



LUOHE GEOTHERMAL BASED SPACE HEATING SYSTEM



Document Prepared by Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

It is pointed out in the *Plan for Clean Heating in Winter in Northern China (2017-2021) (Development and Reform of Energy resources (2017) No. 2100)*¹ that, at present, the proportion of clean heating in northern China is low, especially in some areas, where bulk burning coal is used in winter and air pollutant emissions are high, so it is urgent to promote clean heating. This will have a bearing on the winter warmth of the people in northern China and whether smog can be reduced. It is an important part of the revolution in energy production and consumption and the revolution in rural lifestyles.

According to the requirements of the above Plan, Luohe municipal government will take a series of measures to improve the environment and residents' living conditions. The project activity is designed to introduce geothermal energy-based space heating system to realize heat supply to a series of new residential buildings in Luohe city over winter season, which will displace heat supply from isolated coal-fired boilers as a business-as-usual scenario in the project area.

The project owner is Wanjiang New Energy Group Co. Ltd. It can supply geothermal heat to 8,283 thousand m² of newly built residential buildings with a total heating load of 414.15 MW. The scenario prior to the implementation of the proposed project activity is that heat supplied to the building areas in winter would be provided by isolated coal-fired boilers.

Emission reduction credits will be earned using geothermal energy instead of the combustion of fossil fuel for space heating. The annual average CO₂ emission reductions are estimated as 481,744 tCO₂e, and total GHG emission reductions for the fixed 10 years crediting period are 4,817,400 tCO₂e. The date of crediting period is 01- November-2020 to 31-October-2030.

The actual Emission reductions achieved for the monitoring period was 847,153 tCO₂e. The date of monitoring period is 01-April-2021 to 31-March-2023.

Project timeline for the implementation date of the project is shown in Table 1-1:

Table 1-1 Milestone in the project's implementation

Date	Milestone(s) in the Project's Implementation
01-April-2020	Start date of the project construct
30- September-2020	Project completion date
01- November-2020	The date of project put into operation

¹ <https://www.gov.cn/xinwen/2017-12/20/5248855/files/7ed7d7cda8984ae39a4e9620a4660c7f.pdf>

01- November-2020 to 31-October-2030	Fixed crediting period
01-November-2020 to 31-March-2021	The 1 st monitoring period
01-November-2021 to 31-March-2023	The 2 nd monitoring period

Table 1-2 The audit history of the project

Audit Type	Period	Program	VVB Name	Number of years
Joint validation and 1 st verification	01-November-2020 to 31-March-2021	VCS	Shenzhen CTI International Certification Co., Ltd	0.41 year
2 nd Verification	01-April-2021 to 31-March-2023	VCS	China Certification Center, Inc.	2 years
Total	(01-November-2020 to 31-March-2023)	VCS		2.41 years

1.2 Sectoral Scope and Project Type

The project is not a grouped project, sectoral scope and methodologies are as follows:

Sectoral Scope 1: Energy industries (renewable - / non-renewable sources)

Project Methodology: AM0072 Fossil Fuel Displacement by Geothermal Resources for Space Heating (Version 03.0)

1.3 Project Proponent

Organization name	Wanjiang New Energy Group Co., Ltd.
Contact person	Xiang kang
Title	General Manager
Address	Room 1201, 1202, 1203, 1206, 12 / F, Yizhong Building, No.75 Qilihe South Road, Zhengzhou (East of Zhengzhou), Henan Pilot Free Trade Zone.
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Email	sharkshark999@163.com

1.4 Other Entities Involved in the Project

Organization name	Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.
Role in the Project	VCS Consultant
Contact person	Joanna Zhu
Title	Project Director
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1.5 Project Start Date

As per section 3.8 of VCS Standard (Version 4.4), the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals. The project has been designed to include project activity. There are 10 communities involved in the project activity and all the geothermal space heating system of them started fully commissioning on 01-November-2020. Thus, the project start date is 01-November-2020.

1.6 Project Crediting Period

This project adopts fixed crediting periods of 10 years. The crediting period is 10 years from 01-November-2020 to 31-October-2030 (both days included).

1.7 Project Location

The project is in Luohe City of Henan Province. The geographical coordinates are Longitude east 113°27' to 114°16' and Latitude North 33°24' to 33°59'. The detailed coordinates of the 60 geothermal Wells are provided in Table 1-3 below.

Table 1-3 Coordinates of 60 Geothermal Wells

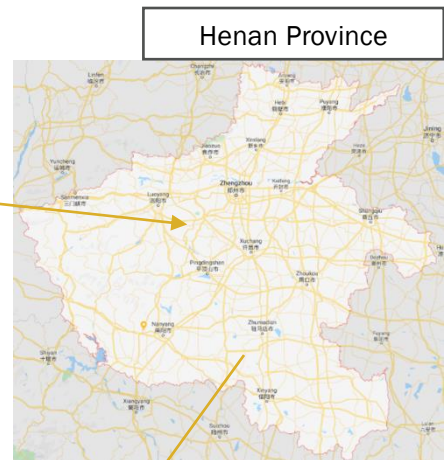
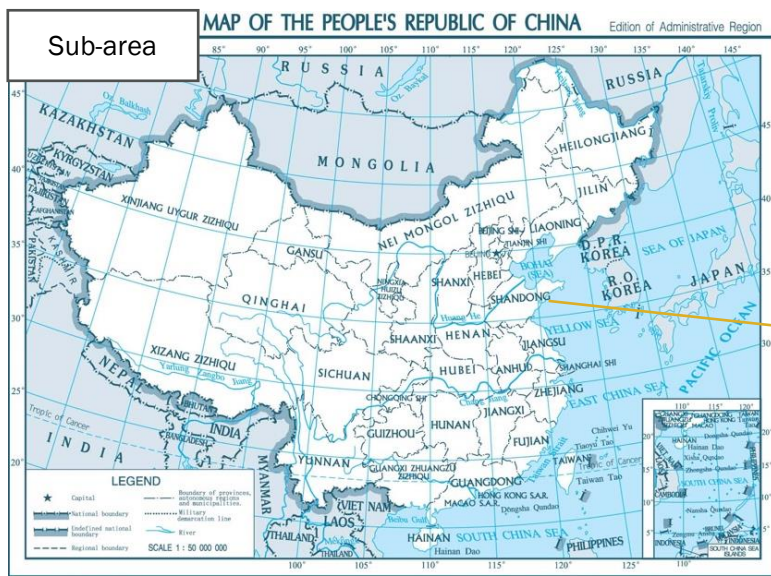
No.	Sub-areas	Heat Substations	Geothermal Wells	Coordinate
1	Binhuoguoji	1#BHGJ 2#BHGJ	1#BHGJ Production Well	33°35'29.2"N 114°03'54.5"E
			2#BHGJ Production Well	33°35'29.5"N 114°03'55.5"E
			1#BHGJ Injection Well	33°35'30.2"N 114°03'57.3"E

		3#BHGJ 4#BHGJ	3#BHGJ Production Well	33°35'27.5"N 114°03'59.4"E
			4#BHGJ Production Well	33°35'26.2"N 114°03'58.6"E
			2#BHGJ Injection Well	33°35'25.4"N 114°03'57.7"E
		5#BHGJ 6#BHGJ	5#BHGJ Production Well	33°35'22.6"N 114°03'56.2"E
			6#BHGJ Production Well	33°35'25.8"N 114°03'55.9"E
			3#BHGJ Injection Well	33°35'26.2"N 114°03'57.5"E
		7#BHGJ 8#BHGJ	7#BHGJ Production Well	33°35'32.4"N 114°03'55.9"E
			8#BHGJ Production Well	33°35'31.4"N 114°03'55.1"E
			4#BHGJ Injection Well	33°35'29.4"N 114°03'55.2"E
		9#BHGJ 10#BHGJ	9#BHGJ Production Well	33°35'26.9"N 114°03'55.5"E
			10#BHGJ Production Well	33°35'25.9"N 114°03'55.7"E
			5#BHGJ Injection Well	33°35'27.7"N 114°03'55.8"E
2	Xiangwanyihao	1#XWYH 2#XWYH	1#XWYH Production Well	33°34'46.6"N 114°03'55.9"E
			2#XWYH Production Well	33°34'45.7"N 114°03'53.6"E
			1#XWYH Injection Well	33°34'44.3"N 114°03'52.5"E
		3#XWYH 4#XWYH	3#XWYH Production Well	33°34'56.4"N 114°03'54.4"E

			4#XWYH Production Well	33°34'55.8"N 114°03'53.0"E
			2#XWYH Injection Well	33°34'53.8"N 114°03'51.4"E
		5#XWYH 6#XWYH	5#XWYH Production Well	33°34'48.3"N 114°03'48.1"E
			6#XWYH Production Well	33°34'47.4"N 114°03'48.1"E
			3#XWYH Injection Well	33°34'48.5"N 114°03'47.1"E
		7#XWYH 8#XWYH	7#XWYH Production Well	33°34'45.4"N 114°03'45.9"E
			8#XWYH Production Well	33°34'45.0"N 114°03'44.8"E
			4#XWYH Injection Well	33°34'44.8"N 114°03'43.8"E
		9#XWYH 10#XWYH	9#XWYH Production Well	33°34'45.9"N 114°03'47.7"E
			10#XWYH Production Well	33°34'45.9"N 114°03'46.1"E
			5#XWYH Injection Well	33°34'45.8"N 114°03'44.6"E
3	Weinisi	1#WNS 2#WNS	1#WNS Production Well	33°34'46.8"N 114°03'35.7"E
			2#WNS Production Well	33°34'46.3"N 114°03'37.4"E
			1#WNS Injection Well	33°34'46.8"N 114°03'35.5"E
4	Yuehugongguan	1#YHGG 2#YHGG	1#YHGG Production Well	33°34'53.0"N 114°02'57.5"E
			2#YHGG Production Well	33°34'52.4"N 114°02'58.6"E

			1#YHGG Injection Well	33°34'53.7"N 114°02'57.7"E
5	Changyuanguoji	1#CYGJ 2#CYGJ 3#CYGJ	1#CYGJ Production Well	33°35'31.5"N 113°57'30.4"E
			2#CYGJ Production Well	33°35'33.7"N 113°57'31.5"E
			3#CYGJ Production Well	33°35'31.4"N 113°57'26.8"E
			1#CYGJ Injection Well	33°35'33.5"N 113°57'29.3"E
6	Lvdicheng	1#LDC 2#LDC 3#LDC	1#LDC Production Well	33°35'28.2"N 113°57'28.6"E
			2#LDC Production Well	33°35'24.8"N 113°57'27.1"E
			3#LDC Production Well	33°35'26.4"N 113°57'25.8"E
			1#LDC Injection Well	33°35'28.4"N 113°57'25.3"E
7	Xixihuayuan	1#XXHY 2#XXHY 3#XXHY	1#XXHY Production Well	33°35'21.3"N 113°57'24.7"E
			2#XXHY Production Well	33°35'17.8"N 113°57'23.3"E
			3#XXHY Production Well	33°35'17.2"N 113°57'19.6"E
			1#XXHY Injection Well	33°35'18.8"N 113°57'17.0"E
8	Jiangshanyin	1#JSY 2#JSY 3#JSY	1#JSY Production Well	33°35'18.2"N 113°58'08.0"E
			2#JSY Production Well	33°35'21.6"N 113°58'06.5"E
			3#JSY Production Well	33°35'23.8"N 113°58'03.6"E

			1#JSY Injection Well	33°35'26.4"N 113°58'00.9"E
9	Jianyeyunxifu	1#JYYXF 2#JYYXF 3#JYYXF	1#JYYXF Production Well	33°35'26.4"N 113°58'00.9"E
			2#JYYXF Production Well	33°35'24.6"N 113°57'42.5"E
			3#JYYXF Production Well	33°35'22.3"N 113°57'41.0"E
			1#JYYXF Injection Well	33°35'25.9"N 113°57'41.5"E
10	Danjiangfu	1#DJF 2#DJF 3#DJF	1#DJF Production Well	33°35'15.7"N 113°57'37.7"E
			2#DJF Production Well	33°35'15.3"N 113°57'39.5"E
			3#DJF Production Well	33°35'17.6"N 113°57'40.8"E
			1#DJF Injection Well	33°35'15.7"N 113°57'36.9"E



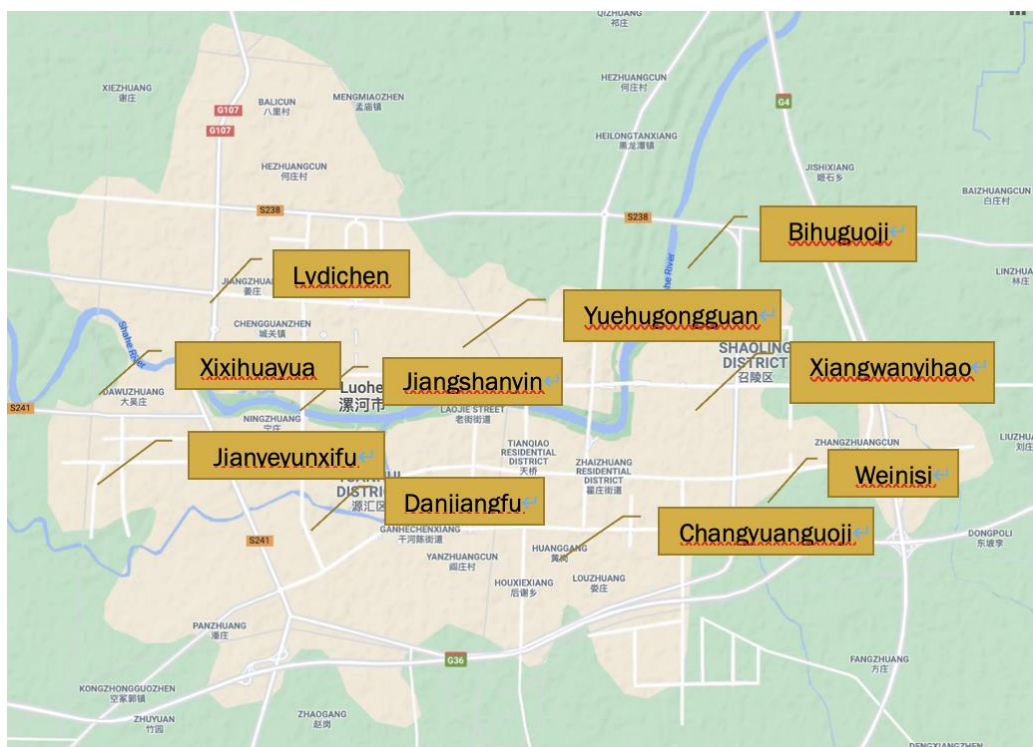


Figure 1-2 Location of the Project

1.8 Title and Reference of Methodology

Approved baseline and monitoring methodology: AM0072 Fossil Fuel Displacement by Geothermal Resources for Space Heating (Version 03.0).

Tool applied:

Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)²

Tool 05 Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)³

Tool 07 Tool to calculate the emission factor for an electricity system (Version 07.0)⁴

Tool 24 Common practice (Version 03.1)⁵

² <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf>

³ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf>

⁴ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

⁵ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-24-v1.pdf>

1.9 Participation under other GHG Programs

The project has neither been registered nor seeking registration under any other GHG programs. The project is participating only in VCS program.

1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

Emission Trading Programs and Other Binding Limits

The project proponent is not part of any emission trading program. The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading. There is a cap & trade scheme in China. However, China's national emissions trading scheme (ETS), which is at its very early stage, only includes 2,225 fossil fuel-fired power plants in the power sector⁶, and the project proponent is not included in the list. China's ETS is expected to include all companies with annual GHG emissions greater than 26,000 tCO_{2e} in eight emission-intensive industries including power generation, petrochemicals, chemicals, building materials, non-ferrous metals, papermaking, steel and aviation⁷. The industry of the project participant is agriculture, not the industry mentioned above according to the business license. There are no any mandatory regulations on GHG emission cap for the industry of agriculture as per the "Interim Measures for Carbon Emissions Trading Management" issued by NDRC December of 2014⁸ and the "Management Measures for Carbon Emissions Trading (Trial)" issued by the Ministry of Ecology and Environment in December of 2020⁹. Therefore, it will not be included in the national ETS. No emission cap will be enforced on the project proponent, nor can it participate in carbon transactions in the national ETS. Therefore, the net GHG emission reductions from the Project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions.

In addition, the project owner had signed the Declaration of No Double Counting Statement and Declaration of not involved in other GHG scheme to ensure that the project will not apply for emission reduction credits or labels under any other schemes other than VCS.

Other Forms of Environmental Credit

The project hasn't sought or received another form of environmental credits.

Supply Chain (Scope 3) Emissions

NA. The project does not affects associated with a good or services in a supply chain.

⁶ <http://mee.gov.cn/xxgk2018/xxgk/xxgk03/202012/W020201230736907682380.pdf>

⁷ http://www.mee.gov.cn/xxgk2018/xxgk/xxgk05/202103/t20210330_826728.html

⁸ http://www.gov.cn/gongbao/content/2015/content_2818456.htm

⁹ https://www.mee.gov.cn/gzk/gz/202112/t20211213_963865.shtml

1.11 Sustainable Development Contributions

The project activity implemented by the project owner can contribute to sustainable development as defined by and tracked against the United Nations Sustainable Development Goals (SDGs). The specific analysis is as follows:

SDG 13: Climate Action

The project introduces a geothermal energy-based space heating system to provide heating for a series of new residential buildings in the winter of Luohe (off-grid solution for target users and/or applications). And replaced heating from isolated coal-fired boilers as a normal business scenario in the project area. And emissions credits would be reduced by using geothermal energy rather than burning fossil fuels. It is affected by the actual occupancy rate. The residential area where the project is located is newly built and the occupancy rate is 84.4% from 01-November-2020 to 31-March-2021, 88.2% from 01-November-2021 to 31-March-2022, 89.7% from 01-November-2022 to 31-March-2023, which leads to the actual heating area and load in the monitoring period being smaller than the design value. For the monitoring period from 01-November-2020 to 31-March-2021, 6,987,854m² of residential buildings with an actual Emission reduction is 400,577 tCO_{2e}. For the monitoring period from 01-November-2021 to 31-March-2022, 7,309,097m² of residential buildings with an actual Emission reduction is 422,681 tCO_{2e}. For the monitoring period from 01-November-2022 to 31-March-2023, 7,435,015m² of residential buildings with an actual Emission reduction is 424,472 tCO_{2e}. Besides, the project will provide an opportunity for local residents to learn and raise awareness on climate change and mitigation measures on the stakeholder consultation fiscal meeting.

