equipment failure which cause excessive noise, the Company will conduct noise reduction transformations to those noise-excessive equipment, so as to achieve the relevant requirements.

#### Other Impacts

Other environmental pollutants generated by power plants also include unorganised emissions of coal field dust and ash field dust. All

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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 within the standards, and actively responded when the requirements of surrounding environment changed, to ensure that surrounding environment and natural resources are protected.

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

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06

Putting People First

#### and Ensuring Safe Production

Huaneng International regards safety as its own life, tolerates no safety incidents, always adheres to the production safety principles of “life oriented, safety first, prevention first, comprehensive management”, uphold 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 in any case safety in the first place, attaches great importance to safety and occupational health of employees, strengthens bottom line awareness, and effectively implements safe production.

According to the Company’s 13th Five-Year Arrangement for Safety Production, by 2020, the Company and various units regulate the operation of the intrinsic safety system, incorporate outsourcing into the scope of the Company’s management and further enhance training on production safety for comprehensive control of risk management, effective implementation of the responsibility system and prevention of safety accidents and occupational diseases. The target is to achieve zero injury (minor or above), zero (environmental) pollution, and zero (equipment) incident in grassroots unit. Major production safety tasks during the 13th Five-Year 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, pushing ahead with production safety education, strengthening onsite monitoring, promoting the information of safety management and creating a corporate safety culture.

#### 6.1 Establishment of 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.

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The fourfold intrinsic safety system include:

#### 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, establishes 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, normative and procedural documents, as well as operating procedures and other supportive documents.

#### Intrinsic Safety Construction and Improvement

The Company continuously advances the development of intrinsic safety systems, which involves the review and approval of grassroots units’ “intrinsic safety systems” as well as an annual assessment of the operating effectiveness of the approved intrinsic safety systems. On a regular basis in accordance with the safety assessment management measures, the company also organise our various professionals at all levels to carry out comprehensive safety inspections and assessments. In 2018, the Company launched the wind power and hydropower intrinsic safety systems, meaning that the Company’s wind power, hydropower and thermal power business operations are fully covered by the intrinsic safety initiative.

#### 6.2 A Sound Safety Management Mechanism

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 achieve safe production targets.

#### Establishing a Three-Level Safety Supervision System

Huaneng International has set up the Committee of Safety, Occupational Health and Environmental Protection, whose main aims are to adhere to 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&#211; regional companies &#211; production units”. The Company took charge of system design, business strategy, on-site supervision and work assessment, whereas regional companies 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 units were tasked with implement the standards on the Fulfilment of Production Safety Responsibilities ( &#21508;&#32026;&#20154;&#21729;&#23433;&#20840;&#29983;&#29986;&#36012;&#20219;&#21040;&#20301;&#21163; ) ensuring all personnel’s fulfilment of their respective safe production responsibilities.

#### Target Responsibility System Concerning Production Safety

The Company and its subsidiaries apply target responsibility system concerning production safety. Every year the Company’s managements sign a memorandum concerning target responsibility of production safety with principals from subsidiaries, carry out monthly pre-assessment and yearly final assessment, and guarantee the implementation of responsibility at every level. The Company’s target of production safety abides by “one vote veto”, which refers to a quantitative evaluation on production safety performance of each unit with starting score of 100 points. Whenever employees’ injury or death accident, injury accidents of outsourcing personnel for whom the Company is responsible, serious and above equipment accidents for which the Company is responsible, or fire disasters, environmental pollution and devastation accidents happen, 100 points will be deducted.

### 6.3 Implementation of Effective Safety Measures

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

#### Overall Production Safety

In 2018, 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 production safety, carrying out the deployment decisions of the Central Communist Party and the State Council and launching the "Year Plan for Employee Production Safety Responsibilities" in accordance with the Company's annual key work arrangements to strengthen production safety accountability assessment and promote the establishment of a production safety accountability system. A dual prevention mechanism comprising classified risk control and risk investigation was put in place to consolidate the foundation for production safety management and enhance our preparedness to respond to production safety incidents. Our annual production safety targets were met and there were no reports of casualties, fire outbreaks, traffic accidents or equipment

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accidents.

