

## INDUSTRY OVERVIEW

*The information and statistics set out in this section and other sections of this document were extracted from the report prepared by Frost & Sullivan, which was commissioned by us, and from various official government publications and other publicly available publications. We engaged Frost & Sullivan to prepare the Frost & Sullivan Report, an independent industry report, in connection with the [REDACTED]. The information from such official and publicly available sources has not been independently verified by us, the Sole Sponsor, [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], any of their respective directors and advisers, or any other persons or parties involved in the [REDACTED], and no representation is given as to its accuracy.*

### SOURCE OF INFORMATION

We have commissioned Frost & Sullivan to analyse and report on the current status of, and forecasts for, China's heat services industry in which we operate. We agreed to pay Frost & Sullivan a fee of RMB2,040,000 for the preparation and use of the Frost & Sullivan Report, which we believe to be consistent with market rates. Unless otherwise indicated, market estimates or forecasts in this section represent Frost & Sullivan's view on the future development of the selected industry in China.

Established in 1961, Frost & Sullivan has conducted industry research and provided market and enterprise strategies, consultancy and training services for several industries, including building and construction, automobile, transportation and logistics, chemical engineering, energy and power systems, environmental protection technologies, electronics, information and telecommunication technologies, and medical and healthcare. In preparing the report, Frost & Sullivan has relied on the statistics and information obtained through primary and secondary research. Primary research includes interviewing industry insiders and recognised third-party industry associations, while secondary research includes reviewing corporate annual reports, databases of relevant official authorities, independent research reports and publications, as well as the exclusive database established by Frost & Sullivan over the past decades.

The forecasts were made by Frost & Sullivan based on certain assumptions which include the following:

- government policies on heat services industry in China will remain unchanged during the forecast period; and
- the heat services industry in China will be continuously growing driven by the continuous growth of urbanisation rate, replacement of traditional coal-fired boilers by clean energy and advances in heating technology.

### OVERVIEW OF THE HEAT SERVICES INDUSTRY IN THE PRC

#### Definition and classification of the heat services

The heat services industry is one of the public utility industries in which heat generated and distributed to heat service customers to meet their requirements for indoor heating in winter. The heat is often obtained from a boiler or cogeneration plant burning traditional fossil fuels such as coal but also increasingly from clean energy sources such as biomass, natural gas, solid waste, geothermal energy and nuclear energy.

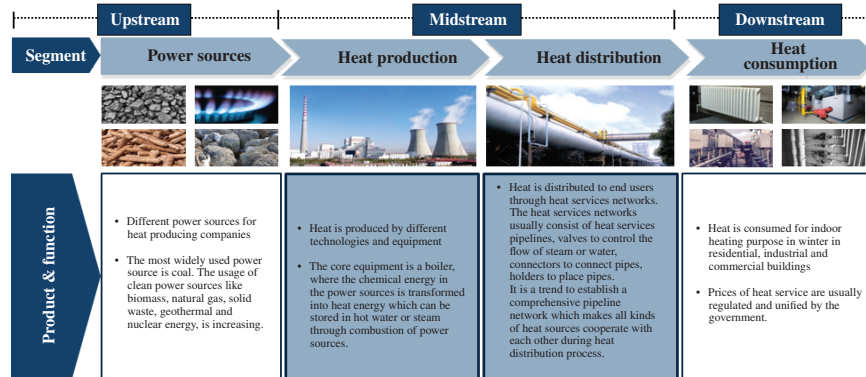
Currently, the PRC heat services industry is mainly located in its northern area, providing indoor heating services for both residential buildings and non-residential buildings, such as commercial buildings and industrial buildings.

#### Value chain of the heat services industry

The value chain of the heat services industry includes supply of power sources, heat production, heat distribution and heat consumption. The heat producers use different power sources to produce heat which can be stored in hot water or steam. Hot water or steam is transported to the heat service customers via heat services networks. Our Group is involved in the heat production and heat distribution processes in the value chain.

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The following chart shows the value chain of the heat services industry in China:



Source: Frost & Sullivan

### Overview of the economic environment in Shanxi Province, Gansu Province, Inner Mongolia Autonomous Region and Henan Province

#### Nominal GDP in Shanxi Province, Gansu Province, Inner Mongolia Autonomous Region and Henan Province

##### Shanxi Province

The nominal GDP of Shanxi Province increased from RMB1.6 trillion in 2018 to RMB2.6 trillion in 2022 due to the successful industrial transformation in the province. The CAGR between 2018 and 2022 is 12.6%. The nominal GDP of Shanxi Province is expected to be further benefited by the continuous industrial transformation in the foreseeable future and increase to RMB3.9 trillion in 2027, representing a CAGR of 8.6% from 2022 to 2027.

##### Gansu Province

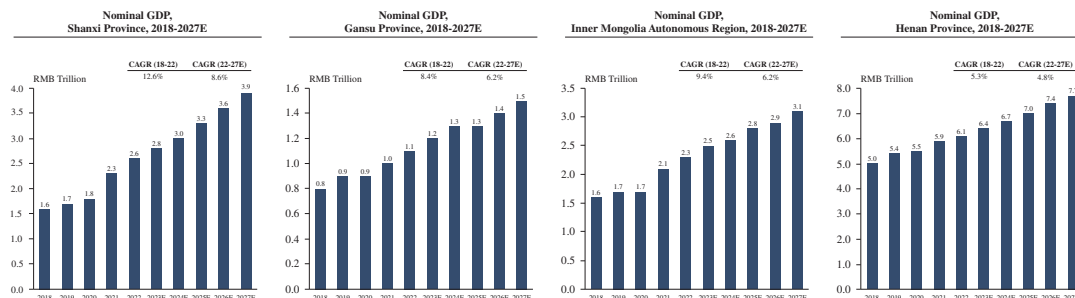
The nominal GDP of Gansu Province increased from RMB0.8 trillion in 2018 to RMB1.1 trillion in 2022 with a CAGR of 8.4%. Influenced by the development of the land-sea corridor (陸海通道) in western China, the economic growth of Gansu Province has speeded up and the nominal GDP of Gansu Province is expected to increase to RMB1.5 trillion in 2027, representing a CAGR of 6.2% from 2022 to 2027.

##### Inner Mongolia Autonomous Region

The nominal GDP of Inner Mongolia Autonomous Region increased from RMB1.6 trillion in 2018 to RMB2.3 trillion in 2022. In 2020, the COVID-19 pandemic had severe impacts on Inner Mongolia Autonomous Region and its nominal GDP increased only by 0.9%, from RMB1.721 trillion in 2019 to RMB1.736 trillion in 2020. In 2021, the nominal GDP of Inner Mongolia Autonomous Region increased to RMB2.1 trillion, which further increased to RMB2.3 trillion in 2022, mainly driven by the economic recovery after pandemic and high coal price since Inner Mongolia Autonomous Region is one of the major coal production provinces in China. The nominal GDP of Inner Mongolia Autonomous Region is expected to further increase to RMB3.1 trillion in 2027, representing a CAGR of 6.2% from 2022 to 2027.