SDG 7: Affordable and Clean Energy

The project introduces a geothermal energy-based space heating system to provide heating for a series of new residential buildings in the winter of Luohe (off-grid solution for target users and/or applications). And replaced heating from isolated coal-fired boilers as a normal business scenario in the project area. And emissions credits would be reduced by using geothermal energy rather than burning fossil fuels. It is affected by the actual occupancy rate. The residential area where the project is located is newly built and the occupancy rate is 84.4% from 01-November-2020 to 31-March-2021, which the actual heating area is 6,987,854m². The occupancy rate is 88.2% from 01-November-2021 to 31-March-2022, which the actual heating area is 7,309,097m². The occupancy rate is 89.7% from 01-November-2022 to 31-March-2023, which the actual heating area is 7,435,015m².

SDG 8: Decent Work and Economic Growth

Project activities provide employment opportunities for local people, regardless of gender or any other status, during project implementation and monitoring activities. Both men and women received equal pay for equal work. The project creates 30 jobs, including 15 males and 15 females.

Table 1-4: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1 renewable energy share in the total final energy consumption	Implemented activities to increase	During this monitoring period, the residential area where the project is located is newly built and the occupancy rate is 88.2% from 01-November-2021 to 31-March-2022, which the actual heating area is 7,309,097m ² . The occupancy rate is 89.7% from 01-November-2022 to 31-March-2023, which the actual heating area is 7,435,015m ² .	From the operation start date of this project activity to the end of this monitoring period, the actual total heating area is 7,435,015 ¹⁰ m ² .
2)	8.3	8.3.1 Proportion of informal employment in non-agriculture employment, by sex	Implemented activities to increase	During this monitoring period, 30 people including 15 females and 15 males were employed for operation, and maintenance of this project.	The project activity generates long-term working opportunities for 30 people during the construction period. From the operation start date of this project activity to the end of this monitoring period, 30 people were employed including 15 females and 15 males.

¹⁰ The heating area already covers the first monitoring period, from 1st-November-2020—31st-March-2021, with a heating area of 6,987,854m².

3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	For the monitoring period from 01-April-2021 to 31-March-2022, 7,309,097m ² of residential buildings with an actual Emission reduction is 422,681 tCO ₂ e. For the monitoring period from 01-November-2022 to 31-March-2023, 7,435,015m ² of residential buildings with an actual Emission reduction is 424,472 tCO ₂ e. For the monitoring period from 01-April-2021 to 31-March-2023, actual Emission reduction is 847,153 tCO ₂ e.	From the operation start date of this project activity to the end of this monitoring period, the project has achieved GHG emission reductions of 1,247,730 tCO ₂ e.
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2 SAFEGUARDS

2.1 No Net Harm

The Environmental Impact Assessment (EIA) Report for the project was compiled by Luohe Yonglan Environmental Technology Co., Ltd. The EIA Report for the Project has been approved by Luohe Ecological environment Bureau on 31-December -2019, with approval No. “Environmental Assessment [2019] No.62”. Every aspect of environmental impact has been considered in the EIA report with corresponding measures during project development, and no net harm has been detected. Meanwhile, the implementation of the project will improve local socio-economic development through creating career opportunities and paying taxes.

2.2 Local Stakeholder Consultation

Local stakeholder consultation was conducted by project owner during the monitoring period through questionnaire.

During this monitoring period, mean of a questionnaire survey was adopted for stakeholder consultation. A questionnaire survey was conducted by project proponent from 10-April-2022 to 13-April-2022. Total 40 questionnaires were distributed, and all questionnaires have been recollected. The basic information about the survey respondents is listed in Table 2-1. Responses and comments from these questionnaires are summarized in Table 2-2

Table 2-1 Structure of stakeholder survey

<i>Distribution Item</i>		<i>Quantity</i>
<i>Number of stakeholders surveyed</i>	<i>Male</i>	<i>24</i>
	<i>Female</i>	<i>16</i>
<i>Age</i>	<i><25</i>	<i>10</i>
	<i>25-45</i>	<i>18</i>
	<i>45-55</i>	<i>10</i>
	<i>>55</i>	<i>2</i>
<i>Occupation</i>	<i>Worker</i>	<i>11</i>
	<i>Peasant</i>	<i>18</i>
	<i>Management personnel</i>	<i>4</i>

	<i>Civil servant</i>	3
	<i>Unspecified</i>	4

Forty questionnaires were distributed to local stakeholders, and all questionnaires have been recollected. Comments from these questionnaires are summarized in Table 2-2 below.

Table 2-2 Summary of the survey results in monitoring period

No.	Questions	Attitude or Opinion	Amount	Percentage
1	<i>Do you know about the project activity?</i>	<i>Very much</i>	36	90.00%
		<i>Heard of</i>	4	10.00%
		<i>Nothing</i>	0	0.00%
2	<i>Do you think this project will improve the current heating situation?</i>	<i>Yes</i>	30	75.00%
		<i>No</i>	0	0.00%
		<i>Don't know</i>	10	25.00%
3	<i>Do you think the project will promote local economic development?</i>	<i>Yes</i>	29	72.50%
		<i>No</i>	3	7.50%
		<i>Don't know</i>	8	20.00%
4	<i>Do you think the project will improve the local employment situation?</i>	<i>Yes</i>	31	77.50%
		<i>No</i>	0	0.00%
		<i>Don't know</i>	9	22.50%
5	<i>What impact do you think will the project bring to your family?</i>	<i>Positive impact</i>	25	62.50%
		<i>No impact</i>	15	37.50%
		<i>Negative impact</i>	0	0.00%
6	<i>What is the most probable environmental impact do you think the project will cause after the construction finish? (Multiple choice)</i>	<i>None</i>	32	80.00%
		<i>Air pollution</i>	0	0.00%
		<i>Water pollution</i>	0	0.00%
		<i>Noise pollution</i>	0	0.00%
		<i>Harm to indigenous animals and plants</i>	0	0.00%

		<i>Don't know</i>	8	20.00%
7	<i>What do you think will be the project's impact on the local community? (Multiple choices)?</i>	<i>Promote economic development</i>	19	47.50%
		<i>Improve electricity supply condition</i>	30	75.00%
		<i>No great impact</i>	5	12.50%
8	<i>What is your attitude to the project activity?</i>	<i>Support</i>	38	95.00%
		<i>Against</i>	0	0.00%
		<i>Indifferent</i>	2	5.00%

In order to set up the mechanism for on-going communication with local stakeholders, a grievance book was put at the entrance of each swine farm. All stakeholders are allowed to record their grievances or comments in the book at any time. During this monitoring period, there is no comment received in the grievance books.

In all, all the villagers and local government that filling out questionnaires are all supportive of the project and to date there has been no need to modify the due to the comments received.

2.3 AFOLU-Specific Safeguards

The project is a non-AFOLU project, this section is not required.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project uses geothermal resources in cascade levels. The high-temperature water can be used to supply heat directly through plate heat exchanger, and the low-temperature water enters the geothermal heat pumps after the heat exchange. Through the secondary heat exchange of the geothermal heat pumps, the temperature of the feed water can be increased to meet the requirements of the terminal heating design parameters.

A total of 60 thermal wells with a design depth of 2,300 meters were constructed, of which the 42 production wells with an average flow rate of 150 m³/h will supply the feed geothermal water at temperature of 75°C to 42 heat substations through primary heating network. The 18 re-injection wells will receive the return water at temperature of 9°C after secondary heat exchange. The 42 heat substations will supply the feed water at temperature of 45°C to the project buildings and receive the return water at temperature of 35°C from them. In terms of terminal devices of

heating configuration of users, floor radiation will be used as per Feasibility Study Report of the project. Technologies and measures employed by the project activity are shown in Figure 3-1 below.

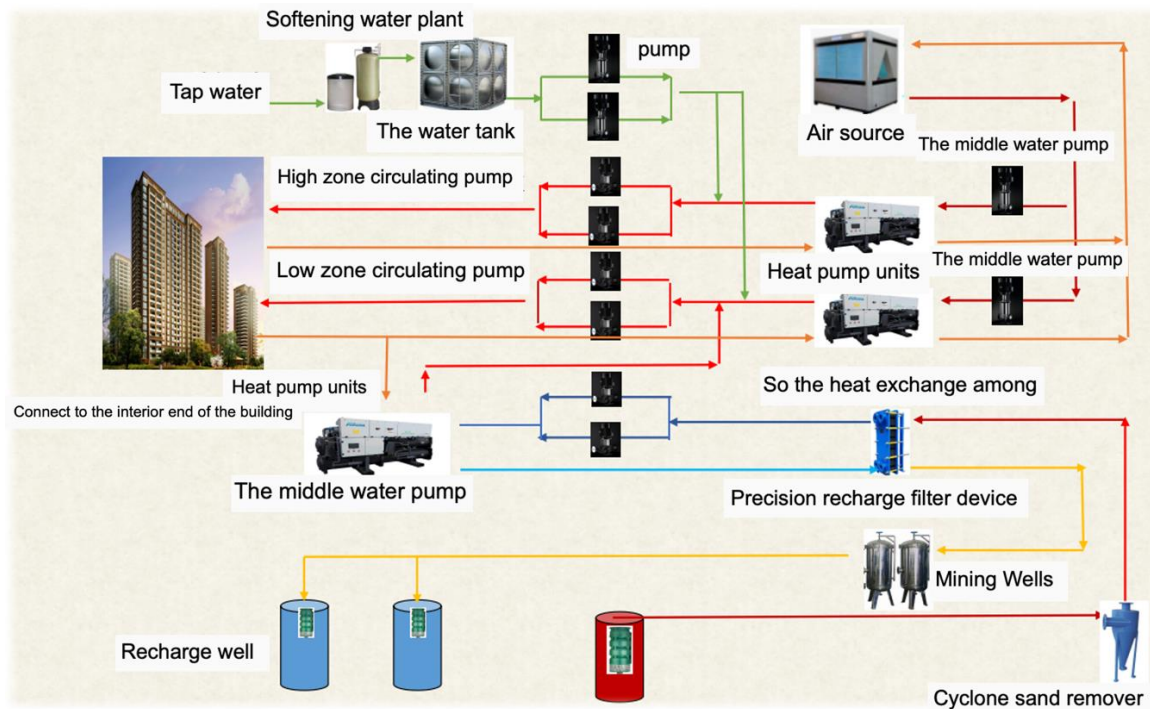


Figure 3-1 Technologies and Measures Employed by the Project Activity

A total of 42 heat substations in 10 sub-areas were constructed to enable the heat exchange between geothermal water transported by the primary heating network and the clean circulation water transported by the secondary network. In addition to water source geothermal heat pumps and air source geothermal heat pumps, the main equipment of the heat substations also includes deep well pumps, hydro-cyclones, plate heat exchangers, circulating pumps, make-up pumps, tank, and water-softening facilities. All the geothermal wells, heat substations and related facilities were newly constructed. As per operation manual of the geothermal space heating system, the lifetime of the heat pump units, the water circulation and air duct system, and the underground pipeline system is 15-20 years, more than 25 years and 50 years separately. Therefore, the lifetime of the whole geothermal space heating system is more than 15 years.

The project started construction on 01-April-2020 and has put into operation on 01-November-2020. Operation start date and test run period are the same and start on 01- November-2020. It can supply geothermal heat to 8,283 thousand m² of residential buildings with a total heating load of 414.15 MW. It is affected by the actual occupancy rate. The residential area where the project is located is newly built and the occupancy rate is 88.2% from 01-November-2021 to 31-March-2022. The occupancy rate is 89.7% from 01-November-2022 to 31-March-2023, For the monitoring period from 01-April-2021 to 31-March-2022, 7,309,097m² of residential buildings

with a heating load of 365.45MW¹¹. For the monitoring period from 01-April-2022 to 31-March-2023, 7,435,015m² of residential buildings with a heating load of 371.75MW¹². which leads to the actual heating area and load in the second monitoring period being smaller than the design value. The Main equipment and parameters of the 42 heat substations are shown in Table below.

Table 3-1 Main Equipment of Each Heat Substation

1#BHJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q ¹³ =70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source	Model: LSBLGHP1220/M	Unit	4	-

¹¹ According to the design area and heat load can be obtained the actual heat load is 7,309,097m²/8,283,000m²*414.15MW=365.45MW.

¹² According to the design area and heat load can be obtained the actual heat load is 7,435,015m²/8,283,000m²*414.15MW=371.75MW.

¹³ Flow rate.

geothermal heat pumps				
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
3# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks

Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	7	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	2	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	5	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
4# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange	Unit	3	-

	temperature of supply water and return water:50/40 °C			
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	3	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
5# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of	Unit	1	-

	supply water and return water:24/8 °C			
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	7	Supplemental heat source
6# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	3	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-

Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
7# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-

Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
8# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
9# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system

Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water: 50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water: 24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
10# BHGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply	Unit	1	-

	water and return water:50/40 °C			
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	3	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1#XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-

Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2# XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-

Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
3# XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	3	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
4# XWYH				

Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
5# XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water:	Unit	1	-

	75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C			
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
6# XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat	Unit	1	-

	exchange temperature of supply water and return water:24/8 °C			
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
7# XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-

Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
8# XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	3	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-

Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
9# XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
10# XWYH				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	8	Using variable frequency regulation system

Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water: 50/40 °C	Unit	2	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water: 24/8 °C	Unit	2	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1#WNS				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply	Unit	3	-

	water and return water:50/40 °C			
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	2	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	3	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2#WNS				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-

Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1#YYGG				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	3	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	2	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-

Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2#YHGG				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1#CYGJ				

Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water: 50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water: 24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2#CYGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water:	Unit	1	-

	75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C			
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	4	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
3#CYGJ				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat	Unit	1	-

	exchange temperature of supply water and return water:24/8 °C			
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1#LDC				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	2	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-

Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2#LDC				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	3	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-

Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
3#LDC				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	8	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	4	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1#XXHY				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system

Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water: 50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water: 24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	--
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2#XXHY				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply	Unit	1	-

	water and return water:50/40 °C			
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
3#XXHY				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-

Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1#JSY				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-

Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	5	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2#JSY				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
3#JSY				

Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1#JYYXF				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water:	Unit	1	-

	75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C			
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	3	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	4	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	7	Supplemental heat source
2#JYYXF				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	7	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	3	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	2	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat	Unit	1	-

	exchange temperature of supply water and return water:24/8 °C			
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
3#JYYXF				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-

Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
1# DJY				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	2	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-

Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
2# DJY				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system
Hydro-cyclones	Treatment capacity: 80 t/h	Unit	1	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water:50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water:24/8 °C	Unit	1	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	4	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source
3# DJY				
Equipment Name	Models and Specifications	Unit	Quantity	Remarks
Deep-well pump	Q=70 m ³ /h, Head=265 m	Unit	6	Using variable frequency regulation system

Hydro-cyclones	Treatment capacity: 80 t/h	Unit	2	-
Primary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 75/43 °C; Secondary heat exchange temperature of supply water and return water: 50/40 °C	Unit	1	-
Secondary plate heat exchanger	Primary heat exchange temperature of supply water and return water: 43/9 °C; Secondary heat exchange temperature of supply water and return water: 24/8 °C	Unit	2	-
Circulating pumps	Q=250 m ³ /h, Head=60 m	Unit	5	Using variable frequency regulation system
Make-up pumps	Q=25 m ³ /h, Head=20 m	Unit	2	Using variable frequency regulation system
Tanks	Effective volume: 100 m ³	Unit	1	-
Water-softening facilities	Treatment capacity: 80 t/h	Set	1	-
Water source geothermal heat pumps	Model: LSBLGHP1220/M	Unit	5	-
Air source geothermal heat pumps	Model: MDHS-60	Unit	6	Supplemental heat source

Table 3-2 Main Parameters of the 42 Heat Substations

No.	Sub-area	Heat substation	Geothermal wells		Heat load (MW)	Heating area (thousand m ²)
			Number of production wells	Number of Re-injection wells		
1	Binhuguoji	10	10	5	107.550	2,151
2	Xiangwanyihao	10	10	5	128.850	2,577
3	Weinisi	2	2	1	21.950	439

4	Yuehugongguan	2	2	1	20.250	405
5	Changyuanguoji	3	3	1	23.450	469
6	Lvdicheng	3	3	1	21.500	430
7	Xixihuayuan	3	3	1	24.350	487
8	Jiangshanyin	3	3	1	20.750	415
9	Jianyeyunxifu	3	3	1	23.500	470
10	Danjiangfu	3	3	1	22.000	440
Total		42	42	18	414.15	Residential buildings 8,283

All the building covered by the project were newly built buildings and there was no existing heating system prior to the project activity. In baseline scenario, heating supply in winter for the building areas will be provided by newly built coal-fired boilers in boiler house.

3.2 Deviations

3.2.1 Methodology Deviations

There is no methodology deviation in this monitoring period.

3.2.2 Project Description Deviations

Not applicable.

3.3 Grouped Projects

Not applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{CO_2,i}$
Data unit	tCO ₂ /TJ

Description	The CO ₂ emission factor per unit of energy of the fuel of technology <i>i</i> that would have been used in the baseline heating technology.
Source of data	Option (d) IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol.2 (Energy) of 2006 IPCC Guidelines on National GHG Inventories is used as per Table 5 of the applied methodology AM0072 (Version 03.0) ¹⁴ .
Value applied:	87.3
Justification of choice of data or description of measurement methods and procedures applied	Values provided by the fuel supplier are unavailable. IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol.2 (Energy) of 2006 IPCC Guidelines on National GHG Inventories are used. For coking coal, it is 87.3 tCO ₂ /TJ.
Purpose of Data	To calculate baseline emissions
Comments	Where several fuel types are used in the boiler, use the fuel type with the lowest CO ₂ emission factor. CO ₂ emission factor of other bituminous coal and sub-bituminous coal are 89.5 tCO ₂ /TJ and 92.8 tCO ₂ /TJ separately, which are higher than that of coking coal. Coking coal and brown coal briquettes have the same CO ₂ emission factor. Coking coal is usually used for heating in coal boiler, which was also validated by space heating experts at the project site for the first monitoring period.

Data / Parameter	$\eta_{BL,i}$
Data unit	Dimensionless
Description	Net thermal efficiency of the boiler technology <i>i</i> using fossil fuel that would have been used in the absence of the project activity.
Source of data	Follow the guidance given in the applied methodology AM0072 (Version 03.0).
Value applied:	85
Justification of choice of data or description of measurement methods and procedures applied	The highest efficiency of coal-fired boilers provided by Zosen Boilers (79%), Fengcheng Energy Equipment Factory (80%) and Henan Hengxin Boiler Manufacturing Co., Ltd (85%). As per Table 3-1 Default baseline efficiency for different boilers of AM0072 (Version 03.0), the highest value of 85% for new coal-fired boiler is applicable for the proposed project.

¹⁴ 2019 Refinement to 2006 IPCC did not change this part, hence the value in 2006 is still applicable.