#### Safety Responsibility Assessment and Accountability System Establishment

In accordance with the Opinions of the Central Committee of the Communist Party of China and the State Council on Promoting Reform and Development in the Field of Production Safety

( 20013; 20849; 20013; 22830; 22283; 21209; 38498; 25512; 23433; 20840; 29983; 2998

as well as the Group's "Year Plan for Implementing the Production Safety Accountability System", we formulated detailed guidelines and urged our various units to conscientiously implement production safety responsibilities by focusing their efforts on execution, rectification, risk control, risk investigation, on-site supervision, education and training and emergency response. Based on production safety standards, our various units conducted self-assessments and performed self-rectification work under the supervision of their respective regional companies. The Company organised experts to assess 23 power plants, such as in Dalian, Weihai and Anyuan, with respect to the implementation of their production safety responsibilities. With the adoption of an overarching approach whereby an example would be made of a single incident for educating all power plants and all power plants across the country would be alerted should a single risk occur, problems discovered were reported and escalated in a timely manner and rectification work was monitored and inspected on a continuing basis. Power plants with recurrent problems were "re-inspected" to ensure that accountability percolated through the Company, thus enabling grassroots units to fulfil their production safety responsibilities.

#### 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.

We urged various units 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 piloted classified risk control in Weihai and Yantai Power Plants, and Changchun Thermal Power Plant, further enhancing grassroots units' risk identification, analysis and control capabilities.

We further tightened and improved risk investigation and mitigation standards. In view of the rising number of cases of electric shocks, falls from height, weightlifting injuries, poisoning and suffocation and machinery accidents in recent years, we urged all units to learn lessons and coalesce efforts around the dual prevention mechanism to strengthen risk investigation, risk mitigation and on-site supervision, while standardising the "two-ticket, three-policy" management process for grassroots units.

We performed focused risk investigation for key areas and key procedures. We took a zero tolerance attitude towards non-compliance 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 from happening.

We continued to carry out special treatment projects and special inspections. In 2018, the Company initiated a series of special treatment projects and special inspections, covering dangerous chemicals and major hazards, fuel systems, outsourcing standardised acceptance, metal supervision, flood prevention, fire safety and fall prevention, etc.

We enhanced our emergency response to production safety incidents. In 2018, the Company formulated contingency plans and conducted emergency drills for natural disasters, geological disasters, gas pipeline leaks, liquid ammonia leaks, confined space environments and power outages. The Company organised experts to inspect and guide the natural gas pipeline leak emergency drill in Chongqing Liangjiang Gas Turbine as well as the typhoon emergency drill in Fujian Luoyuan Power Plant, among others. Through emergency drills, contingency plans were examined and thus made scientifically proven, complete and operable, while personnel's on-site emergency response was enhanced alongside their ability to rescue themselves or others. In 2018, during the flood season, more personnel were deployed to keep watch, various precautionary measures were taken, and timely emergency response was put in place to prevent

flooding. Our regional companies in Guangdong, Fujian, Hainan and Zhejiang etc., successfully prevented super typhoon “Mangkhut” from wreaking havoc.

#### Natural Gas Pipeline Leak Emergency Drill

On 7 June 2018, the Company organised experts to take part in the natural gas pipeline leak emergency drill in Huaneng Chongqing Liangjiang Gas Turbine.

As the Group’s only natural gas long-distance pipeline, Liangjiang’s natural gas pipeline was faced with a complicated external environment that threatened its production safety. The drill simulated a gas pipeline break accident caused by third-party construction work that resulted in large natural gas leaks. Upon receiving the alert, the power plant promptly assessed the leakage and activated the highest level of natural gas leak emergency response. Rescue teams were called to the scene and asked to report the latest situation. Under the command of the on-sire control station, a clear division of labour enabled a swift, coordinated and effective response that stopped further natural gas leaks and successfully put the leakage to an end.

This drill was a meaningful experience that further raised safety awareness and enhanced the power plant’s preparedness for emergency response.

#### Jinling Gas Turbine Power Plant “Closing” the Floodgates

In July 2018, Nanjing entered the rainy season. Since Jinling Gas Turbine Power Plant was located close to the Yangtze River, flooding was a real threat. With an emphasis on “safety, preparedness, prevention and rescue”, the power plant planned ahead, specified responsibilities and conscientiously implemented flood prevention work based on the actual circumstances.

In terms of personnel deployment, the power plant focused on preventing floods, pre-empting hazards and responding to disasters to enhance its preparedness, and took pragmatic steps to follow through with flood prevention work. During heavy rain periods, the power plant took the opportunity to organise rescue teams to conduct emergency drills by district, with the aim of continuously optimising flood contingency plans, further strengthening the pre-warning system and ensuring the effectiveness of flood prevention work.