##### Henan Province

The nominal GDP of Henan Province increased from RMB5.0 trillion in 2018 to RMB6.1 trillion in 2022 with a CAGR of 5.3%. Driven by the industrial development, the economic growth of Henan Province has continued and the nominal GDP of Henan Province is expected to increase further to RMB7.7 trillion in 2027, representing a CAGR of 4.8% from 2022 to 2027.



Sources: National Bureau of Statistics and Frost & Sullivan

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### ***Population and urbanisation rate in Shanxi Province, Gansu Province, Inner Mongolia Autonomous Region and Henan Province***

Northern regions of China, especially the "Three North" region covering most of the northern part of China, have high demand for heat services. Our Company's business mainly operates in the "Three North" region, which accounted for approximately 26% of the population of China in 2022.

#### *Shanxi Province*

Although the total population of Shanxi Province decreased from 35.0 million in 2018 to 34.7 million in 2022 and is expected to decrease further to 34.5 million in 2027, the urbanisation rate of Shanxi Province reached 64.9% with total urban population of 22.5 million in 2022. In 2027, the urbanisation rate is anticipated to reach approximately 71.4% with total urban population of 24.6 million.

In order to optimise and upgrade the industrial structure and accelerate the transformation of the resource-based economy in Shanxi, Shanxi Transformation and Comprehensive Reform Demonstration Zone was established in November 2016. It has a total planning area of approximately 589 km<sup>2</sup> in Taiyuan and Jinzhong cities and is divided into three areas comprising (i) Xiaohe Industrial Park in the south; (ii) Integrated Industrial Area in the central region; and (iii) Yanggu Industrial Park in the north:

- (i) Xiaohe Industrial Park covers a total area of 343 km<sup>2</sup> and is the core part of the Shanxi Transformation and Comprehensive Reform Demonstration Zone. The first phase of Xiaohe Industrial Park with a total area of 100.7 km<sup>2</sup> is being developed at present, which can be divided to Taiyuan region and Jinzhong region. Taiyuan region covers an area of 57.3 km<sup>2</sup>, and is expected to have a population of around 300,000 in 2030. Taiyuan region takes back-pressure CHP units as its basic heat source, and develops various types of renewable energy and clean energy heat supply methods including geothermal energy, air source heat pumps, and distributed gas CCHP. Jinzhong region covers an area of 43.4 km<sup>2</sup>, in which the planned population will be 90,000 in 2030. The heat sources of Jinzhong region are mainly thermal power plants, supplemented by renewable energy and clean energy, including geothermal energy, ground source heat pump, air source heat pump and sewage source heat pumps.
- (ii) Integrated Industrial Area covers a total area of 142 km<sup>2</sup> which includes five industrial parks, one comprehensive bonded zone and one science and technology innovation town. The development of Integrated Industrial Area mainly focuses on big data, internet of things, electronic information, cross-border e-commerce, high-end manufacturing, bio-technology and technical research and development.
- (iii) Yanggu Industrial Park covers a total area of 104 km<sup>2</sup>. The development of Yanggu Industrial Park mainly focuses on new material, new energy, high-end manufacturing, bio-technology, energy conservation and environmental protection. The planned population will be 220,000 in 2025. The heat sources of Yanggu Industrial Park are mainly from thermal power plants, supplemented by renewable energy and clean energy.

The nominal GDP of Shanxi Transformation and Comprehensive Reform Demonstration Zone increased from RMB41.7 billion in 2017 to around RMB86.2 billion in 2021, representing a CAGR of 14.4%.

#### *Gansu Province*

Although the total population of Gansu Province decreased from 25.2 million in 2018 to 25.0 million in 2022 and is expected to decrease further to 24.7 million in 2027, the urbanisation rate of Gansu Province reached 54.4% with total urban population of 13.6 million in 2022. According to the 14th five-year plan outline of Gansu Province, the urbanisation rate is expected to increase by around 8% between 2021 and 2025. In 2027, the urbanisation rate will increase to approximately 58.3% with total urban population of 14.4 million. In order to promote the economic development of western regions in China and support the Great Western Development Strategy (西部大開發戰略), Lanzhou New Area (蘭州新區) was established in 2012 in the middle of Lanzhou, Xining and Yinchuan. It was the first national level new area in the northwest part of China. It is an important national industrial base and an important strategic area for the overall development of western China. The nominal GDP of Lanzhou New Area increased from RMB20.5 billion in 2018 to RMB35.6 billion in 2022, representing a CAGR of 14.8%. The nominal GDP of Lanzhou New Area is expected to further increase to RMB69.9 billion in 2027, representing a CAGR of 14.4% from 2022 to 2027. The relatively high CAGR is caused by extensive industrial investment.

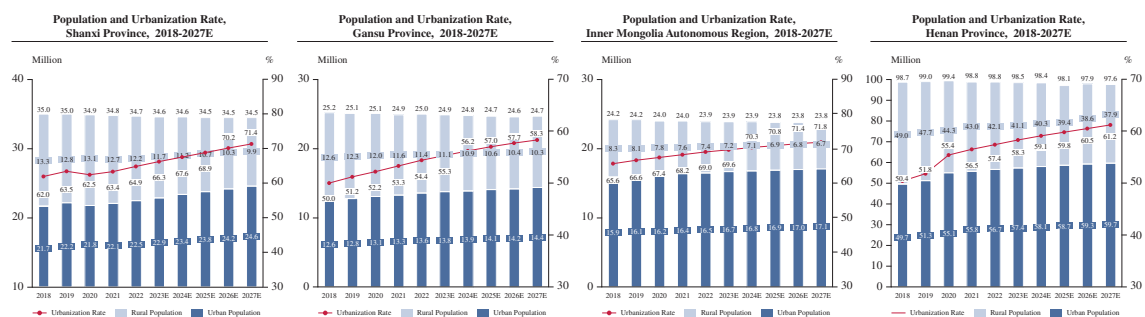
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### Inner Mongolia Autonomous Region

Although the total population of Inner Mongolia Autonomous Region decreased from 24.2 million in 2018 to 23.9 million in 2022 and is expected to decrease further to 23.8 million in 2027, the urbanisation rate of Inner Mongolia Autonomous Region reached 69.0% with total urban population of 16.5 million in 2022 and is expected to continue to grow in the foreseeable future. In 2027, the urbanisation rate is expected to reach approximately 71.8% with total urban population of 17.1 million.