	In summary, the efficiency of 85% is applied for the proposed project.
Purpose of Data	To calculate baseline emissions
Comments	N/A

Data / Parameter	$Loss^{BL}_{i,y}$
Data unit	TJ/yr
Description	The net distribution losses of the heat supply system, in the absence of project activity, during the year y.
Source of data	Section 5.4.6.3 of AM0072 (Version 03.0).
Value applied:	0
Justification of choice of data or description of measurement methods and procedures applied	The historic information is not available, a conservative value of 0% of losses can be used as per paragraph 66 option 1 of AM0072 (Version 03.0).
Purpose of Data	To calculate baseline emissions
Comments	N/A

Data / Parameter	<i>Subscript i</i>
Data unit	
Description	Type of technology used in the baseline scenario.
Source of data	<i>Feasibility Study Report</i> of the proposed project
Value applied:	Coal fired boilers in boiler houses, supplying several buildings through a heat distribution network.
Justification of choice of data or description of measurement methods and procedures applied	As per section 5.2 of AM0072 <i>Fossil Fuel Displacement by Geothermal Resources for Space Heating</i> (Version 03.0), the most plausible baseline scenario shall be determined through the use of <i>Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality</i> (Version 07.0). Heat supply system using coal-fired boilers is identified as the baseline scenario of the proposed project activity. Refer to section 3.4 of the Report for more details.
Purpose of Data	To calculate baseline emissions
Comments	Data shall be stored in an excel sheet/database

Data / Parameter	<i>Subscript j</i>
Data unit	
Description	Geothermal well number.
Source of data	<i>Feasibility Study Report</i> of the proposed project
Value applied:	Geothermal wells number $j = 1$ to 60.
Justification of choice of data or description of measurement methods and procedures applied	There are a total of 60 geothermal wells including 42 production wells and 18 re-injection wells in the boundary of the proposed project activity as per <i>Feasibility Study Report</i> , which can be identified through unique identification code.
Purpose of Data	To calculate baseline emissions
Comments	Distinct geothermal well with distinct properties of temperature, pressure, and flow volume.

Data / Parameter	<i>Subscript m</i>
Data unit	
Description	Space heating construction type
Source of data	<i>Feasibility Study Report</i> of the proposed project
Value applied:	Residential
Justification of choice of data or description of measurement methods and procedures applied	Identified by local urban planners under a short to medium term development plan for the area.
Purpose of Data	To calculate baseline emissions
Comments	Areas designated for space heating under the categories of residential, commercial and industrial space heat

Data / Parameter	<i>Subscript k</i>
Data unit	
Description	Sub-station number
Source of data	<i>Feasibility Study Report</i> of the proposed project

Value applied:	Sub-station number $k=1$ to 42
Justification of choice of data or description of measurement methods and procedures applied	There is a total of 42 sub-stations in the boundary of the proposed project activity, which can be identified through unique identification code and GPS coordinates.
Purpose of Data	To calculate baseline emissions
Comments	Includes a heat exchanger as part of the sub-station.

Data / Parameter	$Loss^{PJ}_y$
Data unit	TJ/yr
Description	Net distribution loss of the geothermal heat supply system during the year y .
Source of data	Calculated based on design heat losses from heat network manufacturer per the methodology.
Value applied:	Refer to ER calculation sheet for more details.
Justification of choice of data or description of measurement methods and procedures applied	$Loss^{PJ}_y = \sum_m 10\% \times A_m \times HI_m \times T_j \times CF \times 10^{-9}$ Where: A_m=Net heating area for construction type m HI_m=Heating index for construction type m T_j=Hours per hear heat utilization in well j CF=Conversion factor from GWh to TJ (3.6).
Purpose of Data	To calculate baseline emissions
Comments	N/A

Data / Parameter	w_i
Data unit	-
Description	Heat generation ratio for baseline heating technology i
Source of data	Paragraph 51(a)(ii) option 2 Assign weights based on available historical records of AM0072 (Version 03.0).
Value applied:	1

Justification of choice of data or description of measurement methods and procedures applied	As per section 4.1 of this Report, the baseline scenario of the project is 3(i) "Coal fired boilers in boiler houses, supplying several buildings through a heat distribution network". Only one technology would be used. According to <i>Research on Heating in Winter of Luohe City</i> published by Housing and Urban-Rural Development Department of Henan Province, all the heating in winter of residential and commercial buildings were supplied by coal fired boilers. As per paragraph 51(a)(ii) option 2 Assign weights based on available historical records of AM0072 (Version 03.0), w_i is equal to 1.
Purpose of Data	To calculate baseline emissions
Comments	N/A

Data / Parameter	H_{ff}
Data unit	TJ
Description	Heat supplied by fossil fuel boiler; in case a boiler is used to meet the heat demand of network.
Source of data	On site metering of heat (e.g., flow of steam/hot water multiplied by enthalpy) at the outlet of the boiler.
Value applied:	There are no fossil fuel boilers used to meet the heat demand of the project heating network. Therefore, $H_{ff}=0$ TJ.
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	To calculate baseline emissions
Comments	Yearly average data to be used

4.2 Data and Parameters Monitored

Data / Parameter	$\Delta t_{j,d,y}$
Data unit	°C
Description	Average temperature difference between inlet and outlet temperatures at the downstream of each heat exchanger in year y.
Source of data	Ultrasonic calorimeters installed at downstream inlet and outlet points of each heat exchanger.
Description of measurement	Outlet temperature minus inlet temperature at the downstream of each heat exchanger j. All the temperature data were measured by

methods and procedures applied	the ultrasonic calorimeters installed at downstream inlet and outlet points of each heat exchanger. Inlet and outlet temperatures at the downstream of each heat exchanger are monitored by the ultrasonic calorimeters. There are 42 production wells and 18 re-injection wells. There are totally 42 sets of heat exchange system. 84 ultrasonic calorimeters are needed to monitor the inlet and outlet temperatures of all the heat exchange system. Refer to Figure 4-2 of the MR for more details on installation and configuration of the ultrasonic calorimeters. Serial No. of the ultrasonic calorimeters are LH00000158, LH00000159, LH00000160, LH00000161, LH00000162, LH00000163, LH00000164, LH00000165, LH00000166, LH00000167, LH00000168, LH00000169, LH00000170, LH00000171, LH00000172, LH00000173, LH00000174, LH00000175, LH00000176, LH00000177, LH00000178, LH00000179, LH00000180, LH00000181, LH00000182, LH00000183, LH00000184, LH00000185, LH00000186, LH00000187, LH00000188, LH00000189, LH00000190, LH00000191, LH00000192, LH00000193, LH00000194, LH00000195, LH00000196, LH00000197, LH00000198, LH00000199, LH00000244, LH00000245, LH00000246, LH00000247, LH00000248, LH00000249, LH00000250, LH00000251, LH00000252, LH00000253, LH00000254, LH00000255, LH00000256, LH00000257, LH00000258, LH00000259, LH00000260, LH00000261, LH00000262, LH00000263, LH00000264, LH00000265, LH00000266, LH00000267, LH00000268, LH00000269, LH00000270, LH00000271, LH00000272, LH00000273, LH00000274, LH00000275, LH00000276, LH00000277, LH00000278, LH00000279, LH00000280, LH00000281, LH00000282, LH00000283, LH00000284, LH00000285 separately. The ultrasonic calorimeters can monitor the inlet and outlet temperature of each heat exchange system continuously and record the temperature data per hour. All the hourly temperature data were exported by the VCS monitoring team to form the monthly record at the beginning of the next month. The average daily inlet and outlet temperature were calculated based on the 24-hourly temperature data separately. The average monthly inlet and outlet temperature were calculated based on all the daily inlet and outlet temperature of this month. Finally, the operation record of the geothermal heating system during the related heating season were summarized by all the monthly record.
Frequency of monitoring/recording	Measured Hourly/Recording Monthly

Value applied:	The average temperature change of the 42-heat exchange system of the 2021-2022 heating season (12°C) and 2022-2023 heating season (11.99°C) was sourced from operation record of the geothermal based space heating system, and it can be found in BE Step 2 of the ER spreadsheet. For detailed monthly data, please refer to the ER spreadsheet.																																	
Monitoring equipment	Ultrasonic calorimeters																																	
QA/QC procedures applied	Ultrasonic calorimeters have been checked regularly for potentially performance-reducing anomalies by the VCS monitoring team. The temperature measurement range of the ultrasonic calorimeters are 4 °C to 95 °C with an accuracy of 0.01 °C. The ultrasonic calorimeters are calibrated based on JJG 225-2001 Verification Regulation of Heat Meters. All the 84 ultrasonic calorimeters were calibrated before the operation period of the geothermal heating system. Calibration of the 84 ultrasonic calorimeters is shown as the following table. If the ultrasonic calorimeters can be used normally, recalibration is not required. The validity is 5 years. <table border="1"> <thead> <tr> <th>NO.</th><th>Serial No.</th><th>Purpose</th><th>Calibration Date</th><th>Term of Validity</th></tr> </thead> <tbody> <tr> <td>1</td><td>LH00000158</td><td>To monitor supply water temperature of 1# heat exchange system</td><td>06-October-2020</td><td>05-October-2025</td></tr> <tr> <td>2</td><td>LH00000159</td><td>To monitor supply water temperature of 2# heat exchange system</td><td>06-October-2020</td><td>05-October-2025</td></tr> <tr> <td>3</td><td>LH00000160</td><td>To monitor supply water temperature of 3# heat exchange system</td><td>06-October-2020</td><td>05-October-2025</td></tr> <tr> <td>4</td><td>LH00000161</td><td>To monitor supply water temperature of 4# heat exchange system</td><td>06-October-2020</td><td>05-October-2025</td></tr> <tr> <td>5</td><td>LH00000162</td><td>To monitor supply water temperature of 5# heat</td><td>06-October-2020</td><td>05-October-2025</td></tr> </tbody> </table>				NO.	Serial No.	Purpose	Calibration Date	Term of Validity	1	LH00000158	To monitor supply water temperature of 1# heat exchange system	06-October-2020	05-October-2025	2	LH00000159	To monitor supply water temperature of 2# heat exchange system	06-October-2020	05-October-2025	3	LH00000160	To monitor supply water temperature of 3# heat exchange system	06-October-2020	05-October-2025	4	LH00000161	To monitor supply water temperature of 4# heat exchange system	06-October-2020	05-October-2025	5	LH00000162	To monitor supply water temperature of 5# heat	06-October-2020	05-October-2025
NO.	Serial No.	Purpose	Calibration Date	Term of Validity																														
1	LH00000158	To monitor supply water temperature of 1# heat exchange system	06-October-2020	05-October-2025																														
2	LH00000159	To monitor supply water temperature of 2# heat exchange system	06-October-2020	05-October-2025																														
3	LH00000160	To monitor supply water temperature of 3# heat exchange system	06-October-2020	05-October-2025																														
4	LH00000161	To monitor supply water temperature of 4# heat exchange system	06-October-2020	05-October-2025																														
5	LH00000162	To monitor supply water temperature of 5# heat	06-October-2020	05-October-2025																														

		exchange system		
	6	LH00000163	To monitor supply water temperature of 6# heat exchange system	06-October-2020 05-October-2025
	7	LH00000164	To monitor supply water temperature of 7# heat exchange system	06-October-2020 05-October-2025
	8	LH00000165	To monitor supply water temperature of 8# heat exchange system	06-October-2020 05-October-2025
	9	LH00000166	To monitor supply water temperature of 9# heat exchange system	06-October-2020 05-October-2025
	10	LH00000167	To monitor supply water temperature of 10# heat exchange system	06-October-2020 05-October-2025
	11	LH00000168	To monitor supply water temperature of 11# heat exchange system	06-October-2020 05-October-2025
	12	LH00000169	To monitor supply water temperature of 12# heat exchange system	06-October-2020 05-October-2025
	13	LH00000170	To monitor supply water temperature of 13# heat exchange system	06-October-2020 05-October-2025
	14	LH00000171	To monitor supply water temperature	06-October-2020 05-October-2025

		of 14# heat exchange system		
	15	LH00000172	To monitor supply water temperature of 15# heat exchange system	06-October-2020 05-October-2025
	16	LH00000173	To monitor supply water temperature of 16# heat exchange system	06-October-2020 05-October-2025
	17	LH00000174	To monitor supply water temperature of 17# heat exchange system	06-October-2020 05-October-2025
	18	LH00000175	To monitor supply water temperature of 18# heat exchange system	06-October-2020 05-October-2025
	19	LH00000176	To monitor supply water temperature of 19# heat exchange system	06-October-2020 05-October-2025
	20	LH00000177	To monitor supply water temperature of 20# heat exchange system	06-October-2020 05-October-2025
	21	LH00000178	To monitor supply water temperature of 21# heat exchange system	06-October-2020 05-October-2025
	22	LH00000179	To monitor supply water temperature of 22# heat exchange system	07-October-2020 06-October-2025
	23	LH00000180	To monitor supply water	07-October-2020 06-October-2025

		temperature of 23# heat exchange system		
	24	LH00000181	To monitor supply water temperature of 24# heat exchange system	07-October-2020 06-October-2025
	25	LH00000182	To monitor supply water temperature of 25# heat exchange system	07-October-2020 06-October-2025
	26	LH00000183	To monitor supply water temperature of 26# heat exchange system	07-October-2020 06-October-2025
	27	LH00000184	To monitor supply water temperature of 27# heat exchange system	07-October-2020 06-October-2025
	28	LH00000185	To monitor supply water temperature of 28# heat exchange system	07-October-2020 06-October-2025
	29	LH00000186	To monitor supply water temperature of 29# heat exchange system	07-October-2020 06-October-2025
	30	LH00000187	To monitor supply water temperature of 30# heat exchange system	07-October-2020 06-October-2025
	31	LH00000188	To monitor supply water temperature of 31# heat exchange system	07-October-2020 06-October-2025

	32	LH00000189	To monitor supply water temperature of 32# heat exchange system	07-October-2020	06-October-2025
	33	LH00000190	To monitor supply water temperature of 33# heat exchange system	07-October-2020	06-October-2025
	34	LH00000191	To monitor supply water temperature of 34# heat exchange system	07-October-2020	06-October-2025
	35	LH00000192	To monitor supply water temperature of 35# heat exchange system	07-October-2020	06-October-2025
	36	LH00000193	To monitor supply water temperature of 36# heat exchange system	07-October-2020	06-October-2025
	37	LH00000194	To monitor supply water temperature of 37# heat exchange system	07-October-2020	06-October-2025
	38	LH00000195	To monitor supply water temperature of 38# heat exchange system	07-October-2020	06-October-2025
	39	LH00000196	To monitor supply water temperature of 39# heat exchange system	07-October-2020	06-October-2025
	40	LH00000197	To monitor supply water temperature of 40# heat	07-October-2020	06-October-2025

		exchange system		
	41	LH00000198	To monitor supply water temperature of 41# heat exchange system	07-October-2020 06-October-2025
	42	LH00000199	To monitor supply water temperature of 42# heat exchange system	07-October-2020 06-October-2025
	43	LH00000244	To monitor return water temperature of 1# heat exchange system	08-October-2020 07-October-2025
	44	LH00000245	To monitor return water temperature of 2# heat exchange system	08-October-2020 07-October-2025
	45	LH00000246	To monitor return water temperature of 3# heat exchange system	08-October-2020 07-October-2025
	46	LH00000247	To monitor return water temperature of 4# heat exchange system	08-October-2020 07-October-2025
	47	LH00000248	To monitor return water temperature of 5# heat exchange system	08-October-2020 07-October-2025
	48	LH00000249	To monitor return water temperature of 6# heat exchange system	08-October-2020 07-October-2025
	49	LH00000250	To monitor return water temperature	08-October-2020 07-October-2025

		of 7# heat exchange system		
50	LH00000251	To monitor return water temperature of 8# heat exchange system	08-October-2020	07-October-2025
51	LH00000252	To monitor return water temperature of 9# heat exchange system	08-October-2020	07-October-2025
52	LH00000253	To monitor return water temperature of 10# heat exchange system	08-October-2020	07-October-2025
53	LH00000254	To monitor return water temperature of 11# heat exchange system	08-October-2020	07-October-2025
54	LH00000255	To monitor return water temperature of 12# heat exchange system	08-October-2020	07-October-2025
55	LH00000256	To monitor return water temperature of 13# heat exchange system	08-October-2020	07-October-2025
56	LH00000257	To monitor return water temperature of 14# heat exchange system	08-October-2020	07-October-2025
57	LH00000258	To monitor return water temperature of 15# heat exchange system	08-October-2020	07-October-2025
58	LH00000259	To monitor return water	08-October-2020	07-October-2025

		temperature of 16# heat exchange system		
59	LH00000260	To monitor return water temperature of 17# heat exchange system	08-October-2020	07-October-2025
60	LH00000261	To monitor return water temperature of 18# heat exchange system	08-October-2020	07-October-2025
61	LH00000262	To monitor return water temperature of 19# heat exchange system	08-October-2020	07-October-2025
62	LH00000263	To monitor return water temperature of 20# heat exchange system	08-October-2020	07-October-2025
63	LH00000264	To monitor return water temperature of 21# heat exchange system	08-October-2020	07-October-2025
64	LH00000265	To monitor return water temperature of 22# heat exchange system	09-October-2020	08-October-2025
65	LH00000266	To monitor return water temperature of 23# heat exchange system	09-October-2020	08-October-2025
66	LH00000267	To monitor return water temperature of 24# heat exchange system	09-October-2020	08-October-2025

	67	LH00000268	To monitor return water temperature of 25# heat exchange system	09-October-2020	08-October-2025
	68	LH00000269	To monitor return water temperature of 26# heat exchange system	09-October-2020	08-October-2025
	69	LH00000270	To monitor return water temperature of 27# heat exchange system	09-October-2020	08-October-2025
	70	LH00000271	To monitor return water temperature of 28# heat exchange system	09-October-2020	08-October-2025
	71	LH00000272	To monitor return water temperature of 29# heat exchange system	09-October-2020	08-October-2025
	72	LH00000273	To monitor return water temperature of 30# heat exchange system	09-October-2020	08-October-2025
	73	LH00000274	To monitor return water temperature of 31# heat exchange system	09-October-2020	08-October-2025
	74	LH00000275	To monitor return water temperature of 32# heat exchange system	09-October-2020	08-October-2025
	75	LH00000276	To monitor return water temperature of 33# heat	09-October-2020	08-October-2025

		exchange system		
	76	LH00000277	To monitor return water temperature of 34# heat exchange system	09-October-2020 08-October-2025
	77	LH00000278	To monitor return water temperature of 35# heat exchange system	09-October-2020 08-October-2025
	78	LH00000279	To monitor return water temperature of 36# heat exchange system	09-October-2020 08-October-2025
	79	LH00000280	To monitor return water temperature of 37# heat exchange system	09-October-2020 08-October-2025
	80	LH00000281	To monitor return water temperature of 38# heat exchange system	09-October-2020 08-October-2025
	81	LH00000282	To monitor return water temperature of 39# heat exchange system	09-October-2020 08-October-2025
	82	LH00000283	To monitor return water temperature of 40# heat exchange system	09-October-2020 08-October-2025
	83	LH00000284	To monitor return water temperature of 41# heat exchange system	09-October-2020 08-October-2025
	84	LH00000285	To monitor return water temperature	09-October-2020 08-October-2025

		of 42# heat exchange system		
	There were no missing data or damaged data during the 2nd monitoring period. The average temperature change of the 42-heat exchange system of the 2021-2022 heating season (12°C) and 2022-2023 heating season (11.99°C) were cross checked by the design temperature difference of the end-user (10-15°C). As per feedback from the space heating experts at the project site, average temperature change of the 42-heat exchange system of the Luohe geothermal heating system is about 12°C.			
Purpose of data	To calculate baseline emissions			
Calculation method	-			
Comments	The heat exchanger should handle the heat supplied by geothermal well only and not by any other source. The temperature readings should be taken at immediate inlet and outlet point of heat exchanger.			