In terms of flood emergency response, first, designated personnel were assigned to provide daily updates on precipitation and the water

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levels of the Yangtze River via the power plant's WeChat group so that all workers could monitor the weather conditions during the flood season and get fully prepared for any imminent floods. Second, river management experts were invited to the power plant to provide special theme training on flood prevention knowledge to create an atmosphere for "full participation in flood prevention work". Third, in low-lying areas, such as the power plant's water pumping station, sandbags were used and more personnel were put on duty for more frequent inspection and emergency prevention.

In terms of supplies, the power plant conducted stocktakes of the spare parts and components of standby auxiliary units and replenished its key auxiliary units in a timely manner. Checks were performed to inquire about flood prevention supplies in various departments and develop a shared understanding of what to prepare. Flood rescue and patrol teams were provided with flashlights, raincoats and rain boots, while main gates were equipped with emergency pumps, shovels and sandbags to guard against possible floods.

#### 6.4 Worker Health and Safety

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 ( 《中华人民共和国劳动法》 ), the Production Safety Law of the People's Republic of China ( 《中华人民共和国安全生产法》 ), 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 units have set up occupational disease prevention organizations to specify and put in place 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 were conducted for employees in the relevant production positions, and an occupational health management database was established.

#### 6.5 Continuous Improvement in Worker Safety Awareness and Practices

##### Safety Training Management Mechanism

Huaneng International's management 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 safety education outline, design of plans, organisation of safety education and training, and sorting well the records and archives of safety trainings. All 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 2018, in view of frequent accidents in recent years, the Company organised sessions of special training on hazardous chemicals, scaffolding, temporary power sources, work ticket standardisation management, and "confined space operations such as in wells". Grassroots units held 4,430 sessions of training, with a total of 181,084 person-times. The Company organised grassroots units to look back on production safety incidents in previous years and compiled 312 pieces of courseware, of which 79 were ranked among the best. As part of the production safety education drive, the Company organised 23 rounds of assessments by job function based on the "one function, one standard" principle, involving a total of 1,567 assesses.

Grassroots Units Training

4,430 sessions

181,084 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 production safety.

Strengthening the Management of Contracted Projects to Ensure Safety

Contractor and contract worker qualifications were subject to close scrutiny and stringent requirements by the Company, and all unqualified contractors and contract workers would be dismissed. The management of contractors had been incorporated into power plants' production management systems based on "four fairness principles" and "four justness principles":

Specified the responsible departments and persons for the management of contractors, enhanced day-to-day management and rejected the idea of "contracting in lieu of management";

Strengthened personnel training and work clearance, rigorously formulated and approved safety measures for special operations, stepped up on-site supervision, especially for special operations, and practiced the "without supervision, no work clearance"

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principle to prevent operations without work tickets and bring contractor safety risks under control; Further unified and coordinated the production safety management of contracted and leased units in non-production areas to ensure their fulfilment of major production safety responsibilities.

#### Enhancing Safety Education and Training for Outsourced Personnel

Based on the requirements of Huaneng 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-to-day 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 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.

8 Four fairness principles: Contractors were subject to the same set of requirements as the Company's internal departments; contractors were managed in the same way as the Company's internal departments; contract workers were subject to the same set of requirements as the Company's employees; and contract workers were managed in the same way as the Company's employees.

9 Four justness principles: Same standards; same requirements; same training; and same rewards and punishments.

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07

Fostering Cohesion  
and Growing Together

7.1 Equal Employment and Equity Protection

The rise of a country relies on talent, and talent is inseparable from the growth of an enterprise. Talent is the driving force for sustainable corporate development. Huaneng International always strives to “maintain long-term, stable and good relationships with its employees”. We are committed to lawful employment and equal employment opportunity, respect and protect the legitimate rights and interests of our employees to make them feel valued and comfortable working with us, and create an environment where everyone can contribute, achieve results, develop careers and succeed.

Equal Employment Opportunity

The Company and its affiliated units strictly abide by the Labour Law of the People’s Republic of China ( 《中华人民共和国劳动法》 ), the Labour Contract Law of the People’s Republic of China ( 《中华人民共和国劳动合同法》 ) and other laws and regulations, adhere to lawful employment and equal employment opportunity, and employ no persons under the age of 16 in accordance with the Provisions on the Prohibition of Use of Child Labour ( 《禁止使用童工规定》 ). Labour contracts are signed for all of our employees. We advocate equal employment policies and oppose forced labour and discrimination based on nationality, race, gender, religion or cultural background. Male and female workers are employed on equal terms and we provide equal protection for all employees.