### Henan Province

The total population of Henan Province increased from 98.7 million in 2018 to 98.8 million in 2022 and is expected to further decrease to 97.6 million in 2027. The urbanisation rate of Henan Province reached 57.4% with total urban population of 56.7 million in 2022 and is expected to continue to grow in the foreseeable future. In 2027, the urbanisation rate is expected to reach approximately 61.2% with total urban population of 59.7 million.

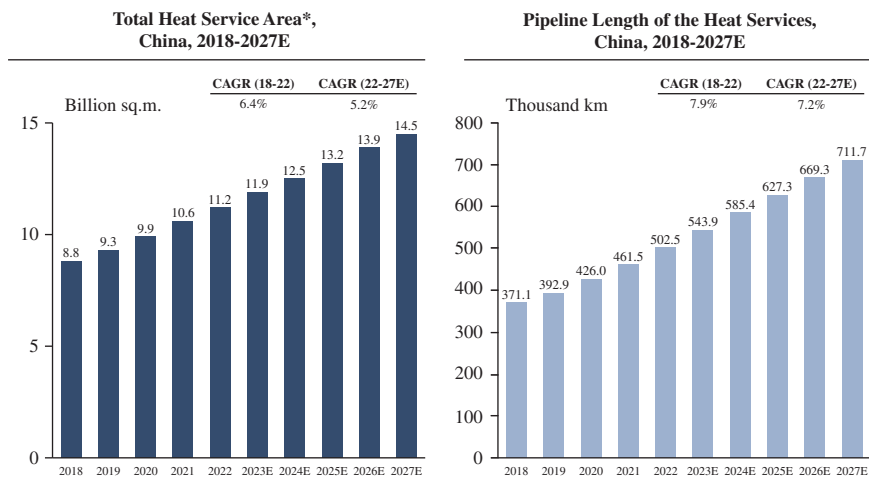


Sources: National Bureau of Statistics and Frost & Sullivan

## ANALYSIS OF THE HEAT SERVICES INDUSTRY IN THE PRC

### Heat services industry in China

To meet the increasing demand for the heat services, which mainly results from the rapid growth in urbanisation rate and the increasing penetration of the heat services in China, total area and pipeline length of the heat services in China rose significantly during the last few years. Total heat services area in China increased from 8.8 billion sq.m. in 2018 to 11.2 billion sq.m. in 2022, with a CAGR of 6.4%. Total heat services area in China is expected to increase to 14.5 billion sq.m. in 2027, with a CAGR of 5.2% from 2022 to 2027. Correspondingly, pipeline length of the heat services in China, which includes both primary and secondary pipelines, increased from 371,100 km in 2018 to 502,500 km in 2022, with a CAGR of 7.9%. It is expected to increase to 711,700 km in 2027, with a CAGR of 7.2% from 2022 to 2027.



Note: Some historical data have been updated according to the latest published official data in this section, other related indicators will be adjusted synchronously, if applicable.

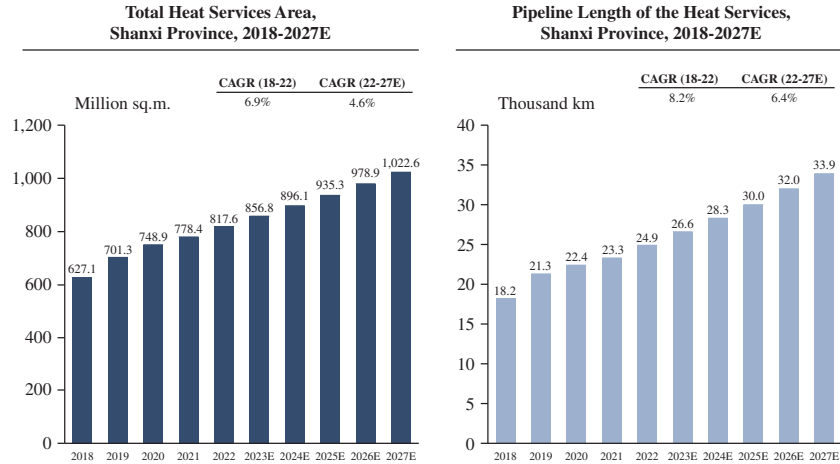
Sources: National Bureau of Statistics and Frost & Sullivan

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### Heat services industry in Shanxi Province

The total heat service area in Shanxi Province increased from 627.1 million sq.m. in 2018 to 817.6 million sq.m. in 2022, with a CAGR of 6.9%. The total heat services area in Shanxi Province accounted for 7.3% of China’s heat services area in 2022. Correspondingly, pipeline length of the heat services in Shanxi Province increased from 18,200 km in 2018 to 24,900 km in 2022, with a CAGR of 8.2%.

The Shanxi government supports the development of clean heating by encouraging the use of the diversified heating sources such as CHP, natural gas, electricity and solar power. The total heat services area in Shanxi Province is expected to increase to 1,022.6 million sq.m. in 2027, with a CAGR of 4.6% from 2022 to 2027. Pipeline length of the heat services in Shanxi Province is expected to increase to 33,900 km in 2027, with a CAGR of 6.4% from 2022 to 2027.

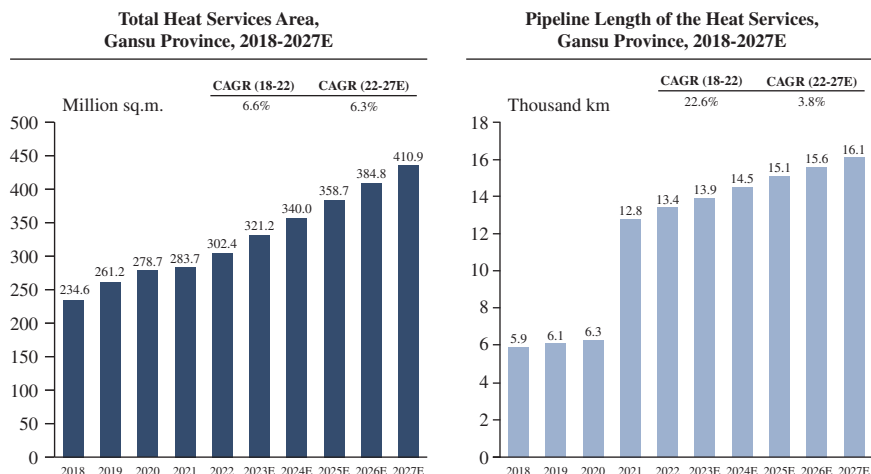


Sources: National Bureau of Statistics and Frost & Sullivan

### Heat services industry in Gansu Province

The total heat services area in Gansu Province increased from 234.6 million sq.m. in 2018 to 302.4 million sq.m. in 2022, with a CAGR of 6.6%. The total heat services area in Gansu Province accounted for 2.7% of China’s heat services area in 2022. Correspondingly, pipeline length of the heat services in Gansu Province increased from 5,900 km in 2018 to 13,400 km in 2022, with a CAGR of 22.6%.