Data / Parameter	$FR_{j,d,y}$
Data unit	kg/h
Description	Average flow rate at the downstream of each heat exchanger (upstream of which is connected with water supply from the geothermal well j) in year y .
Source of data	Ultrasonic calorimeters
Description of measurement methods and procedures applied	Average flow rate at the downstream of each heat exchanger are monitored by the 42 ultrasonic calorimeters. Refer to Figure 4-2 of the MR for more details on installation and configuration of the ultrasonic calorimeters. Serial No. of the ultrasonic calorimeters are LH00000244, LH00000245, LH00000246, LH00000247, LH00000248, LH00000249, LH00000250, LH00000251, LH00000252, LH00000253, LH00000254, LH00000255, LH00000256, LH00000257, LH00000258, LH00000259, LH00000260, LH00000261, LH00000262, LH00000263, LH00000264, LH00000265, LH00000266, LH00000267, LH00000268, LH00000269, LH00000270, LH00000271, LH00000272, LH00000273, LH00000274, LH00000275, LH00000276, LH00000277, LH00000278, LH00000279, LH00000280, LH00000281, LH00000282, LH00000283, LH00000284, LH00000285 separately. The ultrasonic calorimeters can monitor the volume flow rate of each heat exchange system continuously and record it per hour. All the hourly volume flow rate data were exported by the VCS monitoring

	team to form the monthly record at the beginning of the next month. The average daily volume flow rate was calculated based on the 24-hourly data. The average monthly volume flow rate was calculated based on all the daily data of this month. Finally, the operation record of the geothermal heating system during the related heating season were summarized by all the monthly record. Density of the water is 1,000 kg/m³. Mass flow can be calculated as volume flow rate times density of water.																									
Frequency of monitoring/recording	Measured Hourly/Recording Monthly																									
Value applied:	As per the measured data during this monitoring period from 01-April-2021 to 31-March-2022, the average flow rate was 643,154 kg/h. As per the measured data during this monitoring period from 01-April-2022 to 31-March-2023, the average flow rate was 643,147 kg/h.																									
Monitoring equipment	Ultrasonic calorimeters																									
QA/QC procedures applied	Ultrasonic calorimeters have been checked regularly for potentially performance-reducing anomalies by the VCS monitoring team. The highest measurement flow rate range of the ultrasonic calorimeters are 1,000 m³/h with an accuracy of 0.01 m³/h. The ultrasonic calorimeters are calibrated based on JJG 225-2001 Verification Regulation of Heat Meters. All the 42 ultrasonic calorimeters were calibrated before the operation period of the geothermal heating system. Calibration of the 42 ultrasonic calorimeters is shown as the following table. If the ultrasonic calorimeters can be used normally, recalibration is not required. The validity is 5 years. <table><tr><th>NO.</th><th>Serial No.</th><th>Purpose</th><th>Calibration Date</th><th>Term of Validity</th></tr><tr><td>1</td><td>LH00000244</td><td>To monitor flow rate of 1# heat exchange system</td><td>08-October-2020</td><td>07-October-2025</td></tr><tr><td>2</td><td>LH00000245</td><td>To monitor flow rate of 2# heat exchange system</td><td>08-October-2020</td><td>07-October-2025</td></tr><tr><td>3</td><td>LH00000246</td><td>To monitor flow rate of 3# heat exchange system</td><td>08-October-2020</td><td>07-October-2025</td></tr><tr><td>4</td><td>LH00000247</td><td>To monitor flow rate of</td><td>08-October-2020</td><td>07-October-2025</td></tr></table>	NO.	Serial No.	Purpose	Calibration Date	Term of Validity	1	LH00000244	To monitor flow rate of 1# heat exchange system	08-October-2020	07-October-2025	2	LH00000245	To monitor flow rate of 2# heat exchange system	08-October-2020	07-October-2025	3	LH00000246	To monitor flow rate of 3# heat exchange system	08-October-2020	07-October-2025	4	LH00000247	To monitor flow rate of	08-October-2020	07-October-2025
NO.	Serial No.	Purpose	Calibration Date	Term of Validity																						
1	LH00000244	To monitor flow rate of 1# heat exchange system	08-October-2020	07-October-2025																						
2	LH00000245	To monitor flow rate of 2# heat exchange system	08-October-2020	07-October-2025																						
3	LH00000246	To monitor flow rate of 3# heat exchange system	08-October-2020	07-October-2025																						
4	LH00000247	To monitor flow rate of	08-October-2020	07-October-2025																						

		4# heat exchange system		
	5	LH00000248	To monitor flow rate of 5# heat exchange system	08-October-2020 07-October-2025
	6	LH00000249	To monitor flow rate of 6# heat exchange system	08-October-2020 07-October-2025
	7	LH00000250	To monitor flow rate of 7# heat exchange system	08-October-2020 07-October-2025
	8	LH00000251	To monitor flow rate of 8# heat exchange system	08-October-2020 07-October-2025
	9	LH00000252	To monitor flow rate of 9# heat exchange system	08-October-2020 07-October-2025
	10	LH00000253	To monitor flow rate of 10# heat exchange system	08-October-2020 07-October-2025
	11	LH00000254	To monitor flow rate of 11# heat exchange system	08-October-2020 07-October-2025
	12	LH00000255	To monitor flow rate of 12# heat exchange system	08-October-2020 07-October-2025
	13	LH00000256	To monitor flow rate of 13# heat exchange system	08-October-2020 07-October-2025
	14	LH00000257	To monitor flow rate of 14# heat exchange system	08-October-2020 07-October-2025

	15	LH00000258	To monitor flow rate of 15# heat exchange system	08-October-2020	07-October-2025
	16	LH00000259	To monitor flow rate of 16# heat exchange system	08-October-2020	07-October-2025
	17	LH00000260	To monitor flow rate of 17# heat exchange system	08-October-2020	07-October-2025
	18	LH00000261	To monitor flow rate of 18# heat exchange system	08-October-2020	07-October-2025
	19	LH00000262	To monitor flow rate of 19# heat exchange system	08-October-2020	07-October-2025
	20	LH00000263	To monitor flow rate of 20# heat exchange system	08-October-2020	07-October-2025
	21	LH00000264	To monitor flow rate of 21# heat exchange system	08-October-2020	07-October-2025
	22	LH00000265	To monitor flow rate of 22# heat exchange system	09-October-2020	08-October-2025
	23	LH00000266	To monitor flow rate of 23# heat exchange system	09-October-2020	08-October-2025
	24	LH00000267	To monitor flow rate of 24# heat exchange system	09-October-2020	08-October-2025
	25	LH00000268	To monitor flow rate of 25# heat	09-October-2020	08-October-2025

		exchange system		
	26	LH00000269	To monitor flow rate of 26# heat exchange system	09-October-2020 08-October-2025
	27	LH00000270	To monitor flow rate of 27# heat exchange system	09-October-2020 08-October-2025
	28	LH00000271	To monitor flow rate of 28# heat exchange system	09-October-2020 08-October-2025
	29	LH00000272	To monitor flow rate of 29# heat exchange system	09-October-2020 08-October-2025
	30	LH00000273	To monitor flow rate of 30# heat exchange system	09-October-2020 08-October-2025
	31	LH00000274	To monitor flow rate of 31# heat exchange system	09-October-2020 08-October-2025
	32	LH00000275	To monitor flow rate of 32# heat exchange system	09-October-2020 08-October-2025
	33	LH00000276	To monitor flow rate of 33# heat exchange system	09-October-2020 08-October-2025
	34	LH00000277	To monitor flow rate of 34# heat exchange system	09-October-2020 08-October-2025
	35	LH00000278	To monitor flow rate of 35# heat exchange system	09-October-2020 08-October-2025

	36	LH00000279	To monitor flow rate of 36# heat exchange system	09-October-2020	08-October-2025
	37	LH00000280	To monitor flow rate of 37# heat exchange system	09-October-2020	08-October-2025
	38	LH00000281	To monitor flow rate of 38# heat exchange system	09-October-2020	08-October-2025
	39	LH00000282	To monitor flow rate of 39# heat exchange system	09-October-2020	08-October-2025
	40	LH00000283	To monitor flow rate of 40# heat exchange system	09-October-2020	08-October-2025
	41	LH00000284	To monitor flow rate of 41# heat exchange system	09-October-2020	08-October-2025
	42	LH00000285	To monitor flow rate of 42# heat exchange system	09-October-2020	08-October-2025
There were no missing data or damaged data during the monitoring period. The average volume flow rate of 42 heat exchange system of the 2021-2022 heating season (643.15 m³/h), 2022-2023 heating season (643.15 m³/h) were cross checked by the rated flow of the circulating pumps, refer to Table 3-1 of the for more details. The average volume flow rate of 42 heat exchange system of the 2021-2022 heating season and 2022-2023 heating season were lower than the least rated flow of the circulating pumps (1,400 m³/h).					
Purpose of data		To calculate baseline emissions			
Calculation method		-			
Comments		The heat exchanger should handle the heat supplied by geothermal well only and not by any other source.			

Data / Parameter	T_j
Data unit	Hours
Description	Hours per hear heat utilization in well j .
Source of data	Operation record of the geothermal based space heating system.
Description of measurement methods and procedures applied	The actual number of heating hours are sourced from the statistical data of the geothermal base space heating system. As per <i>Research on Heating in Winter of Luohe City</i> published by Housing and Urban-Rural Development Department of Henan Province, winter heating season of Luohe City is usually from November 1 to March 31 of the next year (151 days).
Frequency of monitoring/recording	Monthly
Value applied:	The actual number of heating hours are sourced from operation record of the geothermal based space heating system. Monthly operation time of the 42-heat exchange system were exported by the GS monitoring team at the beginning of the next month. The operation record of the geothermal heating system during the related heating season were summarized by all the monthly record. 3,624h (151 days*24h) during 2021-2022 heating season. 3,624h (151 days*24h) during 2022-2023 heating season.
Monitoring equipment	-
QA/QC procedures applied	Time given for heating services provided will be measured. The measured data shall be cross-checked against applicable local policy and regulation on heat supply.
Purpose of data	To calculate baseline emissions
Calculation method	-
Comments	N/A

Data / Parameter	HI_m
Data unit	W/m ²
Description	Heating index for construction type m .
Source of data	The conservative standard index for construction type m as provided by Feasibility Report of the project
Description of measurement methods and procedures applied	-
Frequency of monitoring/recording	-
Value applied:	50 W/m ² for residential buildings.
Monitoring equipment	-
QA/QC procedures applied	As per feedback from the space heating experts at the project site, heating index of the Luohe geothermal heating system is 50 W/m ² for residential buildings, which are comply with requirement of CJJ 34-2010 Design Code for City Heating Network published by

	Ministry of Housing and Urban-Rural Development of the People's Republic of China.
Purpose of data	To calculate baseline emissions
Calculation method	-
Comments	N/A

Data / Parameter	$EC_{PJ,i,y}$ (EC_y)
Data unit	MWh
Description	Electricity consumption for the year y in operating the geothermal heating system.
Source of data	Record of the Electricity Meters
Description of measurement methods and procedures applied	Electricity consumptions of the geothermal heating system are monitored by the electricity meters installed at each heat substation. Totally 42 electricity meters are needed. Refer to Figure 5.2 of the Joint-PD-MR for more details on installation and configuration of the electricity meters. Serial No. of the electricity meters are 110238121401 , 110238121402 , 110238121403 , 110238121404 , 110238121405 , 110238121406 , 110238121407 , 110238121408 , 110238121409 , 110238121410 , 110238121411 , 110238121412 , 110238121413 , 110238121414 , 110238121415 , 110238121416 , 110238121417 , 110238121418 , 110238121419 , 110238121420 , 110238121421 , 110238121422 , 110238121423 , 110238121424 , 110238121425 , 110238121426 , 110238121427 , 110238121428 , 110238121429 , 110238121430 , 110238121431 , 110238121432 , 110238121433 , 110238121434 , 110238121435 , 110238121436 , 110238121437 , 110238121438 , 110238121439 , 110238121440, 110238121441, 110238121442 separately. Before test run of the whole geothermal space heating system, base number of all the 42 electricity meters were recorded by the VCS monitoring team under the supervision of the representative of each sub-area. At the end of each heating month, the VCS monitoring team recorded readings of the 42 electricity meters, which can calculate the electricity consumption of this month by minus last month's base number of meters. The operation record of the geothermal heating system during the related heating season were summarized by all the monthly record. Electricity consumption of the geothermal space heating system are only part of the power consumption in public area of each sub-area. All the electricity costs during the heating season were settled by the

	community property service company of each sub-area and local power grid company, which includes the electricity consumption of the geothermal heating system.																														
	Electricity settlement agreement was signed between the project owner and the community property service company of each sub-area. At the end of each winter heating season, the project owner prepares electricity bill to the related community property service company for confirmation, which contains name of the community property service company, period of the electricity consumption, related electricity consumption (test run period included), information of the electricity meters (location, serial number, accuracy, highest range and stop number of this heating season) and the related charges. The project owner would pay the bill and payment receipt would be provided by the related community property service company.																														
Frequency of monitoring/recording	Hourly																														
Value applied:	As per the measured data during this monitoring period from 01-April-2021 to 31-March-2023, the electricity consumption was 96,098.67 MWh.																														
Monitoring equipment	Electricity meters. Calibration of the electricity meters has been done according to national standard by qualified organizations. Readings were verified using electricity bill of the geothermal heating system. The accuracy of the electricity meters is 0.5S.																														
QA/QC procedures applied	The electricity meters are calibrated based on JJG 596-2012 Electrical Meters for Measuring Alternating-current Electrical Energy. All the 42 electricity meters were calibrated before the operation period of the geothermal heating system. Calibration of the 42 electricity meters is shown as the following table. If the electricity meters can be used normally, recalibration is not required. The validity is 5 years. <table><tr><th>NO.</th><th>Serial No.</th><th>Location</th><th>Calibration Date</th><th>Term of Validity</th></tr><tr><td>1</td><td>110238121401</td><td>1# BHGJ</td><td>08-October-2020</td><td>07-October-2025</td></tr><tr><td>2</td><td>110238121402</td><td>2# BHGJ</td><td>08-October-2020</td><td>07-October-2025</td></tr><tr><td>3</td><td>110238121403</td><td>3# BHGJ</td><td>08-October-2020</td><td>07-October-2025</td></tr><tr><td>4</td><td>110238121404</td><td>4# BHGJ</td><td>08-October-2020</td><td>07-October-2025</td></tr><tr><td>5</td><td>110238121405</td><td>5# BHGJ</td><td>08-October-2020</td><td>07-October-2025</td></tr></table>	NO.	Serial No.	Location	Calibration Date	Term of Validity	1	110238121401	1# BHGJ	08-October-2020	07-October-2025	2	110238121402	2# BHGJ	08-October-2020	07-October-2025	3	110238121403	3# BHGJ	08-October-2020	07-October-2025	4	110238121404	4# BHGJ	08-October-2020	07-October-2025	5	110238121405	5# BHGJ	08-October-2020	07-October-2025
NO.	Serial No.	Location	Calibration Date	Term of Validity																											
1	110238121401	1# BHGJ	08-October-2020	07-October-2025																											
2	110238121402	2# BHGJ	08-October-2020	07-October-2025																											
3	110238121403	3# BHGJ	08-October-2020	07-October-2025																											
4	110238121404	4# BHGJ	08-October-2020	07-October-2025																											
5	110238121405	5# BHGJ	08-October-2020	07-October-2025																											

	6	11023812140 6	6# BHGJ	08-October-2020	07-October-2025
	7	11023812140 7	7# BHGJ	08-October-2020	07-October-2025
	8	11023812140 8	8# BHGJ	08-October-2020	07-October-2025
	9	11023812140 9	9# BHGJ	08-October-2020	07-October-2025
	10	110238121410	10# BHGJ	08-October-2020	07-October-2025
	11	110238121411	1# XWYH	08-October-2020	07-October-2025
	12	11023812141 2	2# XWYH	08-October-2020	07-October-2025
	13	11023812141 3	3# XWYH	09-October-2020	08-October-2025
	14	110238121414	4# XWYH	09-October-2020	08-October-2025
	15	110238121415	5# XWYH	09-October-2020	08-October-2025
	16	110238121416	6# XWYH	09-October-2020	08-October-2025
	17	110238121417	7# XWYH	09-October-2020	08-October-2025
	18	11023812141 8	8# XWYH	09-October-2020	08-October-2025
	19	11023812141 9	9# XWYH	09-October-2020	08-October-2025
	20	11023812142 0	10# XWYH	09-October-2020	08-October-2025
	21	11023812142 1	1#WNS	09-October-2020	08-October-2025
	22	11023812142 2	2#WNS	09-October-2020	08-October-2025

	23	11023812142 3	1#YHGG	10-October-2020	09-October-2025
	24	11023812142 4	2#YHGG	10-October-2020	09-October-2025
	25	11023812142 5	1#CYGJ	10-October-2020	09-October-2025
	26	11023812142 6	2#CYGJ	10-October-2020	09-October-2025
	27	11023812142 7	3#CYGJ	10-October-2020	09-October-2025
	28	11023812142 8	1#LDC	10-October-2020	09-October-2025
	29	11023812142 9	2#LDC	10-October-2020	09-October-2025
	30	11023812143 0	3#LDC	10-October-2020	09-October-2025
	31	11023812143 1	1#XXHY	10-October-2020	09-October-2025
	32	11023812143 2	2#XXHY	10-October-2020	09-October-2025
	33	11023812143 3	3#XXHY	11-October-2020	10-October-2025
	34	11023812143 4	1#JSY	11-October-2020	10-October-2025
	35	11023812143 5	2#JSY	11-October-2020	10-October-2025
	36	11023812143 6	3#JSY	11-October-2020	10-October-2025
	37	11023812143 7	1#JYYXF	11-October-2020	10-October-2025
	38	11023812143 8	2#JYYXF	11-October-2020	10-October-2025
	39	11023812143 9	3#JYYXF	11-October-2020	10-October-2025

	40	11023812144 0	1#DJF	11-October-2020	10-October-2025
	41	11023812144 1	2#DJF	11-October-2020	10-October-2025
	42	11023812144 2	3#DJF	11-October-2020	10-October-2025
There were no missing data or damaged data during the 2 nd monitoring period. The electricity consumption of this monitoring period from 01-April-2021 to 31-March-2023 (96,098.67MWh) was cross checked with the electricity bill confirmed by each community property service company and payment receipt of the geothermal heating system. And the cross-check result is values are consistent.					
Purpose of data	To calculate project emissions				
Calculation method	-				
Comments	N/A				

Data / Parameter	$EF_{EL,j,y}$ ($EF_{grid,CM,y}$)
Data unit	tCO ₂ /MWh
Description	Combined margin emission factor for the grid in year y.
Source of data	Luohe city is in Henan province, which belongs to Central China Regional Power Grid (CCPG). The data of CCPG's Baseline emission factors of China's regional power grid for emission reduction projects in 2019 published by Ministry of Ecology and Environment of the People's Republic of China¹⁵, which calculated $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ based on Tool 07 (Version 07.0). $EF_{grid,CM,y}$ can be calculated as $EF_{grid,CM,y} = EF_{grid,OM,y} \times \omega_{OM} + EF_{grid,BM,y} \times \omega_{BM}$. As per paragraph 86(b) of Tool 07 (Version 07.0), $\omega_{OM}=0.5$ and $\omega_{BM}=0.5$ are used for the fixed crediting period. It's the monitoring period of the project which belongs to the fixed crediting period. Therefore, $\omega_{OM}=0.5$ and $\omega_{BM}=0.5$ were used for the monitoring period.
Description of measurement methods and procedures applied	Luohe city is in Henan province, which belongs to Central China Regional Power Grid (CCPG). The data of CCPG's $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ were taken from <i>Baseline emission factors of China's regional power grid for emission reduction projects in 2019</i> , which are the latest version published by Ministry of Ecology and Environment of the People's Republic of China. If new version issued, the value of $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ should be updated.