As at the end of 2018, the Company had a total of 57,970 employees, of whom 77% had received college qualifications or above.

In 2018, no labour dispute arising from breaches of laws and regulations occurred.

Protection of Employee Rights and Interests

Upholding our “people first” principle, the Company has established a comprehensive and robust system for the protection of employees’ basic rights and interests. We strive to be a caring employer 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 ( 《中华人民共和国劳动法》 ) concerning workers’ rights and obligations, the Company has set up a number of social insurances, housing provident funds, annuities and supplementary medical insurances to ensure that employees’ rights are protected in the event of retirement, medical treatment, work injuries, unemployment or having a child. At the same time, we have a set of well-established policies governing employee leave of absence. In 2018, the Company did not have any social insurance violations or defaults.

Compensation System: The Company adopts a performance-linked and turnover-dependent incentive policy whereby an employee’s compensation is commensurate with his or her “position, performance, work efficiency and counterpart”, with a view to establishing a fair and competitive compensation system to attract more talent. An employee’s total compensation includes: the basic salary, bonuses and allowances.

Total Employees 57,970 persons

Percentage of Employees Receiving College Qualifications or above

77%

#### Democratic Management

In early 2018, the Company successfully held the fourth session of the 1st annual employee representatives' conference, in which 263 participants took part, to solicit proposals from employees. A total of 31 proposals were received, of which 3 were classified as "adopted proposals" and 28 were classified as "recommended proposals". All proposals were addressed by the Company, a move that fully mobilised employee representatives to proactively participate in corporation 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.

#### Caring for Employees

Helping those in need is the most direct way to protect employees' interests. In 2018, all the assistance funds totalling RMB4.171 million set aside for 309 financially strapped employees in 2017 reached the hands of those in need. We also conducted surveys to gauge the number of needy employees for 2018.

#### 7.2 Talent Training and Long-Term Development

With the belief that "elites are the forefront important assets" and adhering to the concept of "people first", the Company strongly promoted the talent-driven development strategy by focusing on the retention, nurturing, assessment and compensation of talents, with special emphasis on high-level management talent, talent with deep professional knowledge and high-skilled talent, investing core efforts in competency development mainly for an optimised structure of talents with needed expertise, sound quality, loyalty to the Company to carry out our development strategy.

#### Training System

Taking full advantage of our resources, the Company's training system consists of three levels, namely the headquarters level, the regional branch level and the grassroots unit level. The Company has eight group-level training bases (training classrooms) and three second-tier training bases, and the grassroots units basically have established training centres.

The Company formulates its annual training plan according to its annual key projects and business needs, and has implemented the "Regulations on Team Leader Training" and the "Regulations on Production Worker Training". We also guide our regional companies to formulate their training plans according to their actual needs and require them to provide statistics, analyses and conclusions with respect to their annual training progress.

In 2018, the Company's various departments and units executed the annual training plan. Regional companies and their grassroots units coordinated and organised induction training for new joiners, and carried out various skills training, technical training and on-the-job training to effectively enhance employees' professional and technical competencies.

#### Career Development

The Company places emphasis on establishing a platform for employees' personal growth and providing career paths. The Company's promotion policy is "open, fair, just, performance-driven, dynamic and merit-based", to further cement the dual hierarchical promotion structure 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 attaches great importance to the development of professional and technical personnel, and has established a sound management mechanism to clearly define the professional and technical skills, job responsibilities, terms of service, selection process, exit mechanism and assessment. The Company insists on promoting staff who possess the best qualities, have outstanding performance and are recognized by other employees. Promoted employees are appointed for a fixed period and automatically enjoy the benefits of the position upon completion of the term.

The Company continued to strengthen its leadership and core management. Upholding the spirit of the National Organisational Work Conference, we focus our work on ensuring our leadership and core management's fulfilment of their political obligations and their responsibilities for a new era, fostering tolerance and giving the opportunity to right a wrong, encouraging our core members to take responsibility and contribute, providing institutional safeguards for selecting competent core members to address the needs of a new era, and making the work of managing our core members more standardised and scientific.

In 2018, the Company organised a series of training to enhance the overall quality and management competency of our core team members, improve talent mobility and optimise the utilisation of human resources.