With the support of government policy, Gansu Province has encouraged more private capital to enter into the heat services industry. Driven by resources, technology, private capital and provincial policy, the heat services industry will continue to develop in a sustainable way. The total heat services area in Gansu Province is expected to increase to 410.9 million sq.m. in 2027, with a CAGR of 6.3% from 2022 to 2027. Pipeline length of the heat services in Gansu Province is expected to increase to 16,100 km in 2027, with a CAGR of 3.8% from 2022 to 2027.



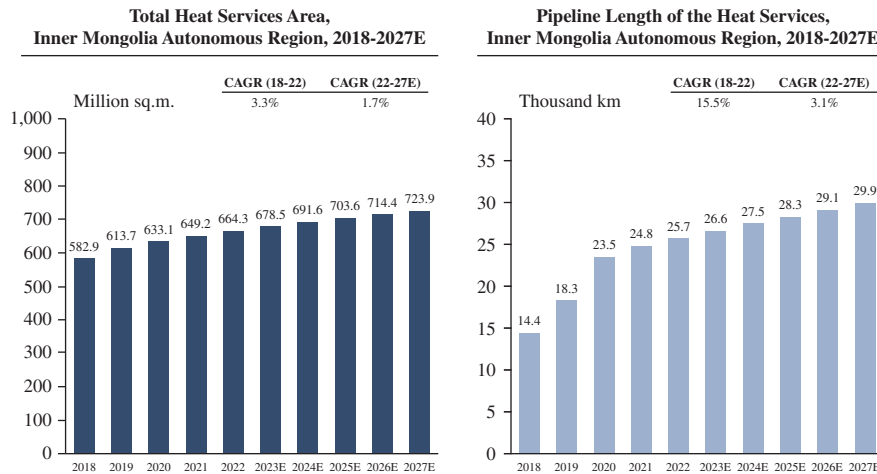
Source: National Bureau of Statistics and Frost & Sullivan

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### **Heat services industry in Inner Mongolia Autonomous Region**

The total heat services area in Inner Mongolia Autonomous Region accounted for 5.9% of China's total heat services area in 2022. The total heat services area in Inner Mongolia Autonomous Region increased from 582.9 million sq.m. in 2018 to 664.3 million sq.m. in 2022, with a CAGR of 3.3%. Correspondingly, pipeline length of the heat services in Inner Mongolia Autonomous Region increased from 14,400 km in 2018 to 25,700 km in 2022, with a CAGR of 15.5%.

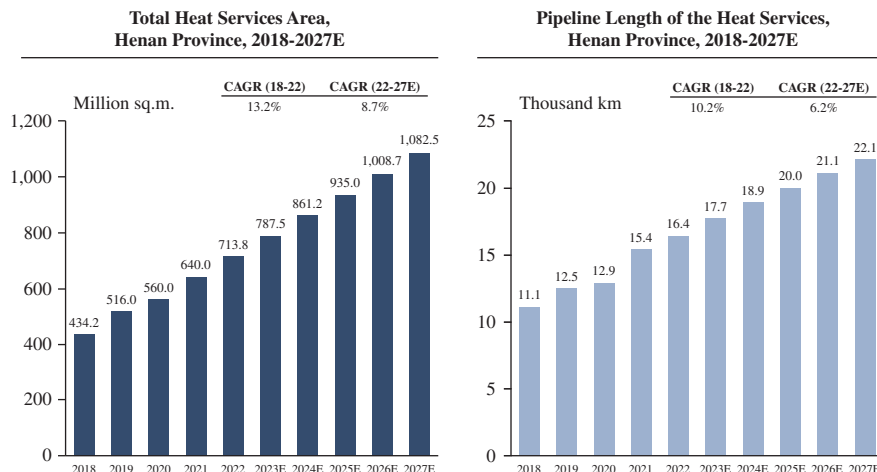
Under the guidance of the policies in Inner Mongolia Autonomous Region, local governments have increased financial investment in the heat services facilities in small and medium-sized cities and counties and encouraged the promotion of new technologies in heat services such as new CHP and energy-saving technologies, which will support the steady growth in the heat services industry in Inner Mongolia Autonomous Region. The total heat services area in Inner Mongolia Autonomous Region is expected to increase to 723.9 million sq.m. in 2027, with a CAGR of 1.7% from 2022 to 2027. Pipeline length of the heat services in Inner Mongolia Autonomous Region is expected to increase to 29,900 km in 2027, with a CAGR of 3.1% from 2022 to 2027.



Sources: National Bureau of Statistics and Frost & Sullivan

### **Heat services industry in Henan Province**

The total heat services area in Henan Province accounted for 6.4% of China's heat services area in 2022. The total heat services area in Henan Province increased from 434.2 million sq.m. in 2018 to 713.8 million sq.m. in 2022, with a CAGR of 13.2%. Correspondingly, pipeline length of the heat services in Henan Province increased from 11,100 km in 2018 to 16,400 km in 2022, with a CAGR of 10.2%. The total heat services area in Henan Province has been increased rapidly in the past five years, stimulated by multiple policies, and the growth rate is expected to remain moderate in foreseeable future. The total heat services area in Henan Province is expected to increase to 1,082.5 million sq.m. in 2027, with a CAGR of 8.7% from 2022 to 2027. Pipeline length of the heat services in Hanan Province is expected to increase to 22,100 km in 2027, with a CAGR of 6.2% from 2022 to 2027.



Sources: National Bureau of Statistics and Frost & Sullivan

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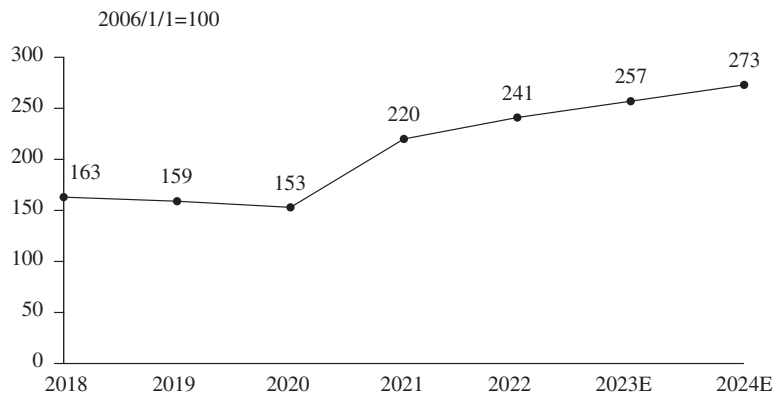
### Coal price and heat services price

#### Coal price in China

Coal price in China was on a decreasing trend from 2018 to 2020. In 2022, coal price index reached 241 which was mainly affected by increased international coal price, insufficient domestic supply and increased in domestic demand. In 2023, coal price index is expected to increase to 257 mainly due to the same reasons. In 2024, coal price is expected to increase to 273.