¹⁵ <http://www.mee.gov.cn/ywgz/ydqbhb/wsqtz/202012/W020201229610353340851.pdf>

Frequency of monitoring/recording	Once each monitoring period
Value applied:	0.5721 (0.8587*0.5+0.2854*0.5)
Monitoring equipment	-
QA/QC procedures applied	The latest version of <i>Baseline emission factors of China's regional power grid for emission reduction projects</i> published by Ministry of Ecology and Environment of the People's Republic of China were used for the monitoring period. It calculated $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ based on the latest version of <i>Tool 07</i> (Version 07.0).
Purpose of data	To calculate project emissions
Calculation method	-
Comments	N/A

Data / Parameter	$TDL_{j,y}$
Data unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j in year y .
Source of data	In case of scenario B and scenario C, case C.II, assume $TDL_{j,y}=0$ as a simplification. In case of other scenarios (scenario A and scenario C, cases C.I and C.III), choose one of the following options: 1. Use annual average value based on the most recent data available within the host country. 2. Use as default values of 20% for: (a) project or leakage electricity consumption sources; (b) baseline electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is larger than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies. 3. Use as default values of 3% for: (a) baseline electricity consumption sources. (b) project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is smaller than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.
Description of measurement methods and procedures applied	Scenario A: Electricity consumption from the grid is applied to the proposed project. For project electricity consumption sources, a default value of 20% is used for $TDL_{j,y}$.

Frequency of monitoring/recording	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
Value applied:	20%
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	To calculate project emissions
Comments	For (a): $TDL_{j,y}$ should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g., commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation.

Data / Parameter	A_m
Data unit	m ²
Description	Net heating area for construction type m .
Source of data	Heating supply contracts.
Description of measurement methods and procedures applied	Yearly measurement.
Frequency of monitoring/recording	Yearly
Value applied:	7,309,097 m ² for residential buildings of 2021-2022 heating season. 7,435,015 m ² for residential buildings of 2022-2023 heating season.
Monitoring equipment	-
QA/QC procedures applied	The data was cross-checked with Certificate of Enterprise Investment Project in Henan Province issued by Luohe Development and Reform Commission. The net heating area sourced from the heating supply contract were lower than that of the government approval. Because all the communities covered by the project are newly built, some of the local residents haven't moved in yet, and there is no need for heating during the 2021-2022 heating season and 2022-2023 heating season.

Purpose of data	To calculate baseline emissions
Comments	N/A

4.3 Monitoring Plan

The monitoring plan presented in this MR assures that real, measurable, long term GHG emission reductions can be monitored, recorded, and reported. It is a crucial procedure to identify the final VCUs of the project. This monitoring plan was implemented by the project owner during the project operation. The details of the monitoring plan are specified as follows:

Parameters to be monitored

The monitoring requirements for this methodology include the monitoring of parameters for both baseline and project emissions calculations. All provisions in the methodology and relevant tools shall apply, as described for each parameter in section 4.2 of the Report.

For the parameters of A_m , net heating area for construction type m (A_m) will be determined based on heating supply contracts.

Heating index for construction type m (HI_m) is sourced from the conservative standard index as provided in FSR. The values should be updated according to the latest national and local standards. Local standards take precedence over national standards.

Average technical transmission and distribution losses for providing electricity to source j in year y ($TDL_{j,y}$) shall be determined using the latest version of Tool 05.

Hours per hear heat utilization in well j (T_j) will be sourced from data logged in the Geothermal system (Operation Record of the Geothermal Space Heating System). Monthly operation time of the 42 heat exchange system will be exported by the VCS monitoring team at the beginning of the next month. The operation record of the geothermal heating system during the related heating season will be summarized by all the monthly record. Besides, the winter heating season is fixed by local regulations, which is usually from November 1 to March 31 of the next year.

Combined margin emission factor for the grid in year y ($EF_{EL,j,y}$ ($EF_{grid,CM,y}$)) is calculated using the procedures in the latest version of Tool 07. It shall be determined as per the latest Baseline emission factors of China's regional power grid for emission reduction projects published by Ministry of Ecology and Environment of the People's Republic of China.

Above all, the monitoring system only need to address the monitoring of parameter $\Delta t_{j,d,y}$, $FR_{j,d,y}$ and $EC_{PJ,j,y}$ (EC_y).

Monitoring framework

Above all, the monitoring system only need to address the monitoring of parameter $\Delta t_{j,d,y}$, $FR_{j,d,y}$ and $EC_{PJ,j,y}$ (EC_y). Figure 4-1 below outlines the organization structure of the monitoring system for the related three parameters. The project owner was responsible for the whole monitoring work. The VCS monitoring team was responsible for the monitoring of all the parameters to be monitored. All the data was reviewed by the project developer and VVB.

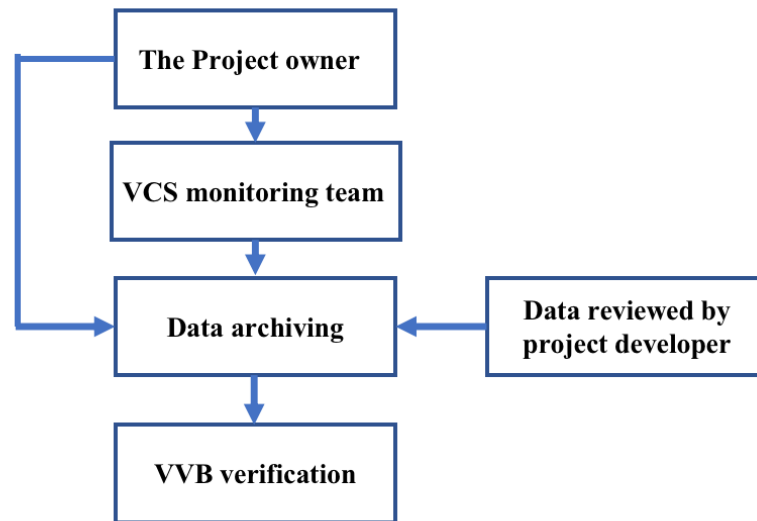


Figure 4-1 Organization Structure of the Monitoring Team

Principle of Monitoring

All heat supplied to end-users shall be measured at each substation k as part of the monitoring plan. For each isolated district heating network connected to a heat exchange station (k), the quantity of heat supplied should be measured continuously.

Meters shall be installed in a manner that ensures that only the quantity of heat supplied for space heating purposes and supplied by geothermal well j is metered. Besides, the meters shall be installed in a manner that ensures that metering of flow conditions at the heat exchanger be satisfied.

If point of heat measurement is changed or added during the crediting period, this should be documented transparently in the monitoring reports, and the procedure for post registration changes shall be followed.

Monitoring equipment and installation

Inlet and outlet temperatures at the downstream of each heat exchanger are monitored by the ultrasonic calorimeters. There are 42 production wells and 18 re-injection wells. There are totally 42 sets of heat exchange system. The temperature measurement range of the ultrasonic calorimeters are 4 °C to 95 °C with an accuracy of 0.01 °C.

Average flow rate at the downstream of each heat exchanger are monitored by the 42 ultrasonic calorimeters for outlet temperature. The highest measurement flow rate range of the ultrasonic calorimeters are 1,000 m³/h with an accuracy of 0.01 m³/h.

Electricity consumptions of the geothermal heating system are monitored by the electricity meters installed at each heat substation. 42 electricity meters are needed. The highest measurement range of the electricity meters are 999999.99 kWh with an accuracy of 0.01 kWh.

Installation and configuration of monitoring equipment are shown as Figure 4-2. All the monitoring equipment can measure continuously and installed in a manner that only the heat supplied by the geothermal heating system and the electricity consumed by it are measured.

In order to ensure measurements with a low degree of uncertainty, all the data monitoring equipment were calibrated by appropriately qualified third party according to appropriate national standard. The ultrasonic calorimeters are calibrated based on *JJG 225-2001 Verification Regulation of Heat Meters*¹⁶ and the electricity meters are calibrated based on *JJG 596-2012 Electrical Meters for Measuring Alternating-current Electrical Energy*¹⁷. All the monitoring equipment were calibrated before the operation period of the geothermal heating system. If the monitoring equipment can be used normally, recalibration is not required. The validity of them are 5 years.

The point of heat measurement was not changed or added during the 2st monitoring period.

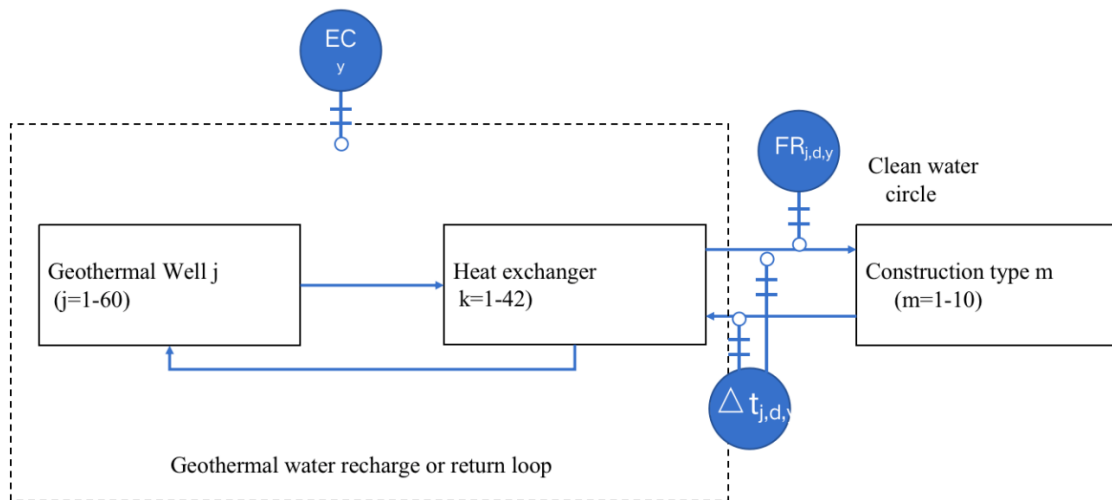


Figure 4-2 Installation and Configuration of Meters

EM (1-42): 42 electricity meters installed at 42 heat substations to monitor the electricity consumptions of the geothermal heating system.

1UC Outlet (1-21): The first 21 ultrasonic calorimeters installed at downstream of each heat exchange system to monitor the supply water temperature and the average flow rate from the geothermal heating system.

2UC Outlet (1-21): The second 21 ultrasonic calorimeters installed at downstream of each heat exchange system to monitor the supply water temperature and the average flow rate from the end users.

¹⁶ <https://www.wdfwx.net/doc60326801.htm>

¹⁷ <https://www.wdfwx.net/doc91019332.htm>

1UC Inlet (1-21): The first 21 ultrasonic calorimeters installed at downstream of each heat exchange system to monitor the return water temperature from the end users.

2UC Inlet (1-21): The second 21 ultrasonic calorimeters installed at downstream of each heat exchange system to monitor the return water temperature from the end users.

Quality control and quality assurance procedures

A quality management system was established, which ensures the quality and accuracy of the measured data.

Training

For all members involved in the project, necessary trainings were be provided by the project owner. Besides, the project owner should ensure that only skilled employees are allowed to undertake the monitoring work. The training contents should be regard to the general and technical aspects of the project to the extent appropriate, as well as basic understandings of VCS Standard and climate change.

Data management

All data collected as part of monitoring plan should be saved with at least 1 backup copy until the end of the crediting period. After the crediting period ends, the data should be archived electronically on hard disks and be kept at least 2 years after the end of the last crediting period.

Corrective actions

The whole VCS monitoring team will follow recognized standard data evaluation methods to guarantee that the data is reliable and accurate. The quality control and quality assurance procedures include the handling and correction of nonconformities in the implementation of the project or the monitoring plan. In case such nonconformities are observed:

- An analysis of the nonconformity and its causes will be carried out immediately by the project owner, with the help of external experts if necessary.

- A corrective action plan should then be developed to eliminate the non-conformity and its causes to prevent its recurrence.

- Corrective actions are implemented and reported back to the VCS monitoring team.

- Relative information will be included in the monitoring report and reported to VVB during the verification.

- For conservativeness, 0 value will be used for the missing data of $\Delta t_{j,d,y}$ and $FR_{j,d,y}$.

- For $EC_{PJ,j,y}$ (EC_y), average monthly electricity consumption in the MR (96,098.67 MWh/10=9,609.87 MWh) or average electricity consumption of the previous months whichever is higher will be used for missing data. This is the most conservative approach.

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5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions in year y (BE_y) can be calculated as follows,

$$BE_y = \sum_i (HS_{i,y}^{BL}) \times EF_{CO_2,i} / \eta_{BL,i}$$

Where:

BE_y	=	The baseline emissions from heat displaced by the project activity during the year y (t CO ₂ e/yr).
$EF_{CO_2,i}$	=	The CO ₂ emission factor per unit of energy of the fuel of technology i that would have been used in the baseline heating technology in (t CO ₂ /TJ). Where several fuel types are used in the boiler, use the fuel type with the lowest CO ₂ emission factor. Values provided by the fuel supplier are unavailable. IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol.2 (Energy) of 2006 IPCC Guidelines on National GHG Inventories are used. For coking coal, it is 87.3 tCO ₂ /TJ.
$\eta_{BL,i}$	=	The net thermal efficiency of the heating technology i using fossil fuel that would have been used in the absence of the project activity. The highest efficiency of coal-fired boilers provided by Zosen Boilers (79%), Fengcheng Energy Equipment Factory (80%) and Henan Hengxin Boiler Manufacturing Co., Ltd (85%). As per Table 3-1 Default baseline efficiency for different boilers of AM0072 (Version 03.0), the highest value of 85% for new coal-fired boiler is applicable for the proposed project. In summary, the efficiency of 85% is applied for the proposed project.
$HS_{i,y}^{BL}$	=	The net output of heat generated by the baseline heat supply system using the technology i measured at the end point of the heat facility, during the year y (TJ/yr).

$HS_{i,y}^{BL}$ can be calculated as follows,

$$HS_{i,y}^{BL} = w_i \times (HS_y - Loss^{PJ_y} + Loss^{BL_y})$$

Where:

$HS_{i,y}^{BL}$	=	The net output of heat generated by the baseline heat supply system using the technology i measured at the end point of the heat facility, during the year y (TJ/yr).
w_i	=	Assign weights for heat generated by technology i . As per section 4.1 of this Report, the baseline scenario of the project is 3(i) "Coal fired boilers in boiler

houses, supplying several buildings through a heat distribution network". Only one technology will be used. According to *Research on Heating in Winter of Luohe City* published by Housing and Urban-Rural Development Department of Henan Province, all the heating in winter of residential were supplied by coal fired boilers. As per paragraph 51(a)(ii) option 2 Assign weights based on available historical records of AM0072 (Version 03.0), w_i is equal to 1.

- HS_y = Net quantity of heat supplied by the geothermal heat resource(s) in the project activity, during the year y (TJ/yr).
- $Loss^{PJ}_y$ = The net distribution losses of the geothermal heat supply system during the year y (TJ/yr).
- $Loss^{BL}_y$ = The net distribution losses of the heat supply system, in the absence of project activity, during the year y (TJ/yr).

The net quantity of heat supplied by the project activity is estimated based on the heat provided by the geothermal well. It considers flow rates, temperature, and usage time for each geothermal well to be considered by the project activity.

$$HS_y = \min\{H_{CAP}, HS_{y,estimated}\} \quad (5)$$

$HS_{y,estimated}$ can be determined by the use of the flow and temperature of water supplied by the substation heat exchanger k to the demand side space heating.

$$HS_{y,estimated} = \sum_j (Q_{j,d,y} \times T_j \times CF) \quad (6)$$

Where:

- $HS_{y,estimated}$ = Estimated quantity of heat supplied by the geothermal heat resource(s) in the project activity, during the year y (TJ)
- $Q_{j,d,y}$ = Heat supplied at the downstream of heat exchanger (upstream of which is connected with water supply from the geothermal well j) (GW). It can be calculated as formula (7).
- T_j = Number of hours per year heat utilization at well j.
- CF = Conversion factor from GWh to TJ (3.6).

$$Q_{j,d,y} = \frac{FR_{j,d,y} \times \Delta t_{j,d,y} \times 4.18}{3.6} \times 10^{-9} \quad (7)$$

Where:

- $FR_{j,d,y}$ = Average flow rate at the downstream of heat exchanger (upstream of which is connected with water supply from the geothermal well j) in year y (kg/hr).
- $\Delta t_{j,d,y}$ = Heat supplied at the downstream of heat exchanger (upstream of which is connected with water supply from the geothermal well j) ($^{\circ}\text{C}$).