In collaboration with Dalian Business Executives Academy, the Company organised a leadership skills enhancement special training workshop attended by 64 major persons in charge from grassroots units.

42 core leadership members from regional companies were selected to participate in a business executives selected training project of Dalian Business Executives Academy, and 78 of the Company's core leadership members were selected to attend training at the Party School of the Central Committee of the CPC, China Executive Leadership Academy Pudong, the Party School of Huaneng and the Hong Kong Polytechnic University, etc., aimed at equipping them for the effective discharge of their duties.

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We further enhanced the nurturing of our young core team members through interviews, visits and research, and conducted surveys on some of our regional companies to understand how they nurtured young people. We also provided additional training for core members holding key positions and stepped up efforts in the selection of young people to join the Company's core teams.

In the future, the Company will further enhance talent development, increase efforts in education and training and provide avenues and platforms for employees' career development. Ultimately, we hope to grow and develop hand in hand with our employees.

### 7.3 A Healthy Work-Life Balance

To create an atmosphere of "happy work, happy life", in 2018, the Company organised a variety of leisure and cultural activities and health talks, which helped enrich employees' lives.

To foster synergy and team spirit among our employees as well as encourage them to take good care of their physical and mental health, in 2018, the Company organised a series of activities ranging from spring jogging, autumn jogging, planting, autumn expedition, "International Women's Day" celebration and Spring Festival fun sport games, tennis and table tennis matches, among others. Through these activities, we hope that employees can stay physically and mentally strong working with the Company for a better future.

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## 08 Serving Society

for a Win-Win Situation

### 8.1 Building a Sustainable Supply Chain

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.

In 2018, compliance with laws and regulations and high efficiency, the Company published the Supplier Management Measures ( ) and other policies, which classify suppliers into three main categories, namely materials suppliers, services suppliers and engineering suppliers, and according to the principle of "hierarchical management", the Company further divide them into regional company-level suppliers and grassroots unit-level suppliers. The Company's supplier management approach emphasises the importance of classification, rigorous acceptance control, quantitative assessment and dynamic maintenance. Regional companies and grassroots units maintain their suppliers separately in terms of supplier acceptance, daily management, supplier assessment and etc., and are required to file their supplier information with the Company.

### 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 and identify more quality suppliers.

### Supplier Acceptance

The Company's various units 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 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

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Supplier assessment is based on the “user assesses” principle. The Company’s various 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. To further regulate fuel procurement in terms of procurement channels and methods, the Company formulated the Huaneng Power International Fuel Supplier Management Measures

( 33775;33021;22283;38555;38651;21147;32929;20221;26377;38480;20844;21496;# which specify the classifications of suppliers as well as their corresponding management measures. 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, 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 fuel supplier monitoring and management, the Company assesses 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 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 Good and Stable Client Relationships

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.

#### Maintaining a Tradition of Harmonious and Stable Relationships with Clients

Currently, Huaneng International’s clients are mainly power grid companies, which account for the purchase and sale of most of the power generated and are responsible for settlement. The Company has maintained a long-term and

friendly partnering relationship with power grid companies. Since the power consumption of clients is not affected, no complaint from end users has been received.

#### Expanding the Client Base

With the deepening of the power system reform, The Company is determined to strive for reform and solicit new corporate clients and retain existing clients, while learning international cutting-edge electricity retailing experience to develop new end users and build our capacity in meeting clients' needs.

#### Developing Direct Heat Supply Business

The Company earnestly seeks to develop direct heat supply business through construction, acquisition and holding to establish connectivity between "heat sources, pipelines and clients" with a view to extending the heat supply industry chain, increasing the Company's market share and enhancing our comprehensive 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 precision poverty alleviation called for by the state, supporting community infrastructure construction, fulfilling our social responsibilities and fostering social harmony.

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#### 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.

#### 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 local government requirements, and based on the actual circumstances, Huaneng International formulated the Management Measures for Donations ( 《 捐赠管理办法 》 ), which provide guidelines for regional companies and grassroots units to carry out poverty alleviation work and manage donations in a “lawful, practicable, honest, transparent and targeted” manner.

In 2018, the Company Made a Donation of RMB 19.8602 million

#### Qinbei Power Plant Launched Assistance and Facilitation Joint Action<sup>10</sup>

In November 2018, Qinbei Power Plant organised “Assistance and Facilitation Joint Action” activities in Linshan Village and Tanzhuang Village in Wangwu Town, including visits to poor families and students, donations of clothing and study supplies as well as financial assistance. Qinbei Power Plant donated RMB980,000 to the villages in August 2017 and has applied for RMB810,000 of poverty alleviation funds for infrastructure construction in 2018. These efforts attested to the initiative's progress in helping the two villages shake off poverty.