According to Guiding Opinions on Building a Coal & Heating Price Pass Through Mechanism (《關於建立煤熱價格聯動機制的指導意見》) issued by NDRC and the then Ministry of Construction, when the price of coal changes over certain level, the ex-factory price of heat shall be adjusted accordingly.

Coal Price Index, China, 2018-2024E



Sources: China National Coal Association and Frost & Sullivan

#### Heat services price

The revenue for heat services providers usually includes provision and distribution of heat and the pipeline connection fee.

Generally, heat services price in China is regulated by the local governments and their price bureaux. Heat services prices for residential use and non-residential use may vary from one city to another. The price of residential use is usually lower than that of other uses. Generally, heat services price adjustment shall go through the following procedures: (i) the Local Development and Reform Commission holds the hearing on the heat services price adjustment; (ii) after the hearing, it will submit the final hearing report to the local government; and (iii) according to the general opinion of the hearing, government will make the final plan on the heat services price adjustment and announce the decision publicly.

In order to ensure the stability in the provision of heat services, certain local governments in PRC cities, provinces or regions provide price subsidies to heat services providers in their respective areas in accordance with the Interim Measures. It is not uncommon that such price subsidies are assessed based on pre-determined formulae with reference to heat rates charged and relevant heat service costs. Heat services companies may also receive subsidies from the local governments in various ways, including but not limited to in the form of operation subsidy (including subsidies related to construction and upgrading of heat services facilities), tax subsidy and subsidy for the losses.

Heat services prices were adjusted upwards in the Lanzhou New Area district of Lanzhou, in which the Group was operating, in 2022. The monthly heat services price for residential use in Lanzhou New Area increased from RMB5.00 per sq.m. to RMB5.8 per sq.m.. Similarly, the monthly heat services price for non-residential use in Lanzhou New Area increased from RMB7.0-9.2 per sq.m. to RMB8.0-10.2 per sq.m.. From 2018 to 2022, heat services prices of the majority of the cities in Shanxi Province, Inner Mongolia Autonomous Region and Henan Province, in which the Group was operating, remained unchanged.

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The table below sets out monthly heat rates charged by us on different types of heat service users by project during the Track Record Period:

	Shanxi Province			Gansu Province	Inner Mongolia Autonomous Region
	Taiyuan Project	Shanxi Demonstration Zone Project	Shuozhou Project	Lanzhou New Area Project	Hulunbair Project
RMB per sq.m. per month					
Residential	3.6	3.6	2.52	5.0/5.8	3.5
Non-residential	7.5	7.5	4.8	7.0-9.2/8.0-10.2	4.8

Sources: Bureau of Commodity Prices and Frost & Sullivan

### Heat services industry growth drivers

The key growth drivers for heat services industry in China include the following:

**Continuous growth in urbanisation rate.** The urbanisation rates in Shanxi Province, Gansu Province, Inner Mongolia Autonomous Region and Henan Province kept increasing during the last few years. Heat services industry is a kind of public utility for northern China covering Shanxi Province, Gansu Province, Inner Mongolia Autonomous Region and Henan Province owing to their cold weathers in winter. According to the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and the Long-term Objectives Through the Year 2035 (《國民經濟和社會發展第十四個五年規劃和2035年遠景目標綱要》) issued by the Central Committee and the State Council, it is expected that the urbanisation rate to increase about 5% between 2021 and 2025. Therefore, the increasing population in urban areas creates incremental demand for heat services.

**The growth in demand for high-quality life.** Given the growth in demand for high-quality life for Chinese people, demand for stable and reliable high-quality heat services for residents has increased. There are increasing number of heat services companies adopting new technologies to improve their heat services. Depending on the temperature change, the local government may bring forward the commencement of the heat service period or extend the period to meet the heat service demand from residents.

In recent years, extreme low temperature, frosting and other extreme weather conditions have occurred in southern China. Demand for heat services in southern China is growing in line with the pursuit of high-quality life. At present, Hefei, Nanjing, Hangzhou, Shanghai and other cities along the Yangtze River have taken the lead in providing heat services in some residential areas.

**Replacement of traditional coal-fired boilers by clean energy.** Replacement of traditional coal-fired boilers by accelerating the usage of clean energy from supply side of the industry can strengthen industry standardisation by following the national policy orientation and therefore drives the development of the industry. According to the Plan for Winter Clean Heating in Northern Region (2017-2021) (《北方地區冬季清潔取暖規劃(2017-2021)》), the proportion of clean heat services should be accelerated by using clean energy including gas and electricity as much as possible. Plan for Comprehensive Control of Air Pollution in Autumn and Winter in 2021 to 2022 (《2021-2022年秋冬季大氣污染綜合治理攻堅方案》) published by the Ministry of Ecology and Environment and other government departments as well as local governments in October 2021 requires specific northern cities, including Taiyuan and Shuozhou, in both of which our Group operates, to basically complete the replacement of traditional coal-fired boilers by the end of 2021. In addition, Plan for Modern Energy System in the Fourteenth Five-Year Plan (《“十四五”現代能源體系規劃》) published by NDRC and National Energy Administration has set out the target for basic elimination of the coal-fired boilers under 35T/h in key regions of the air pollution control by 2025.

In Shanxi Province, the provincial government aims to abandon all coal-fired boilers in key urban areas with heating capacity no more than 35 T/h by October 2020, articulated in its 2019 to 2022 action plan on improvement for urban living environment. It has proposed such task after eliminating small-scale coal-fired boilers with heating capacity lower than 10 T/h.

In Gansu Province, the removal of more than 13,000 coal-fired boilers with accumulative 57,000 T/h has been proposed between 2018 and 2021 during the “Three-year Action Plan to Win the Blue Sky Defense War” (《打贏藍天保衛戰三年行動計劃》).

**Advances in heating technology.** Benefiting from advancement in heating technology, the level of efficiency and environmental friendliness of China’s heat services industry have improved in recent years. Shanxi Province, Inner Mongolia Autonomous Region and Gansu



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Province have been promoting the diversification of heat sources, such as biomass, solar thermal energy and geothermal heat, and upgrading heat services networks by utilising intelligent control on the heat services.