To ensure that the geothermal well is providing the required amount of energy a cap is

defined. The basis to define the cap is from the space heating design, which considers the net heating area, the heating index, the type of construction that will utilize the heat and the time used throughout the year for each construction type.

$$H_{CAP} = (\sum_m A_m \times HI_m \times T_j) \times CF + Loss_y^{PJ} - H_{ff} \quad (8)$$

Where:

H_{CAP}	=	The net quantity of heat supplied by the geothermal heat resource(s) in the project activity, during the year y (TJ).
A_m	=	Net heating area for construction type m (m ²).
HI_m	=	Heating index for construction type m (GW/m ²). As per Feasibility Report of the project, HI_m is 50 W/m ² for residential buildings.
T_j	=	Number of hours per year heat utilization at well j.
CF	=	Conversion factor from GWh to TJ (3.6).
$Loss_y^{PJ}$	=	Heat distribution losses from substation k to space heating areas (To be determined in Sub-step 2.b).
H_{ff}	=	Heat supplied by fossil fuel boiler, in case a boiler is used to meet the heat demand of network. No fossil fuel boiler is utilized in the project activity and H_{ff} is 0 TJ.

Based on the results of monitored parameters, heat supplied by the geothermal based heating system (each heat exchangers) is summarized as Table 5-1 and Table 5-2:

Table 5-1-1 : Net quantity of heat supplied by the geothermal heat resources during 2021-2022 season

Sub-areas	Heat Substations	Geothermal Wells	A_m (m ²)	Nov-21		Dec-21		Jan-22		Feb-22		Mar-22	
			Residential	$Loss_y^P$ (TJ)	H_{CAP} (TJ)	$Loss_y^P$ (TJ)	H_{CAP} (TJ)	$Loss_y^P$ (TJ)	H_{CAP} (TJ)	$Loss_y^P$ (TJ)	H_{CAP} (TJ)	$Loss_y^P$ (TJ)	H_{CAP} (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	295,260.00	3.83	42.09	3.95	43.50	3.95	43.50	3.57	39.29	3.95	43.50
	2# BHGJ	2# Production and Re-injection Well											
	3# BHGJ	3#Production and Re-injection Well	358,176.00	4.64	51.06	4.80	52.76	4.80	52.76	4.33	47.66	4.80	52.76
	4# BHGJ	4#Production and Re-injection Well											
	5# BHGJ	5#Production and Re-injection Well	263,340.00	3.41	37.54	3.53	38.79	3.53	38.79	3.19	35.04	3.53	38.79
	6# BHGJ	6#Production and Re-injection Well											
	7# BHGJ	7#Production and Re-injection Well	523,566.00	6.79	74.64	7.01	77.13	7.01	77.13	6.33	69.66	7.01	77.13
	8# BHGJ	8#Production and Re-injection Well											
	9# BHGJ	9#Production and Re-injection Well	323,232.00	4.19	46.08	4.33	47.62	4.33	47.62	3.91	43.01	4.33	47.62
	10# BHGJ	10#Production and Re-injection Well											
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	478,737.00	6.20	68.25	6.41	70.52	6.41	70.52	5.79	63.70	6.41	70.52
	2# XWYH	2# Production and Re-injection Well											

	3# XWYH	3#Production and Re-injection Well	114,705.00	1.49	16.35	1.54	16.90	1.54	16.90	1.39	15.26	1.54	16.90
	4# XWYH	4#Production and Re-injection Well											
	5# XWYH	5#Production and Re-injection Well	543,892.00	7.05	77.54	7.28	80.12	7.28	80.12	6.58	72.37	7.28	80.12
	6# XWYH	6#Production and Re-injection Well											
	7# XWYH	7#Production and Re-injection Well	731,456.00	9.48	104.28	9.80	107.75	9.80	107.75	8.85	97.32	9.80	107.75
	8# XWYH	8#Production and Re-injection Well											
	9# XWYH	9#Production and Re-injection Well	423,904.00	5.49	60.43	5.68	62.45	5.68	62.45	5.13	56.40	5.68	62.45
	10# XWYH	10#Production and Re-injection Well											
Weinisi	1#WNS	1#Production and Re-injection Well	437,902.00	5.68	62.43	5.86	64.51	5.86	64.51	5.30	58.27	5.86	64.51
	2#WNS	2# Production and Re-injection Well											
Yuehugongguan	1# YHGG	1#Production and Re-injection Well	361,118.00	4.68	51.48	4.84	53.20	4.84	53.20	4.37	48.05	4.84	53.20
	2# YHGG	2# Production and Re-injection Well											
Changyuanguoji	1# CYGJ	1#Production and Re-injection Well	442,360.00	5.73	63.06	5.92	65.16	5.92	65.16	5.35	58.86	5.92	65.16
	2# CYGJ	2# Production and Re-injection Well											
	3# CYGJ	3# Production and Re-injection Well											

Lvdicheng	1# LDC	1#Production and Re-injection Well	392,805.00	5.09	56.00	5.26	57.86	5.26	57.86	4.75	52.27	5.26	57.86
	2# LDC	2# Production and Re-injection Well											
	3# LDC	3# Production and Re-injection Well											
Xixihuayuan	1# XXHY	1#Production and Re-injection Well	439,944.00	5.70	62.72	5.89	64.81	5.89	64.81	5.32	58.54	5.89	64.81
	2# XXHY	2#Production and Re-injection Well											
	3# XXHY	3#Production and Re-injection Well											
Jiangshanyin	1# JSY	1#Production and Re-injection Well	363,938.00	4.72	51.88	4.87	53.61	4.87	53.61	4.40	48.42	4.87	53.61
	2# JSY	2# Production and Re-injection Well											
	3# JSY	3# Production and Re-injection Well											
Jianyeyunxifu	1# JYYXF	1#Production and Re-injection Well	422,436.00	5.47	60.22	5.66	62.23	5.66	62.23	5.11	56.21	5.66	62.23
	2# JYYXF	2# Production and Re-injection Well											
	3# JYYXF	3# Production and Re-injection Well											
Danjiangfu	1# DJF	1#Production and Re-injection Well	392,326.00	5.08	55.93	5.25	57.79	5.25	57.79	4.75	52.20	5.25	57.79
	2# DJF	2# Production and Re-injection Well											
	3# DJF	3# Production and Re-injection Well											

Total	7,309,097.00	94.73	1,041.98	97.88	1,076.72	97.88	1,076.72	88.41	972.52	97.88	1,076.72
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Table 5-1-2 : Net quantity of heat supplied by the geothermal heat resources during 2022-2023 season

Sub-areas	Heat Substations	Geothermal Wells	A_m (m ²)	Nov-22		Dec-22		Jan-23		Feb-23		Mar-23	
			Residential	Loss ^{PJy} (TJ)	H _{CAP} (TJ)	Loss ^{PJy} (TJ)	H _{CAP} (TJ)	Loss ^{PJy} (TJ)	H _{CAP} (TJ)	Loss ^{PJy} (TJ)	H _{CAP} (TJ)	Loss ^{PJy} (TJ)	H _{CAP} (TJ)
Binhguoj i	1# BHGJ	1#Production and Re-injection Well	300,884.00	3.90	42.89	4.03	44.32	4.03	44.32	3.64	40.03	4.03	44.32
	2# BHGJ	2# Production and Re-injection Well											
	3# BHGJ	3#Production and Re-injection Well	365,064.00	4.73	52.04	4.89	53.78	4.89	53.78	4.42	48.57	4.89	53.78
	4# BHGJ	4#Production and Re-injection Well											
	5# BHGJ	5#Production and Re-injection Well	268,380.00	3.48	38.26	3.59	39.54	3.59	39.54	3.25	35.71	3.59	39.54
	6# BHGJ	6#Production and Re-injection Well											
	7# BHGJ	7#Production and Re-injection Well	533,596.00	6.92	76.07	7.15	78.61	7.15	78.61	6.45	71.00	7.15	78.61
	8# BHGJ	8#Production and Re-injection Well											
	9# BHGJ	9#Production and Re-injection Well	329,388.00	4.27	46.96	4.41	48.52	4.41	48.52	3.98	43.83	4.41	48.52
	10# BHGJ	10#Production and Re-injection Well											

Xiangwan yihao	1# XWYH	1#Production and Re-injection Well	487,917.00	6.32	69.56	6.53	71.88	6.53	71.88	5.90	64.92	6.53	71.88
	2# XWYH	2# Production and Re-injection Well											
	3# XWYH	3#Production and Re-injection Well	116,913.00	1.52	16.67	1.57	17.22	1.57	17.22	1.41	15.56	1.57	17.22
	4# XWYH	4#Production and Re-injection Well											
	5# XWYH	5#Production and Re-injection Well	549,067.00	7.12	78.27	7.35	80.88	7.35	80.88	6.64	73.06	7.35	80.88
	6# XWYH	6#Production and Re-injection Well											
	7# XWYH	7#Production and Re-injection Well	752,576.00	9.75	107.29	10.08	110.86	10.08	110.86	9.10	100.1 3	10.08	110.86
	8# XWYH	8#Production and Re-injection Well											
	9# XWYH	9#Production and Re-injection Well	432,017.00	5.60	61.59	5.79	63.64	5.79	63.64	5.23	57.48	5.79	63.64
	10# XWYH	10#Production and Re-injection Well											
Weinisi	1#WNS	1#Production and Re-injection Well	437,902.00	5.68	62.43	5.86	64.51	5.86	64.51	5.30	58.27	5.86	64.51
	2#WNS	2# Production and Re-injection Well											
Yuehugon gguan	1# YHGG	1#Production and Re-injection Well	365,937.00	4.74	52.17	4.90	53.91	4.90	53.91	4.43	48.69	4.90	53.91
	2# YHGG	2# Production and Re-injection Well											
Changyua nguoji	1# CYGJ	1#Production and Re-injection Well	447,003.00	5.79	63.72	5.99	65.85	5.99	65.85	5.41	59.48	5.99	65.85

	2# CYGJ	2# Production and Re-injection Well											
	3# CYGJ	3# Production and Re-injection Well											
Lvdi Cheng	1# LDC	1# Production and Re-injection Well	400,330.00	5.19	57.07	5.36	58.97	5.36	58.97	4.84	53.27	5.36	58.97
	2# LDC	2# Production and Re-injection Well											
	3# LDC	3# Production and Re-injection Well											
Xixihuayuan	1# XXHY	1# Production and Re-injection Well	448,339.00	5.81	63.92	6.00	66.05	6.00	66.05	5.42	59.65	6.00	66.05
	2# XXHY	2# Production and Re-injection Well											
	3# XXHY	3# Production and Re-injection Well											
Jiangshan yin	1# JSY	1# Production and Re-injection Well	370,910.00	4.81	52.88	4.97	54.64	4.97	54.64	4.49	49.35	4.97	54.64
	2# JSY	2# Production and Re-injection Well											
	3# JSY	3# Production and Re-injection Well											
Jianyeyun xifu	1# JYYXF	1# Production and Re-injection Well	430,482.00	5.58	61.37	5.77	63.42	5.77	63.42	5.21	57.28	5.77	63.42
	2# JYYXF	2# Production and Re-injection Well											
	3# JYYXF	3# Production and Re-injection Well											
Danjiangf u	1# DJF	1# Production and Re-injection Well	398,310.00	5.16	56.78	5.33	58.68	5.33	58.68	4.82	53.00	5.33	58.68

	2# DJF	2# Production and Re-injection Well											
	3# DJF	3# Production and Re-injection Well											
Total			7,435,015.00	96.36	1,059.94	99.57	1,095.27	99.57	1,095.27	89.93	989.27	99.57	1,095.27

Table 5-2 : Estimated quantity of heat supplied by the geothermal heat resources

Nov-21							
Sub-areas	Heat Substations	Geothermal Wells	FR _{j,d,y} (kg/hr)	$\Delta t_{j,d,y}$ (°C)	Q _{j,d,y} (GW)	T _j (h)	HS _{y,estimated} (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	642,070.00	11.99	0.00894	720	23.17
	2# BHGJ	2# Production and Re-injection Well	643,100.00	12.08	0.00902	720	23.38
	3# BHGJ	3#Production and Re-injection Well	643,660.00	12.01	0.00898	720	23.27
	4# BHGJ	4#Production and Re-injection Well	643,350.00	11.89	0.00888	720	23.02
	5# BHGJ	5#Production and Re-injection Well	642,640.00	11.91	0.00889	720	23.04
	6# BHGJ	6#Production and Re-injection Well	643,180.00	12.02	0.00898	720	23.27
	7# BHGJ	7#Production and Re-injection Well	642,970.00	12.01	0.00897	720	23.24
	8# BHGJ	8#Production and Re-injection Well	642,590.00	11.99	0.00895	720	23.19
	9# BHGJ	9#Production and Re-injection Well	642,750.00	12.06	0.00900	720	23.33
	10# BHGJ	10#Production and Re-injection Well	643,670.00	11.93	0.00892	720	23.11
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	643,020.00	11.98	0.00894	720	23.18
	2# XWYH	2# Production and Re-injection Well	642,040.00	12.02	0.00896	720	23.23
	3# XWYH	3#Production and Re-injection Well	643,610.00	11.97	0.00895	720	23.19
	4# XWYH	4#Production and Re-injection Well	642,670.00	12.07	0.00901	720	23.35
	5# XWYH	5#Production and Re-injection Well	643,300.00	11.94	0.00892	720	23.12
	6# XWYH	6#Production and Re-injection Well	643,890.00	11.95	0.00893	720	23.16
	7# XWYH	7#Production and Re-injection Well	644,480.00	11.94	0.00893	720	23.16
	8# XWYH	8#Production and Re-injection Well	643,150.00	12.01	0.00897	720	23.25

	9# XWYH	9#Production and Re-injection Well	643,900.00	12.06	0.00902	720	23.37
	10# XWYH	10#Production and Re-injection Well	643,820.00	12.00	0.00897	720	23.25
Weinisi	1#WNS	1#Production and Re-injection Well	643,510.00	12.05	0.00900	720	23.34
	2#WNS	2# Production and Re-injection Well	642,820.00	12.01	0.00896	720	23.23
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	643,570.00	11.97	0.00894	720	23.18
	2#YHGG	2# Production and Re-injection Well	643,190.00	12.02	0.00898	720	23.27
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	643,220.00	12.06	0.00901	720	23.35
	2#CYGJ	2# Production and Re-injection Well	643,340.00	12.04	0.00899	720	23.31
	3#CYGJ	3# Production and Re-injection Well	642,100.00	11.97	0.00892	720	23.13
Lvdicheng	1#LDC	1#Production and Re-injection Well	643,430.00	11.99	0.00896	720	23.22
	2#LDC	2# Production and Re-injection Well	643,200.00	12.01	0.00897	720	23.25
	3#LDC	3# Production and Re-injection Well	643,840.00	11.97	0.00895	720	23.19
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	643,310.00	12.00	0.00896	720	23.23
	2#XXHY	2#Production and Re-injection Well	642,620.00	12.05	0.00899	720	23.31
	3#XXHY	3#Production and Re-injection Well	642,420.00	12.06	0.00900	720	23.32
Jiangshanyin	1#JSY	1#Production and Re-injection Well	643,370.00	11.93	0.00891	720	23.10
	2#JSY	2# Production and Re-injection Well	643,260.00	12.06	0.00901	720	23.35
	3#JSY	3# Production and Re-injection Well	643,300.00	12.10	0.00904	720	23.43
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	643,170.00	12.04	0.00899	720	23.31
	2#JYYXF	2# Production and Re-injection Well	642,990.00	11.94	0.00891	720	23.11
	3#JYYXF	3# Production and Re-injection Well	642,800.00	12.03	0.00898	720	23.27
Danjiangfu	1#DJF	1#Production and Re-injection Well	644,140.00	11.97	0.00895	720	23.21
	2#DJF	2# Production and Re-injection Well	643,230.00	11.92	0.00890	720	23.08
	3#DJF	3# Production and Re-injection Well	643,480.00	12.00	0.00897	720	23.24
Total							975.66

Dec-21							
Sub-areas	Heat Substations	Geothermal Wells	$FR_{j,d,y}$ (kg/hr)	$\Delta t_{j,d,y}$ (°C)	$Q_{j,d,y}$ (GW)	T_j (h)	$HS_{y,estimated}$ (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	642,920.00	11.96	0.00893	744	23.91
	2# BHGJ	2# Production and Re-injection Well	643,770.00	12.01	0.00898	744	24.04
	3# BHGJ	3#Production and Re-injection Well	642,900.00	11.96	0.00893	744	23.91
	4# BHGJ	4#Production and Re-injection Well	643,100.00	12.01	0.00897	744	24.02
	5# BHGJ	5#Production and Re-injection Well	642,690.00	12.05	0.00899	744	24.08

	6# BHGJ	6#Production and Re-injection Well	643,760.00	12.02	0.00898	744	24.06
	7# BHGJ	7#Production and Re-injection Well	643,300.00	11.93	0.00891	744	23.87
	8# BHGJ	8#Production and Re-injection Well	642,980.00	11.98	0.00894	744	23.96
	9# BHGJ	9#Production and Re-injection Well	643,190.00	12.04	0.00899	744	24.08
	10# BHGJ	10#Production and Re-injection Well	643,520.00	11.97	0.00894	744	23.96
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	643,090.00	12.06	0.00901	744	24.12
	2# XWYH	2# Production and Re-injection Well	643,990.00	11.97	0.00895	744	23.97
	3# XWYH	3#Production and Re-injection Well	642,650.00	12.13	0.00905	744	24.24
	4# XWYH	4#Production and Re-injection Well	643,100.00	12.10	0.00904	744	24.20
	5# XWYH	5#Production and Re-injection Well	642,500.00	12.05	0.00899	744	24.08
	6# XWYH	6#Production and Re-injection Well	643,560.00	12.04	0.00900	744	24.10
	7# XWYH	7#Production and Re-injection Well	642,530.00	12.02	0.00897	744	24.02
	8# XWYH	8#Production and Re-injection Well	643,100.00	12.06	0.00901	744	24.12
	9# XWYH	9#Production and Re-injection Well	643,060.00	11.98	0.00895	744	23.96
	10# XWYH	10#Production and Re-injection Well	643,080.00	12.02	0.00898	744	24.04
Weinisi	1#WNS	1#Production and Re-injection Well	642,790.00	12.03	0.00898	744	24.05
	2#WNS	2# Production and Re-injection Well	642,730.00	11.91	0.00889	744	23.81
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	643,090.00	12.00	0.00896	744	24.00
	2#YHGG	2# Production and Re-injection Well	643,320.00	12.00	0.00896	744	24.01
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	642,900.00	11.91	0.00889	744	23.81
	2#CYGJ	2# Production and Re-injection Well	643,850.00	11.98	0.00896	744	23.99
	3#CYGJ	3# Production and Re-injection Well	643,390.00	12.01	0.00897	744	24.03
Lvdicheng	1#LDC	1#Production and Re-injection Well	643,430.00	12.00	0.00897	744	24.01
	2#LDC	2# Production and Re-injection Well	643,740.00	11.99	0.00896	744	24.00
	3#LDC	3# Production and Re-injection Well	643,140.00	12.05	0.00900	744	24.10
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	642,270.00	12.04	0.00898	744	24.05
	2#XXHY	2#Production and Re-injection Well	642,530.00	11.88	0.00886	744	23.74
	3#XXHY	3#Production and Re-injection Well	643,220.00	12.09	0.00903	744	24.18
Jiangshanyin	1#JSY	1#Production and Re-injection Well	643,410.00	12.04	0.00899	744	24.09
	2#JSY	2# Production and Re-injection Well	643,750.00	11.94	0.00892	744	23.90
	3#JSY	3# Production and Re-injection Well	643,570.00	12.02	0.00898	744	24.06
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	643,110.00	12.02	0.00898	744	24.04
	2#JYYXF	2# Production and Re-injection Well	642,520.00	11.96	0.00892	744	23.90
	3#JYYXF	3# Production and Re-injection Well	642,000.00	12.02	0.00896	744	24.00