10 “Assistance and Facilitation Joint Action”: Assistance for consolidating the work of Party building and addressing the problems faced by villagers; and facilitation of Party building and economic and social development in rural areas

#### Yangluo Power Plant's Precision Poverty Alleviation Work

Huaneng Hubei regional company undertook the poverty alleviation work for 15 households in Shiziyuan Village and mobilised its core members to form a poverty alleviation team. Persons and departments responsible for poverty alleviation were specified, and poverty alleviation plans and measures were formulated to ensure that precision poverty alleviation work was put in place. Since October 2015, we have invested RMB400,000 specifically in road construction and tap water supply in the village.

#### (Luoyuan) Port Company's Poverty Alleviation Work

On 18 October 2018, teams from Huaneng (Luoyuan) Port Company came to Xinge Village, a designated beneficiary of the Company's poverty alleviation project, to take part in the hardening work commencement ceremony for the village's 6-kilometre trunk road. Port Company brought daily living supplies to the financially strapped Party members and encouraged them to work together to alleviate poverty. Port Company also donated RMB1 million and some books on Party building to help transform village life and further educate Party members on Party directions, approaches and policies in an effort to facilitate the recruitment of new blood.

09 Going Global

and Powering the World

In 2008, Huaneng International 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, which Tuas Power owns and operates two plants, Tuas Power Station and Tembusu Multi-Utilities Complex (TMUC).

As of 31 December 2018,  
the Total Market Share of Tuas Power in Power Generation Market was  
21.1%

Tuas Power Station has been providing safe, reliable and efficient electricity supply to Singapore since 1999. The Station has five Combined Cycle Power (CCP) plants and a steam plant that contributes to the country’s energy demands at a high reliability performance record 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.

Going beyond energy, the company enlarged its operations to cover multi-utility, environmental, oil terminals and storage services &#8211; all of which harness leading-edge technologies and world-class practices to power today’s industries.

Tuas Power emphasizes 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 system of Tuas Power for the management and planning of its environment, occupational health and safety has been certified by OHSAS 18001 (Occupational Health and Safety Assessment Series) certification and ISO 14001 (Environmental Management System) certification, both Tuas Power Station and TMUC. While ensuring that laws and regulations are complied with, these certifications can also help to identify and scrutinise 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 2018, Tuas Power has had no reportable environment-related incidents. Tuas Power will continue to enhance environmental and safety.

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% and the less efficient oil-fired unit is now on standby mode.

Between July and August 2018, Tuas Power performed an energy audit of the existing air-conditioning system of the power station building where its natural gas combined cycle power units were located. The energy audit assessed the current cooling load of the building and whether energy efficiency could be enhanced by using absorption chillers. Absorption chillers are able to recover waste heat from the operating units to provide energy for cooling. The energy audit showed that using absorption chillers to recover waste heat for power generation could increase energy efficiency by about 50%. Tuas Power plans to study the implementation of heat recovery systems and absorption chillers in 2019. It also plans to further equip its employees for performance monitoring and analysis through exchange and experience sharing with Huaneng Group's domestic power plants and obtain the ISO 50001 energy management systems certification for energy saving improvement by the end of 2019.

“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.”

&#8211;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.”

&#8211; Comments made by Zijian Liang, the Director of Energy and Chemical Industry Department of the Economic Development Board of Singapore.

#### Energy Conservation Efforts at TMUC

TMUC continued to step up energy saving work through seawater intake pump optimisation, load distribution optimisation for steam turbine generators (STD) and LED retrofitting for the area of circulating fluidised bed (CFB) boilers.

The optimization of seawater intake pumps are being carried out by gradually reducing its speed to an optimum operating level without comprising plant reliability. An annual saving of 882 MWh has been achieved from this initial action. The optimization of load distribution for STGs has gained an annual savings of 3,790 MWh. Fluorescent lightings at the CFB boiler areas are replaced with energy savings LED lightings. This project has an annual saving of 135 MWh. These three projects were submitted as part of the mandatory annual submission to National Environmental Agency (NEA) under the Energy Conservation Act (ECA).