According to the National Coal-fired Power Plant Upgrading Implementation Plan (《全國煤電機組改造升級實施方案》), heat services companies are encouraged to develop long-distance heating delivery technology for the purpose of heat services area expansion. In addition, it encourages the condensing power plants (which uses coal to generate power) to be upgraded to combined heat and power (CHP) in order to achieve cleaner and more efficient power plants. Current CHPs in operation are also encouraged to improve the level of efficiency through technological transformation. More than 50 million kW of power plant capacity should be upgraded by the end of 2025. The advancement in heating technology creates momentum for development of the heat services industry.

### Heat services industry restraints

***Increasingly stringent environmental requirements on heat services sector.*** PRC Government is raising up the environmental standards on the heat services sector. Coal-fired heating generation is still heavily relied upon by heat service providers, and a large amount of small coal-fired boilers are regarded as the main sources of air pollutants and are forced to shut down. According to Management Regulations on Combined Heat and Power (《熱電聯產管理辦法》) published by NDRC, certain coal-fired cogeneration plants are required to be equipped with high efficient dust-remover, deNO<sub>x</sub> and desulphurisation equipment to meet strict emission standards. Such actions will increase capital and operating expenses for the heat services companies.

***Limitation on pricing regime of heat services.*** Heat services prices are usually regulated by the local municipal governments and their price bureaux. Under current pricing regime, the change of price is complex and time-consuming. Change in raw material prices may generate pressure on operating costs for companies in heat services industry.

***Difficulty in renovating and serving the old residential communities.*** Renovating and serving the old residential communities which lack high-quality heat services have gradually become an important task for the heat services industry. Issues such as difficulty in site selection for heat exchange stations and slow progress in construction may significantly slow down the pace of development of the industry.

### Heat services industry development trends

***Promotion of CHP.*** Plan for Winter Clean Heating in Northern Region (2017-2021) (《北方地區冬季清潔取暖規劃(2017-2021)》) imposed by NDRC emphasises and promotes the usage of CHP in northern China for heating purpose. CHP shall be implemented to replace those existing coal-fired boilers for heat services.

***Industry consolidation.*** Small-scale heat services companies with low operation efficiency may be squeezed out of the market or be acquired by other companies, including large non-State-owned enterprises with solid industry experience, high operation efficiency, strong technical and financial capabilities. Additionally, to optimise the urban structure, many local governments are promoting the regional concentration of residential and industrial areas by re-zoning residential areas and developing industrial parks. In the circumstances, heat services industry in China has been gradually consolidated.

***Clean heating.*** According to National Bureau of Statistics, clean energy industry mainly contains wind power, solar power, hydro power, nuclear power, efficient utilisation of traditional energy, etc. Currently, a large proportion of energy used in heat services industry comes from coal-fired heat generations in China. China has attached great importance to carbon emission control in recent years and several policies for carbon reduction and environmental protection purposes have been released. For example, according to the Guiding Opinions on Promoting the Industrialisation of Bio-Natural Gas (《關於促進生物天然氣產業化發展的指導意見》) issued by NDRC in 2019, bio-natural gas was encouraged to replace coal for direct heat services usage in order to make contribution to air pollution treatment. In 2020, China announced its plan of achieving carbon peaking by 2030 and achieving carbon neutrality by 2060. In line with the implementation of carbon peaking and carbon neutrality objectives, the PRC Government encourages municipal governments to develop different ways of clean heating according to local conditions and accelerates the replacement of small-scale coal-fired boilers which have higher carbon emission for large-scale coal-fired boilers generating heat using cleaner energy. This promotes the transition from high-carbon emission heat coal-fired generations to low-carbon emission heat generations, and to develop renewable energy sources such as geothermal, industrial waste heat and solar thermal energy, etc. For example, the Guiding Opinions on Accelerating the Development of Green and Low-carbon Circular

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Economic Development System (《關於加快建立健全綠色低碳循環發展經濟體系的指導意見》) issued by the State Council in 2021 encourage counties in Northern regions to develop clean heating through adopting CHP. The Synergistic Implementation Plan on Pollution and Carbon Reduction (《減污降碳協同增效實施方案》) issued by multiple departments in 2022 encourages to develop renewable energy sources for heating purpose with reduced carbon emissions in Northern regions. Given the steadfast determination on achieving carbon peaking and carbon neutrality objectives, it is expected that the promotion of clean heating will continue.

**Opening up of the heat services industry.** China’s heat services industry tends to be more opened-up as a number of supportive policies have been issued by local governments. For instance, Implementation Plan for Optimisation of Heating System and Improvement of Building Energy Efficiency of Urban Clean Heating in Winter in Gansu Province (2017-2021) 《甘肅省冬季清潔取暖城鎮供熱系統優化和建築能效提升實施方案(2017-2021年)》 was issued by Department of Housing and Urban-Rural Development of Gansu Province (甘肅省住房和城鄉建設廳) in 2018 to promote the heat services industry through encouraging capital investment in Gansu Province. Therefore, non-State-owned enterprises will have more opportunities for entering the market. Facing numerous market opportunities, different heat services providers enter the heat services industry by leveraging their own characteristics and advantages. Non-State-owned companies often have advantages including flexible mechanism in corporate management, high business operation efficiency, with emphasis on research and development of new heating technologies, and have strong ability and motivation to conduct cross-provincial operation of heat services business. Moreover, non-State-owned heat services enterprises tend to focus on service quality.

### COMPETITIVE ANALYSIS OF THE HEAT SERVICES INDUSTRY IN THE PRC

The heat services industry in China is fragmented with a large number of market players. Currently, most market players in the heat services industry in China fall into three categories: specialised heat services providers, subsidiaries of power generation groups and property developers. The specialised heat services providers can be further divided into State-owned and non-State-owned companies, and non-State-owned specialised heat services companies are growing due to the flexible operation, advantage in cost control and favourable government policies.

#### Competitive landscape of the heat services industry segment operated by non-State-owned companies in China

The heat services industry in China is highly fragmented. The major players in the heat services industry in China are specialised heat services providers and most of the players are State-owned companies. Total actual heat services area in China was 11,239.4 million sq.m. in 2022. The majority of the top 10 players were State-owned companies. The aggregate heat services area of the top 10 companies accounted for more than 16.0% of the total actual heat services area in the PRC in 2022, with the tenth largest heat services provider having an actual heat services area of more than 100.0 million sq.m..

In this industry, cross-provincial market players are not commonly seen, as high technology advantages and abundant cross-provincial operation experience are required. Total actual heat services area in China operated by non-State-owned companies was 2,371.2 million sq.m. in 2022, accounting for 21.0% of the total actual heat services area in 2022. Our Company ranked fourth with a market share of 1.8% in this market segment in 2022. Meanwhile, our Company was the second largest non-State-owned cross-provincial heat service provider in China in terms of actual heat services area in 2022.