Danjiangfu	1#DJF	1#Production and Re-injection Well	642,620.00	12.06	0.00900	744	24.10
	2#DJF	2# Production and Re-injection Well	643,070.00	12.04	0.00899	744	24.08
	3#DJF	3# Production and Re-injection Well	643,210.00	11.92	0.00890	744	23.84
Total							1008.54

Jan-22							
Sub-areas	Heat Substations	Geothermal Wells	FR _{i,d,y} (kg/hr)	$\Delta t_{j,d,y}$ (°C)	Q _{i,d,y} (GW)	T _j (h)	HS _{y,estimated} (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	642,900.00	12.06	0.00900	744	24.11
	2# BHGJ	2# Production and Re-injection Well	642,720.00	11.93	0.00890	744	23.85
	3# BHGJ	3#Production and Re-injection Well	643,420.00	12.06	0.00901	744	24.13
	4# BHGJ	4#Production and Re-injection Well	643,630.00	12.00	0.00897	744	24.02
	5# BHGJ	5#Production and Re-injection Well	643,000.00	11.94	0.00891	744	23.88
	6# BHGJ	6#Production and Re-injection Well	643,350.00	11.93	0.00891	744	23.87
	7# BHGJ	7#Production and Re-injection Well	644,100.00	11.99	0.00897	744	24.02
	8# BHGJ	8#Production and Re-injection Well	643,040.00	12.06	0.00900	744	24.12
	9# BHGJ	9#Production and Re-injection Well	643,620.00	11.98	0.00895	744	23.98
	10# BHGJ	10#Production and Re-injection Well	642,810.00	11.96	0.00893	744	23.91
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	642,910.00	11.99	0.00895	744	23.97
	2# XWYH	2# Production and Re-injection Well	643,260.00	12.01	0.00897	744	24.03
	3# XWYH	3#Production and Re-injection Well	643,530.00	12.03	0.00899	744	24.08
	4# XWYH	4#Production and Re-injection Well	642,070.00	11.99	0.00894	744	23.94
	5# XWYH	5#Production and Re-injection Well	643,460.00	11.94	0.00892	744	23.89
	6# XWYH	6#Production and Re-injection Well	643,540.00	12.05	0.00900	744	24.12
	7# XWYH	7#Production and Re-injection Well	643,520.00	12.09	0.00903	744	24.20
	8# XWYH	8#Production and Re-injection Well	642,790.00	12.02	0.00897	744	24.03
	9# XWYH	9#Production and Re-injection Well	643,270.00	12.09	0.00903	744	24.19
	10# XWYH	10#Production and Re-injection Well	642,820.00	11.99	0.00895	744	23.97
Weinisi	1#WNS	1#Production and Re-injection Well	643,280.00	12.01	0.00897	744	24.03
	2#WNS	2# Production and Re-injection Well	642,450.00	11.93	0.00890	744	23.84
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	643,820.00	12.02	0.00899	744	24.07
	2#YHGG	2# Production and Re-injection Well	643,340.00	12.00	0.00896	744	24.01
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	643,220.00	12.03	0.00898	744	24.06
	2#CYGJ	2# Production and Re-injection Well	643,700.00	11.97	0.00895	744	23.96

	3#CYGJ	3# Production and Re-injection Well	642,420.00	11.98	0.00894	744	23.93
Lvdicheng	1#LDC	1#Production and Re-injection Well	643,260.00	12.06	0.00901	744	24.13
	2#LDC	2# Production and Re-injection Well	644,000.00	11.95	0.00894	744	23.93
	3#LDC	3# Production and Re-injection Well	642,830.00	11.97	0.00893	744	23.93
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	643,520.00	12.00	0.00897	744	24.02
	2#XXHY	2#Production and Re-injection Well	642,610.00	11.93	0.00890	744	23.84
	3#XXHY	3#Production and Re-injection Well	643,310.00	11.96	0.00893	744	23.93
Jiangshanyin	1#JSY	1#Production and Re-injection Well	643,050.00	12.02	0.00897	744	24.04
	2#JSY	2# Production and Re-injection Well	644,030.00	12.00	0.00897	744	24.03
	3#JSY	3# Production and Re-injection Well	642,580.00	12.01	0.00896	744	24.00
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	643,120.00	11.99	0.00895	744	23.98
	2#JYYXF	2# Production and Re-injection Well	643,270.00	12.00	0.00896	744	24.01
	3#JYYXF	3# Production and Re-injection Well	643,710.00	11.93	0.00892	744	23.88
Danjiangfu	1#DJF	1#Production and Re-injection Well	643,100.00	12.05	0.00900	744	24.10
	2#DJF	2# Production and Re-injection Well	643,490.00	11.99	0.00896	744	23.99
	3#DJF	3# Production and Re-injection Well	643,570.00	11.98	0.00895	744	23.98
Total							1007.97

Feb-22							
Sub-areas	Heat Substations	Geothermal Wells	$FR_{j,d,y}$ (kg/hr)	$\Delta t_{j,d,y}$ (°C)	$Q_{j,d,y}$ (GW)	T_j (h)	$HS_{y,estimated}$ (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	643,850.00	11.93	0.00892	672	21.58
	2# BHGJ	2# Production and Re-injection Well	643,620.00	11.93	0.00892	672	21.57
	3# BHGJ	3#Production and Re-injection Well	642,980.00	12.02	0.00897	672	21.71
	4# BHGJ	4#Production and Re-injection Well	642,660.00	12.07	0.00901	672	21.79
	5# BHGJ	5#Production and Re-injection Well	643,010.00	11.96	0.00893	672	21.60
	6# BHGJ	6#Production and Re-injection Well	643,670.00	11.93	0.00892	672	21.57
	7# BHGJ	7#Production and Re-injection Well	642,650.00	11.96	0.00892	672	21.59
	8# BHGJ	8#Production and Re-injection Well	642,990.00	11.93	0.00891	672	21.55
	9# BHGJ	9#Production and Re-injection Well	643,770.00	11.97	0.00895	672	21.65
	10# BHGJ	10#Production and Re-injection Well	643,220.00	11.91	0.00889	672	21.52
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	644,110.00	12.00	0.00897	672	21.71
	2# XWYH	2# Production and Re-injection Well	642,560.00	11.95	0.00892	672	21.57
	3# XWYH	3#Production and Re-injection Well	643,300.00	12.02	0.00898	672	21.72

	4# XWYH	4#Production and Re-injection Well	642,830.00	12.05	0.00899	672	21.76
	5# XWYH	5#Production and Re-injection Well	643,610.00	12.01	0.00898	672	21.71
	6# XWYH	6#Production and Re-injection Well	643,580.00	12.07	0.00902	672	21.82
	7# XWYH	7#Production and Re-injection Well	643,020.00	12.06	0.00900	672	21.78
	8# XWYH	8#Production and Re-injection Well	643,350.00	11.96	0.00893	672	21.61
	9# XWYH	9#Production and Re-injection Well	643,330.00	12.07	0.00902	672	21.81
	10# XWYH	10#Production and Re-injection Well	643,520.00	12.01	0.00897	672	21.71
Weinisi	1#WNS	1#Production and Re-injection Well	643,080.00	12.01	0.00897	672	21.69
	2#WNS	2# Production and Re-injection Well	642,130.00	11.98	0.00893	672	21.61
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	643,370.00	12.00	0.00896	672	21.69
	2#YHGG	2# Production and Re-injection Well	643,450.00	12.10	0.00904	672	21.87
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	643,590.00	12.02	0.00898	672	21.73
	2#CYGJ	2# Production and Re-injection Well	642,350.00	12.01	0.00896	672	21.67
	3#CYGJ	3# Production and Re-injection Well	643,180.00	12.03	0.00898	672	21.73
Lvdicheng	1#LDC	1#Production and Re-injection Well	643,360.00	12.09	0.00903	672	21.85
	2#LDC	2# Production and Re-injection Well	642,310.00	12.07	0.00900	672	21.78
	3#LDC	3# Production and Re-injection Well	642,920.00	12.02	0.00897	672	21.71
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	643,550.00	11.92	0.00891	672	21.55
	2#XXHY	2#Production and Re-injection Well	642,970.00	11.95	0.00892	672	21.58
	3#XXHY	3#Production and Re-injection Well	643,300.00	11.95	0.00893	672	21.59
Jiangshanyin	1#JSY	1#Production and Re-injection Well	643,170.00	12.01	0.00897	672	21.70
	2#JSY	2# Production and Re-injection Well	643,840.00	11.99	0.00896	672	21.68
	3#JSY	3# Production and Re-injection Well	643,420.00	11.99	0.00896	672	21.67
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	643,010.00	11.95	0.00892	672	21.58
	2#JYYXF	2# Production and Re-injection Well	642,910.00	11.94	0.00891	672	21.56
	3#JYYXF	3# Production and Re-injection Well	643,710.00	12.07	0.00902	672	21.82
Danjiangfu	1#DJF	1#Production and Re-injection Well	642,810.00	11.91	0.00889	672	21.51
	2#DJF	2# Production and Re-injection Well	642,930.00	12.02	0.00897	672	21.71
	3#DJF	3# Production and Re-injection Well	643,400.00	12.04	0.00899	672	21.76
Total							910.37

Mar-22							
Sub-areas	Heat Substations	Geothermal Wells	$FR_{j,d,y}$ (kg/hr)	$\Delta t_{j,d,y}$ (°C)	$Q_{j,d,y}$ (GW)	T_j (h)	$HS_{y,estimated}$ (TJ)

Binhuguoji	1# BHGJ	1#Production and Re-injection Well	642,440.00	12.04	0.00898	744	24.06
	2# BHGJ	2# Production and Re-injection Well	643,790.00	12.09	0.00904	744	24.21
	3# BHGJ	3#Production and Re-injection Well	643,550.00	12.06	0.00901	744	24.14
	4# BHGJ	4#Production and Re-injection Well	642,950.00	12.08	0.00902	744	24.15
	5# BHGJ	5#Production and Re-injection Well	642,850.00	12.02	0.00897	744	24.03
	6# BHGJ	6#Production and Re-injection Well	643,480.00	11.97	0.00894	744	23.95
	7# BHGJ	7#Production and Re-injection Well	643,660.00	11.96	0.00894	744	23.94
	8# BHGJ	8#Production and Re-injection Well	642,240.00	11.95	0.00891	744	23.87
	9# BHGJ	9#Production and Re-injection Well	643,040.00	12.00	0.00896	744	24.00
	10# BHGJ	10#Production and Re-injection Well	642,900.00	12.06	0.00900	744	24.11
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	642,280.00	11.91	0.00888	744	23.79
	2# XWYH	2# Production and Re-injection Well	642,840.00	11.97	0.00893	744	23.93
	3# XWYH	3#Production and Re-injection Well	644,020.00	12.02	0.00899	744	24.07
	4# XWYH	4#Production and Re-injection Well	642,210.00	11.95	0.00891	744	23.87
	5# XWYH	5#Production and Re-injection Well	642,380.00	11.92	0.00889	744	23.81
	6# XWYH	6#Production and Re-injection Well	642,850.00	11.98	0.00894	744	23.95
	7# XWYH	7#Production and Re-injection Well	642,700.00	12.02	0.00897	744	24.02
	8# XWYH	8#Production and Re-injection Well	642,760.00	12.02	0.00897	744	24.03
	9# XWYH	9#Production and Re-injection Well	642,350.00	12.04	0.00898	744	24.05
	10# XWYH	10#Production and Re-injection Well	643,340.00	11.97	0.00894	744	23.95
Weinisi	1#WNS	1#Production and Re-injection Well	642,820.00	12.00	0.00896	744	23.99
	2#WNS	2# Production and Re-injection Well	643,320.00	12.01	0.00897	744	24.03
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	643,740.00	12.06	0.00901	744	24.14
	2#YHGG	2# Production and Re-injection Well	643,700.00	12.02	0.00898	744	24.06
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	643,600.00	12.04	0.00900	744	24.10
	2#CYGJ	2# Production and Re-injection Well	642,840.00	12.02	0.00897	744	24.03
	3#CYGJ	3# Production and Re-injection Well	643,220.00	12.05	0.00900	744	24.10
Lvdicheng	1#LDC	1#Production and Re-injection Well	642,810.00	11.97	0.00893	744	23.93
	2#LDC	2# Production and Re-injection Well	642,910.00	12.03	0.00898	744	24.05
	3#LDC	3# Production and Re-injection Well	642,950.00	11.96	0.00893	744	23.91
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	643,260.00	12.07	0.00902	744	24.15
	2#XXHY	2#Production and Re-injection Well	642,880.00	12.01	0.00896	744	24.01
	3#XXHY	3#Production and Re-injection Well	644,050.00	11.94	0.00893	744	23.92
Jiangshanyin	1#JSY	1#Production and Re-injection Well	642,870.00	12.05	0.00899	744	24.09

	2#JSY	2# Production and Re-injection Well	641,920.00	12.00	0.00894	744	23.96
	3#JSY	3# Production and Re-injection Well	643,080.00	12.01	0.00897	744	24.02
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	642,040.00	11.98	0.00893	744	23.92
	2#JYYXF	2# Production and Re-injection Well	643,600.00	11.95	0.00893	744	23.92
	3#JYYXF	3# Production and Re-injection Well	643,700.00	12.02	0.00898	744	24.06
Danjiangfu	1#DJF	1#Production and Re-injection Well	642,980.00	11.95	0.00892	744	23.90
	2#DJF	2# Production and Re-injection Well	643,190.00	11.96	0.00893	744	23.92
	3#DJF	3# Production and Re-injection Well	643,880.00	11.99	0.00896	744	24.01
Total							1008.15

Nov-22							
Sub-areas	Heat Substations	Geothermal Wells	FR _{i,d,y} (kg/hr)	Δt _{j,d,y} (°C)	Q _{i,d,y} (GW)	T _j (h)	HS _{y,estimated} (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	642,440.00	11.96	0.00892	744	23.90
	2# BHGJ	2# Production and Re-injection Well	643,830.00	11.97	0.00895	744	23.97
	3# BHGJ	3#Production and Re-injection Well	643,150.00	12.00	0.00896	744	24.00
	4# BHGJ	4#Production and Re-injection Well	643,550.00	11.98	0.00895	744	23.98
	5# BHGJ	5#Production and Re-injection Well	642,370.00	11.99	0.00894	744	23.95
	6# BHGJ	6#Production and Re-injection Well	642,910.00	11.98	0.00894	744	23.95
	7# BHGJ	7#Production and Re-injection Well	643,010.00	12.06	0.00900	744	24.12
	8# BHGJ	8#Production and Re-injection Well	642,900.00	11.99	0.00895	744	23.97
	9# BHGJ	9#Production and Re-injection Well	643,440.00	12.08	0.00903	744	24.17
	10# BHGJ	10#Production and Re-injection Well	643,040.00	12.00	0.00896	744	24.00
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	642,710.00	11.98	0.00894	744	23.95
	2# XWYH	2# Production and Re-injection Well	643,190.00	12.03	0.00898	744	24.06
	3# XWYH	3#Production and Re-injection Well	643,550.00	11.95	0.00893	744	23.92
	4# XWYH	4#Production and Re-injection Well	643,450.00	12.04	0.00900	744	24.09
	5# XWYH	5#Production and Re-injection Well	642,360.00	11.96	0.00892	744	23.89
	6# XWYH	6#Production and Re-injection Well	643,090.00	12.02	0.00898	744	24.04
	7# XWYH	7#Production and Re-injection Well	641,560.00	11.92	0.00888	744	23.78
	8# XWYH	8#Production and Re-injection Well	643,260.00	12.03	0.00899	744	24.07
	9# XWYH	9#Production and Re-injection Well	643,180.00	12.04	0.00899	744	24.08
	10# XWYH	10#Production and Re-injection Well	642,700.00	12.08	0.00901	744	24.14
Weinisi	1#WNS	1#Production and Re-injection Well	642,870.00	12.04	0.00899	744	24.07

	2#WNS	2# Production and Re-injection Well	643,060.00	12.06	0.00900	744	24.12
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	643,470.00	12.06	0.00901	744	24.13
	2#YHGG	2# Production and Re-injection Well	643,300.00	12.00	0.00896	744	24.01
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	643,090.00	11.87	0.00886	744	23.74
	2#CYGJ	2# Production and Re-injection Well	643,500.00	12.05	0.00900	744	24.11
	3#CYGJ	3# Production and Re-injection Well	643,570.00	11.96	0.00894	744	23.94
Lvdi Cheng	1#LDC	1#Production and Re-injection Well	642,460.00	12.06	0.00900	744	24.10
	2#LDC	2# Production and Re-injection Well	642,990.00	12.10	0.00903	744	24.20
	3#LDC	3# Production and Re-injection Well	644,120.00	11.91	0.00891	744	23.86
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	643,660.00	12.00	0.00897	744	24.02
	2#XXHY	2#Production and Re-injection Well	643,670.00	11.98	0.00895	744	23.98
	3#XXHY	3#Production and Re-injection Well	641,430.00	11.99	0.00893	744	23.92
Jiangshanyin	1#JSY	1#Production and Re-injection Well	642,730.00	11.89	0.00887	744	23.77
	2#JSY	2# Production and Re-injection Well	642,890.00	11.93	0.00891	744	23.85
	3#JSY	3# Production and Re-injection Well	643,630.00	12.05	0.00901	744	24.12
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	642,600.00	12.00	0.00895	744	23.98
	2#JYYXF	2# Production and Re-injection Well	643,830.00	11.99	0.00896	744	24.01
	3#JYYXF	3# Production and Re-injection Well	643,220.00	11.93	0.00891	744	23.86
Danjiangfu	1#DJF	1#Production and Re-injection Well	642,640.00	12.03	0.00898	744	24.04
	2#DJF	2# Production and Re-injection Well	643,010.00	12.06	0.00900	744	24.12
	3#DJF	3# Production and Re-injection Well	643,760.00	11.96	0.00894	744	23.94
Total							1007.92