To demonstrate the corporate's commitment in continuous effort to conserve energy and to comply with local regulatory requirements, TMUC obtained the ISO 50001 (energy management systems) certification in November 2018.

#### Emission Management

##### Greenhouse Gas Management

With the installation of 5 CCP plants, 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 Kernel 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 footprint and will lower the carbon tax TMUC has to bear when carbon tax implements in 2019.

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 2018, apart from the statutory two-day run for testing the safety valves of oil-fired boilers, oil-fired power units of Tuas Power Plant were discontinued and only natural gas combined cycle power units were in operation throughout the year. As a result, there were no sulphur dioxide emissions from the power plant.

TMUC reduces NO<sub>x</sub> and SO<sub>2</sub> 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<sub>x</sub> and low SO<sub>2</sub> emission. SO<sub>2</sub> 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" ( [20445;35703;21644; 29702;27861;26696](#) ).

#### Ash Recycling and Utilization

In Singapore, the landfill of the ash generated in industrial process is prohibited. Now TMUC has achieved 100% comprehensive

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utilization of ash by cooperating with local building materials company, EnGro.

Tuas Power had initially conducted 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 developed by EnGro finally got approval from local authorities, the Building and Construction Authority (BCA) and the National Environmental Agency (NEA), which is mandatory regulatory requirement for the TMUC project.

In 2016, TMUC manage to collaborate with EnGro 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 with EN12620:2008 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.

#### Providing Customers with High-Quality Services

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, Tuas Power has stepped up energy saving and emission reduction efforts since. 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 and recommend improvements in the base design and features of their buildings, and bring value to customers. The lighting solution helps customers achieve significant energy-saving effects through changing simple details, such as using energy efficient lighting system instead of existing traditional lighting systems, so as to reduce energy conception and save costs.

#### 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 employee of Tuas Power improved this intelligent meter to better meet the needs of local customers.

In handling customer information, Tuas Power enters 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 Co-Construction

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

#### 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 employee 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 electricity market in Singapore, the Company has given many in-depth talks in Shanghai and Beijing to various departments within the Huaneng Group and Huaneng International. Tuas Power has shared the experience of Singapore's electricity 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.

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#### and Beyond 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. Face 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 114 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

Scale of overseas business further expands. International business operating level and overseas business profitability rank among the international leading power generation listed companies.

#### Overall Management

Overall management further develop. To form a scientific and complete modern management system and mechanism, to enhance ability of management innovation, to continuous consummate management mechanism. Performance management, financial management, risk management and other overall managements of the Company and its subsidiaries comprehensively enhance, reach the standard of international leading power generation listed companies.

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#### Talent Management

To build an international leading talent team with 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 internal 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, achieved a steady growth of operation performance.

#### Party Building

Study in-depth the spirit of a series of significant speeches of General Secretary Xi Jinping, follow the plan of Huaneng Group's party group and further implement the overall requirements of the CCP Party Central Committee to comprehensively govern the party in a strict manner. Comprehensively deepen party building of the Company, and focus on the implementation of three key works, namely, "one post two responsibilities", strengthening the branch party construction, and consolidate and enlarge the achievements of behaviour construction. Strive to achieve "clear targets, implemented responsibilities, specific contents and quantified assessments".

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## Appendix

### 11.1 About this Report

This report is the third “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 will 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 oversea 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 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, 2018 to December 31, 2018, 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 Sustainability Reporting 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

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and Stable Client Relationships

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4.2.3 Protection of Intellectual Property Rights

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&#8211; N/A

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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

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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:

&#12295; good&#8195;&#8195;&#8195;&#8195;&#8195;&#12295;

fair&#8195;&#8195;&#8195;&#8195;&#12295; poor

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

&#12295; good&#8195;&#8195;&#8195;&#8195;&#8195;&#12295;

fair&#8195;&#8195;&#8195;&#8195;&#12295; poor

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

&#12295; good&#8195;&#8195;&#8195;&#8195;&#8195;&#12295;

fair&#8195;&#8195;&#8195;&#8195;&#12295; poor

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

&#12295; good&#8195;&#8195;&#8195;&#8195;&#8195;&#12295;

fair&#8195;&#8195;&#8195;&#8195;&#12295; 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:

SIGNATURE

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the under-signed, thereunto duly authorized.

HUANENG POWER INTERNATIONAL, INC.

By /s/ Huang Chaoquan

Name: Huang Chaoquan

Title: Company Secretary

Date: April 24, 2019