Market share of top non-State-owned companies in the heat services industry (by actual heat services area), China, 2022



## INDUSTRY OVERVIEW

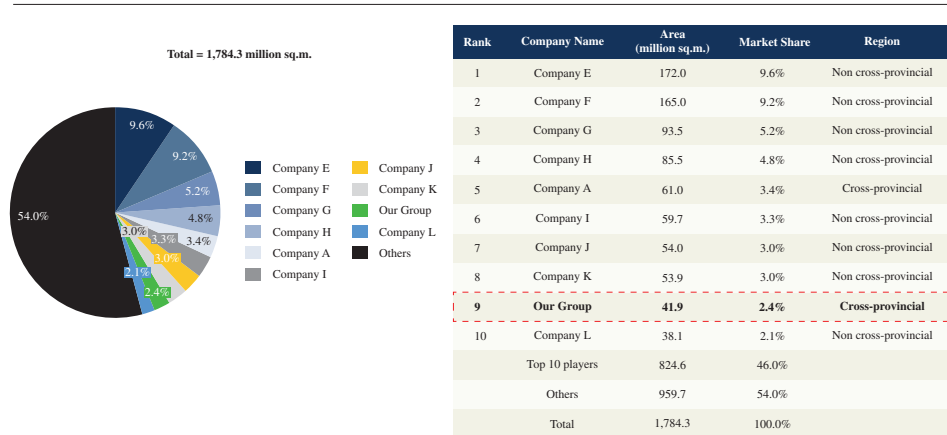
*Sources:* Company reports and Frost & Sullivan

*Note:* Our Group has a heat service project, namely Xinmi Project, in Henan Province which has reached the final stages of preparation to provide heat services. The provision of heat services in Henan Province is expected to commence from the 2023/2024 heat service period in or around November 2023. As such, the actual heat service area of our Company in 2022 does not take into account our Xinmi Project.

### Competitive landscape of the heat services industry segment in Shanxi Province, Gansu Province and Inner Mongolia Autonomous Region

In 2021, the aggregate actual heat services area of Shanxi Province, Gansu Province and Inner Mongolia Autonomous Region accounted for around 21% and 16% of the total actual heat services area in the “Three North” Regions and China, respectively. The heat services industry in Shanxi Province, Gansu Province and Inner Mongolia Autonomous Region is demonstrating a moderate competition, with the top 10 heat services providers in terms of the aggregate actual heat services area of these three areas in 2022 taking up around 46.0% of the market. Most of the players are mainly focusing on providing heat services in their own provinces or cities. For example, our Group operates in one of the six jurisdictions in Shuozhou city of Shanxi Province, and there are heat service providers in the other jurisdictions of Shuozhou city. Our Group was ranked No. 9 in terms of the aggregate actual heat services area of the three areas in 2022 and was the second largest cross-provincial heat services provider in these three areas.

**Market share of top players in the heat services industry (by actual heat services area),  
Shanxi Province, Gansu Province and Inner Mongolia Autonomous Region, 2022**



*Source:* Company reports, Frost & Sullivan

*Note:* Company A is a private non-state own company headquartered in Beijing, and provides heating services using clean energy in provinces such as Hebei, Henan, Gansu.  
 Company B is a private non-state own company headquartered in Tianjin, and provides heating services in Tianjin.  
 Company C is a public non-state own company headquartered in Liaoning Province, and provides heating services in Liaoning and power service.  
 Company D is a public non-state own company headquartered in Beijing, and provides heating services in Beijing and Hebei.  
 Company E is a private state-owned company headquartered in Shanxi Province and provides heating services in Taiyuan Shanxi.  
 Company F is a private state-owned company headquartered in Inner Mongolia and provides heating service in Inner Mongolia and power service.  
 Company G is a private state-owned company headquartered in Shanxi province and provides heating service in Dadong Shanxi.  
 Company H is a private state-owned company headquartered in Inner Mongolia and provides heating service in Hohhot Inner Mongolia.  
 Company I is a private state-owned Company headquartered in Shanxi and provides heating service in Changzhi Shanxi.  
 Company J is a private state-owned company headquartered in Inner Mongolia and provides heating service in Hulunbuir Inner Mongolia.  
 Company K is a private state-owned company headquartered in Gansu and provides heating service in Lanzhou Gansu.  
 Company L is a private state-owned company headquartered in Inner Mongolia and provides heating service in Chifeng Inner Mongolia.

## INDUSTRY OVERVIEW

### Entry barriers of the heat services industry in China

**Qualification barrier.** Heat services is an essential public utility to ensure the living quality of the residents in China. Governments issued strict regulations on the qualification of heat services companies. The qualification of heat services companies is authorised by related departments of provincial or municipal governments. Most of the municipal heating regulations adopted in the cities where our Group operates (e.g. Administrative Measures for Urban Heat Services and Use in Lanzhou New Area (《蘭州新區城市供熱用熱管理辦法》), Hulunbuir Urban Heat Services Administration Measures (Trial) (《呼倫貝爾市城鎮供熱管理辦法(試行)》)) have specified that, heat services entities must have stable and reliable heating resources, professional staff with specialties in heating, sufficient fund and heating facilities that correspond to their heat services scale, and sizeable rescue team, in order to obtain heat services business qualifications and/or concession rights issued by local authorities before being engaged in any heat services business.

**Technology barrier.** According to the Code for Urban Heating Supply Planning (《城市供熱規劃規範 GB51074-2015》), and Design Code for City Heating Network (《城鎮供熱管網設計規範 CJJ 34-2010》) and Code for Urban and Rural Heating Supply Project (《城鄉供熱工程項目規範》) issued by MOHURD, there are technical standards specified for heating load distribution, water pressure and temperature, etc., which shall be met by heat services companies when running heat services business. Such technical standards are aimed to ensure safety during design, construction and operation stage. Moreover, heat services companies are also required to apply advanced technologies in automated monitoring and management of the heating networks, so as to increase standards on environmental friendliness and efficiency for heating networks. It takes time and endeavours for new entrants to meet those technological requirements and be able to compete with the established players.

**Experience barrier.** The heat services companies shall have abundant experiences and capabilities in running heat services business safely and reliably. Heat services companies typically need multiple years' of heating operation to accumulate such experiences and build up their own capabilities, which is hard for new entrants with little or no experience to catch up during short period of time.

**Capital barrier.** The development of heat services projects requires substantial amount of funds to invest in the construction of pipeline networks. The typical initial capital investment required for a heat services project with 1 million sq.m. is between RMB100 million to RMB200 million, making sufficient funds to be a barrier for new entrants in the industry.

### OVERVIEW OF THE ENGINEERING CONSTRUCTION SERVICES INDUSTRY SPECIALISING IN HEAT FACILITIES IN CHINA

#### Overview and competitive landscape of the engineering construction services industry specialising in heat facilities in China

The engineering construction services industry specialising in heat facilities in China is highly fragmented. Generally speaking, most market players in the engineering construction services industry specialising in heat facilities in China fall into two categories: heat services providers and construction companies. Heat services providers construct the heat facilities and then provide heat services to their customers. Construction companies, on the other hand, only construct the heat facilities used for heat services and do not participate in the provision of heat services.

Construction companies usually have more readily available professional labour and the necessary equipment for the construction process and they usually undertake the construction process using their own resources. On the other hand, many heat services providers do not always have sufficient professional labour and the necessary equipment for the construction process. It is not uncommon that heat services providers undertake the construction process through outsourcing.

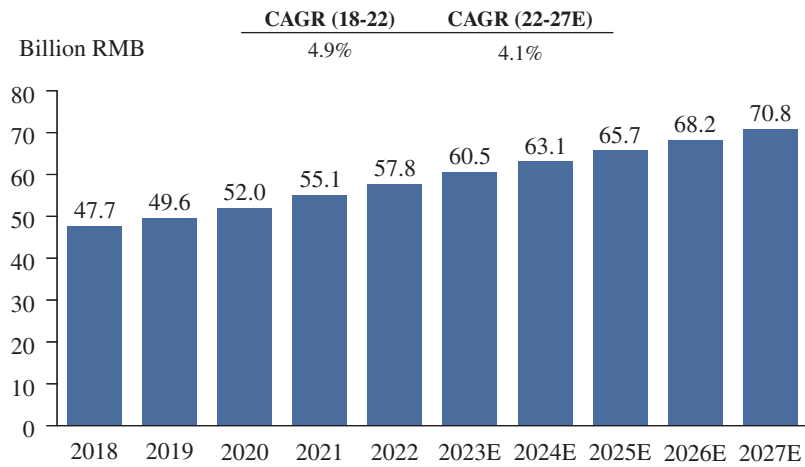
#### Market size of the engineering construction services industry specialising in heat facilities in China

The market size of the engineering construction services industry specialising in heat facilities has experienced rapid growth in 2018 in line with the development of the length of the pipeline for the heat services. The COVID-19 pandemic only affected the industry in China in a limited way and the market size has reached RMB57.8 billion in 2022, representing a CAGR of 4.9% from 2018 to 2022.

In anticipation of the continuous development of heat services market in China, it is expected that the market size of the engineering construction services industry specialising in heat facilities will increase to RMB70.8 billion in 2027, representing a CAGR of 4.1% from 2022 to 2027.

## INDUSTRY OVERVIEW

### Market Size of the Engineering Construction Services Industry Specialising in Heat Facilities, China, 2018-2027E



Source: Frost & Sullivan

### Drivers and development trends of the engineering construction services industry specialising in heat facilities in China

#### *Continuous development of the heat services industry*

China’s engineering construction services industry specialising in heat facilities is closely related to China’s heat services industry. The growth of the heat services industry driven by factors such as urbanisation rate and environmental protection provides the related construction services industry with a large amount of construction demands and therefore has become a driver of that industry. It is expected that the engineering construction services industry specialising in heat facilities will continue to grow in line with the large demands related to existing facility upgrades and new energy-efficient facility construction in order to better achieve the carbon peaking and carbon neutrality goals.

#### *Policy supports*

In pursuit of providing the public with the high-quality living standard, improving the quantity and quality of heating pipelines has become one of the focuses of the government. The Guiding Opinions on Enhancing the Construction of the Urban Underground Municipal Infrastructures (《關於加強城市地下市政基礎設施建設的指導意見》) released by the MOHURD in December 2020 emphasises the renovation and digitalisation of the heating pipeline networks in urban areas in order to eliminate any hidden safety hazards. In addition, the Implementation Plan for Upgrading Aging Urban Gas Pipelines (2022 – 2025) (《城市燃氣管道等老化更新改造實施方案(2022-2025年)》) released by the State Council in June 2022 specified the conditions and requirements of upgrading heating pipelines in urban areas. It is expected that the engineering construction services industry specialising in heat facilities will keep growing in light of the continuous support from the government.

#### *Development of the digital technologies*

Digital technologies (such as Building Information Modeling, or BIM) have been introduced in China’s construction industry for decades with a view to improving efficiency and quality. They have been widely accepted and used in the industry and successfully drove the development of the industry. In line with the continuous development of other digital technologies, such as Geographic Information Systems (or GIS) and UAV Oblique Photography Technologies, the quality and efficiency of engineering construction services has been improved. More and more construction companies, including engineering construction services companies specialising in heat facilities, have accepted and implemented digitalisation transitions in order to enhance their competitive capabilities. The continuous development of the digital technologies has become a significant driver of the industry.

### OVERVIEW OF THE EMC INDUSTRY IN THE PRC

Energy management contract, or EMC, is an energy-conservation service contract under which an energy saving service provider provides energy-conservation service to an energy-consuming enterprise to achieve certain energy saving goals. Under the EMC business model, the energy saving service provider is sometimes entitled to a share of the profit accrued from energy conserved as a result of the energy conservation services provided.

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## INDUSTRY OVERVIEW

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In the PRC, the EMC industry has developed rapidly since the beginning of the "12th Five-Year Plan" (《中華人民共和國國民經濟和社會發展第十二個五年規劃綱要》). In line with the development of the electricity and heat services industries in northern China, an increasing number of energy-related enterprises in this region are opting for EMC services as a way to fulfil their environmental protection objectives. Additionally, with a view to promoting the EMC business, the PRC Government has promulgated a series of regulations and policies which offer preferential tax treatments, interest subsidies and financial rewards for companies meeting energy conservation thresholds. The PRC Government has released the Guidance on Energy Management Contract (《合同能源管理技術通則》) in 2010 for industry regulation purpose. The guidance was revised in 2020 to keep pace with the development of the industry.

EMC projects require initial investments by energy saving service companies regarding energy conservation equipment and machinery installed in the premises of energy-consuming companies. For the purpose of accelerating the development of EMC industry and improving the efficiency of energy utilisation, several policies in financial field have been released and more financial tools are accessible for the industry. In addition, more companies in the industry tend to adopt cutting-edge technologies and provide integrated comprehensive solutions for better energy consumption control and heating costs reduction. Also, in line with the development of electricity and heat services industry, more energy related enterprises in northern regions have chosen to procure EMC services to fulfil their objectives of energy saving and financial results.