Dec-22							
Sub-areas	Heat Substations	Geothermal Wells	$FR_{j,d,y}$ (kg/hr)	$\Delta t_{j,d,y}$ (°C)	$Q_{j,d,y}$ (GW)	T_j (h)	$HS_{y,estimated}$ (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	643,650.00	11.97	0.00895	744	23.96
	2# BHGJ	2# Production and Re-injection Well	644,270.00	12.00	0.00898	744	24.04
	3# BHGJ	3#Production and Re-injection Well	643,030.00	11.95	0.00892	744	23.90
	4# BHGJ	4#Production and Re-injection Well	642,430.00	12.02	0.00897	744	24.01
	5# BHGJ	5#Production and Re-injection Well	642,780.00	12.07	0.00901	744	24.13
	6# BHGJ	6#Production and Re-injection Well	643,170.00	12.00	0.00896	744	24.00
	7# BHGJ	7#Production and Re-injection Well	642,600.00	11.94	0.00891	744	23.86
	8# BHGJ	8#Production and Re-injection Well	642,470.00	11.98	0.00894	744	23.94

	9# BHGJ	9#Production and Re-injection Well	643,050.00	12.03	0.00898	744	24.06
	10# BHGJ	10#Production and Re-injection Well	642,820.00	11.98	0.00894	744	23.95
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	642,610.00	11.99	0.00895	744	23.96
	2# XWYH	2# Production and Re-injection Well	643,580.00	11.90	0.00889	744	23.82
	3# XWYH	3#Production and Re-injection Well	642,760.00	11.98	0.00894	744	23.95
	4# XWYH	4#Production and Re-injection Well	643,430.00	12.09	0.00903	744	24.19
	5# XWYH	5#Production and Re-injection Well	643,430.00	12.04	0.00900	744	24.09
	6# XWYH	6#Production and Re-injection Well	643,440.00	12.02	0.00898	744	24.05
	7# XWYH	7#Production and Re-injection Well	643,850.00	11.95	0.00893	744	23.93
	8# XWYH	8#Production and Re-injection Well	643,510.00	12.08	0.00903	744	24.18
	9# XWYH	9#Production and Re-injection Well	643,270.00	11.95	0.00893	744	23.91
	10# XWYH	10#Production and Re-injection Well	643,650.00	12.08	0.00903	744	24.18
Weinisi	1#WNS	1#Production and Re-injection Well	642,750.00	11.96	0.00893	744	23.91
	2#WNS	2# Production and Re-injection Well	642,450.00	12.01	0.00896	744	24.00
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	642,920.00	12.02	0.00897	744	24.03
	2#YHGG	2# Production and Re-injection Well	643,390.00	12.01	0.00897	744	24.03
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	642,730.00	11.94	0.00891	744	23.87
	2#CYGJ	2# Production and Re-injection Well	643,340.00	12.01	0.00897	744	24.03
	3#CYGJ	3# Production and Re-injection Well	643,220.00	11.98	0.00895	744	23.96
Lvdicheng	1#LDC	1#Production and Re-injection Well	643,340.00	11.96	0.00893	744	23.93
	2#LDC	2# Production and Re-injection Well	642,920.00	12.00	0.00896	744	23.99
	3#LDC	3# Production and Re-injection Well	642,810.00	12.04	0.00899	744	24.07
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	643,650.00	11.91	0.00890	744	23.84
	2#XXHY	2#Production and Re-injection Well	643,960.00	11.93	0.00892	744	23.89
	3#XXHY	3#Production and Re-injection Well	643,720.00	12.05	0.00901	744	24.12
Jiangshanyin	1#JSY	1#Production and Re-injection Well	642,910.00	11.97	0.00894	744	23.93
	2#JSY	2# Production and Re-injection Well	643,980.00	11.98	0.00896	744	23.99
	3#JSY	3# Production and Re-injection Well	643,040.00	11.97	0.00894	744	23.94
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	643,710.00	12.05	0.00901	744	24.12
	2#JYYXF	2# Production and Re-injection Well	643,540.00	11.93	0.00891	744	23.88
	3#JYYXF	3# Production and Re-injection Well	643,090.00	11.97	0.00894	744	23.94
Danjiangfu	1#DJF	1#Production and Re-injection Well	642,440.00	12.00	0.00895	744	23.98
	2#DJF	2# Production and Re-injection Well	643,460.00	12.05	0.00900	744	24.11
	3#DJF	3# Production and Re-injection Well	642,860.00	11.99	0.00895	744	23.97

Total							1007.64
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Jan-23							
Sub-areas	Heat Substations	Geothermal Wells	FR _{i,d,y} (kg/hr)	Δt _{j,d,y} (°C)	Q _{i,d,y} (GW)	T _j (h)	HS _{y,estimated} (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	642,270.00	11.97	0.00893	744	23.91
	2# BHGJ	2# Production and Re-injection Well	642,540.00	12.07	0.00900	744	24.12
	3# BHGJ	3#Production and Re-injection Well	643,200.00	11.98	0.00895	744	23.96
	4# BHGJ	4#Production and Re-injection Well	643,000.00	11.98	0.00894	744	23.96
	5# BHGJ	5#Production and Re-injection Well	642,140.00	12.02	0.00896	744	24.00
	6# BHGJ	6#Production and Re-injection Well	643,660.00	11.93	0.00892	744	23.88
	7# BHGJ	7#Production and Re-injection Well	642,550.00	11.94	0.00891	744	23.86
	8# BHGJ	8#Production and Re-injection Well	643,940.00	11.96	0.00894	744	23.95
	9# BHGJ	9#Production and Re-injection Well	643,140.00	12.00	0.00896	744	24.00
	10# BHGJ	10#Production and Re-injection Well	643,810.00	11.90	0.00890	744	23.83
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	642,660.00	11.93	0.00890	744	23.84
	2# XWYH	2# Production and Re-injection Well	642,970.00	11.99	0.00895	744	23.98
	3# XWYH	3#Production and Re-injection Well	642,560.00	11.98	0.00894	744	23.94
	4# XWYH	4#Production and Re-injection Well	643,010.00	12.06	0.00900	744	24.12
	5# XWYH	5#Production and Re-injection Well	642,630.00	12.08	0.00901	744	24.14
	6# XWYH	6#Production and Re-injection Well	643,170.00	11.94	0.00892	744	23.88
	7# XWYH	7#Production and Re-injection Well	642,850.00	11.94	0.00891	744	23.87
	8# XWYH	8#Production and Re-injection Well	642,910.00	12.06	0.00900	744	24.11
	9# XWYH	9#Production and Re-injection Well	643,410.00	11.98	0.00895	744	23.97
	10# XWYH	10#Production and Re-injection Well	644,080.00	12.02	0.00899	744	24.08
Weinisi	1#WNS	1#Production and Re-injection Well	643,460.00	12.02	0.00898	744	24.05
	2#WNS	2# Production and Re-injection Well	643,730.00	12.07	0.00902	744	24.16
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	642,850.00	12.03	0.00898	744	24.05
	2#YHGG	2# Production and Re-injection Well	643,080.00	11.95	0.00892	744	23.90
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	643,340.00	12.04	0.00899	744	24.09
	2#CYGJ	2# Production and Re-injection Well	642,950.00	12.04	0.00899	744	24.07
	3#CYGJ	3# Production and Re-injection Well	642,710.00	12.02	0.00897	744	24.03
Lvdicheng	1#LDC	1#Production and Re-injection Well	642,700.00	12.08	0.00901	744	24.14
	2#LDC	2# Production and Re-injection Well	643,280.00	11.99	0.00896	744	23.99

	3#LDC	3# Production and Re-injection Well	642,410.00	11.97	0.00893	744	23.91
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	642,740.00	12.05	0.00899	744	24.09
	2#XXHY	2#Production and Re-injection Well	642,510.00	12.01	0.00896	744	24.00
	3#XXHY	3#Production and Re-injection Well	643,010.00	11.97	0.00894	744	23.94
Jiangshanyin	1#JSY	1#Production and Re-injection Well	642,430.00	12.00	0.00895	744	23.97
	2#JSY	2# Production and Re-injection Well	642,970.00	12.00	0.00896	744	24.00
	3#JSY	3# Production and Re-injection Well	642,640.00	12.07	0.00901	744	24.12
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	643,360.00	12.00	0.00896	744	24.01
	2#JYYXF	2# Production and Re-injection Well	643,100.00	12.05	0.00900	744	24.10
	3#JYYXF	3# Production and Re-injection Well	642,690.00	11.92	0.00890	744	23.82
Danjiangfu	1#DJF	1#Production and Re-injection Well	643,330.00	11.98	0.00895	744	23.97
	2#DJF	2# Production and Re-injection Well	643,120.00	12.05	0.00900	744	24.10
	3#DJF	3# Production and Re-injection Well	643,200.00	11.86	0.00886	744	23.72
Total							1007.64

Feb-23							
Sub-areas	Heat Substations	Geothermal Wells	$FR_{j,d,y}$ (kg/hr)	$\Delta t_{j,d,y}$ (°C)	$Q_{j,d,y}$ (GW)	T_j (h)	$HS_{y,estimated}$ (TJ)
Binhuguoji	1# BHGJ	1#Production and Re-injection Well	643,310.00	11.92	0.00890	672	21.54
	2# BHGJ	2# Production and Re-injection Well	642,760.00	12.00	0.00896	672	21.67
	3# BHGJ	3#Production and Re-injection Well	643,310.00	11.96	0.00893	672	21.61
	4# BHGJ	4#Production and Re-injection Well	642,340.00	12.03	0.00897	672	21.71
	5# BHGJ	5#Production and Re-injection Well	643,770.00	11.98	0.00895	672	21.66
	6# BHGJ	6#Production and Re-injection Well	643,860.00	11.97	0.00895	672	21.65
	7# BHGJ	7#Production and Re-injection Well	643,890.00	11.99	0.00896	672	21.69
	8# BHGJ	8#Production and Re-injection Well	642,450.00	11.96	0.00892	672	21.58
	9# BHGJ	9#Production and Re-injection Well	642,230.00	12.04	0.00898	672	21.72
	10# BHGJ	10#Production and Re-injection Well	643,240.00	11.93	0.00891	672	21.56
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	643,000.00	12.03	0.00898	672	21.73
	2# XWYH	2# Production and Re-injection Well	643,390.00	12.00	0.00896	672	21.69
	3# XWYH	3#Production and Re-injection Well	643,460.00	12.05	0.00900	672	21.78
	4# XWYH	4#Production and Re-injection Well	643,520.00	12.05	0.00900	672	21.78
	5# XWYH	5#Production and Re-injection Well	642,950.00	11.99	0.00895	672	21.65
	6# XWYH	6#Production and Re-injection Well	642,450.00	12.01	0.00896	672	21.67

	7# XWYH	7#Production and Re-injection Well	643,280.00	11.97	0.00894	672	21.63
	8# XWYH	8#Production and Re-injection Well	643,300.00	12.03	0.00899	672	21.74
	9# XWYH	9#Production and Re-injection Well	643,780.00	12.02	0.00898	672	21.74
	10# XWYH	10#Production and Re-injection Well	643,510.00	12.04	0.00900	672	21.76
Weinisi	1#WNS	1#Production and Re-injection Well	643,140.00	11.97	0.00894	672	21.62
	2#WNS	2# Production and Re-injection Well	642,470.00	11.99	0.00894	672	21.64
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	643,080.00	12.03	0.00898	672	21.73
	2#YHGG	2# Production and Re-injection Well	642,790.00	11.94	0.00891	672	21.56
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	642,540.00	11.99	0.00895	672	21.64
	2#CYGJ	2# Production and Re-injection Well	643,270.00	12.00	0.00896	672	21.68
	3#CYGJ	3# Production and Re-injection Well	642,670.00	11.99	0.00895	672	21.64
Lvdicheng	1#LDC	1#Production and Re-injection Well	643,500.00	11.98	0.00895	672	21.65
	2#LDC	2# Production and Re-injection Well	644,600.00	11.97	0.00896	672	21.67
	3#LDC	3# Production and Re-injection Well	643,930.00	12.04	0.00900	672	21.78
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	642,480.00	12.02	0.00897	672	21.69
	2#XXHY	2#Production and Re-injection Well	642,710.00	12.03	0.00898	672	21.72
	3#XXHY	3#Production and Re-injection Well	642,670.00	11.99	0.00895	672	21.64
Jiangshanyin	1#JSY	1#Production and Re-injection Well	643,260.00	11.98	0.00895	672	21.65
	2#JSY	2# Production and Re-injection Well	643,860.00	11.99	0.00896	672	21.68
	3#JSY	3# Production and Re-injection Well	643,480.00	11.98	0.00895	672	21.65
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	643,680.00	11.96	0.00894	672	21.62
	2#JYYXF	2# Production and Re-injection Well	642,810.00	11.98	0.00894	672	21.63
	3#JYYXF	3# Production and Re-injection Well	642,780.00	11.98	0.00894	672	21.63
Danjiangfu	1#DJF	1#Production and Re-injection Well	643,160.00	12.03	0.00898	672	21.73
	2#DJF	2# Production and Re-injection Well	644,400.00	12.09	0.00905	672	21.88
	3#DJF	3# Production and Re-injection Well	641,890.00	12.04	0.00897	672	21.71
Total							910.43

Mar-23							
Sub-areas	Heat Substations	Geothermal Wells	$FR_{j,d,y}$ (kg/hr)	$\Delta t_{j,d,y}$ (°C)	$Q_{j,d,y}$ (GW)	T_j (h)	$HS_{y,estimated}$ (TJ)
Binhuoguoji	1# BHGJ	1#Production and Re-injection Well	642,630.00	12.02	0.00897	744	24.02
	2# BHGJ	2# Production and Re-injection Well	643,430.00	12.08	0.00902	744	24.17
	3# BHGJ	3#Production and Re-injection Well	643,380.00	11.98	0.00895	744	23.97

	4# BHGJ	4#Production and Re-injection Well	642,990.00	11.95	0.00892	744	23.90
	5# BHGJ	5#Production and Re-injection Well	642,540.00	12.00	0.00895	744	23.98
	6# BHGJ	6#Production and Re-injection Well	643,490.00	12.01	0.00897	744	24.03
	7# BHGJ	7#Production and Re-injection Well	643,350.00	11.98	0.00895	744	23.97
	8# BHGJ	8#Production and Re-injection Well	643,330.00	11.99	0.00896	744	23.99
	9# BHGJ	9#Production and Re-injection Well	644,010.00	11.96	0.00894	744	23.95
	10# BHGJ	10#Production and Re-injection Well	642,540.00	12.05	0.00899	744	24.08
Xiangwanyihao	1# XWYH	1#Production and Re-injection Well	643,900.00	12.03	0.00899	744	24.09
	2# XWYH	2# Production and Re-injection Well	643,840.00	11.94	0.00893	744	23.91
	3# XWYH	3#Production and Re-injection Well	643,960.00	12.03	0.00899	744	24.09
	4# XWYH	4#Production and Re-injection Well	642,470.00	12.08	0.00901	744	24.14
	5# XWYH	5#Production and Re-injection Well	643,420.00	11.93	0.00891	744	23.87
	6# XWYH	6#Production and Re-injection Well	643,390.00	11.98	0.00895	744	23.97
	7# XWYH	7#Production and Re-injection Well	643,360.00	12.01	0.00897	744	24.03
	8# XWYH	8#Production and Re-injection Well	642,780.00	11.98	0.00894	744	23.95
	9# XWYH	9#Production and Re-injection Well	643,360.00	12.02	0.00898	744	24.05
	10# XWYH	10#Production and Re-injection Well	643,600.00	12.00	0.00897	744	24.02
Weinisi	1#WNS	1#Production and Re-injection Well	643,240.00	11.98	0.00895	744	23.97
	2#WNS	2# Production and Re-injection Well	642,860.00	12.03	0.00898	744	24.05
Yuehugongguan	1#YHGG	1#Production and Re-injection Well	643,030.00	11.91	0.00889	744	23.82
	2#YHGG	2# Production and Re-injection Well	642,780.00	12.04	0.00899	744	24.07
Changyuanguoji	1#CYGJ	1#Production and Re-injection Well	643,800.00	12.03	0.00899	744	24.09
	2#CYGJ	2# Production and Re-injection Well	643,780.00	12.02	0.00898	744	24.07
	3#CYGJ	3# Production and Re-injection Well	643,250.00	12.00	0.00896	744	24.01
Lvdicheng	1#LDC	1#Production and Re-injection Well	643,130.00	11.93	0.00891	744	23.86
	2#LDC	2# Production and Re-injection Well	643,660.00	11.97	0.00895	744	23.96
	3#LDC	3# Production and Re-injection Well	643,490.00	11.93	0.00891	744	23.87
Xixihuayuan	1#XXHY	1#Production and Re-injection Well	642,370.00	12.06	0.00900	744	24.09
	2#XXHY	2#Production and Re-injection Well	643,480.00	11.99	0.00896	744	23.99
	3#XXHY	3#Production and Re-injection Well	642,710.00	12.01	0.00896	744	24.01
Jiangshanyin	1#JSY	1#Production and Re-injection Well	644,150.00	12.00	0.00898	744	24.04
	2#JSY	2# Production and Re-injection Well	643,660.00	12.05	0.00901	744	24.12
	3#JSY	3# Production and Re-injection Well	643,340.00	11.96	0.00893	744	23.93
Jianyeyunxifu	1#JYYXF	1#Production and Re-injection Well	643,770.00	12.03	0.00899	744	24.08

	2#JYYXF	2# Production and Re-injection Well	643,610.00	11.97	0.00895	744	23.96
	3#JYYXF	3# Production and Re-injection Well	643,310.00	12.05	0.00900	744	24.11
Danjiangfu	1#DJF	1#Production and Re-injection Well	642,880.00	12.02	0.00897	744	24.03
	2#DJF	2# Production and Re-injection Well	643,130.00	12.00	0.00896	744	24.00
	3#DJF	3# Production and Re-injection Well	643,440.00	11.97	0.00894	744	23.95
Total							1008.25

Calculation results of baseline emissions in year y (BE_y) are summarized as Table 6-3

Table 5-3 Calculation results of baseline emissions

Date	HS_y (TJ)	$Loss^{P}_y$ (TJ)	$Loss^{BL}_y$ (TJ)	$HS^{BL}_{i,y}$ (TJ)	$EF_{CO_2,i}$ (t CO_2 /TJ)	$\eta_{BL,i}$ (%)	BE_y (t CO_2e /yr)
01-April-2020-31-October-2021	0.00	0.00	0	0.00	87.3	85%	0
1-November-2021-30-November-2021	975.66	94.73	0	880.93			90,477
1-December-2021-31-December-2021	1,008.54	97.88	0	910.66			93,530
1-January-2022-31-January-2022	1,007.97	97.88	0	910.09			93,471
1-February-2022-28-February-2022	910.37	88.41	0	821.96			84,420
1-March-2022-31-March-2022	1,008.15	97.88	0	910.27			93,490
1-April-2021-31-December-2021	1,984.20	192.61	0	1,791.59			184,007
1-January-2022-31-March-2022	2,926.49	284.18	0	2,642.32			271,381
1-November-2021-31-March-2022	4,910.70	476.79	0	4,433.91			455,388
1-April-2022-31-October-2022 ¹⁸	0.00	0.00	0	0.00	87.3	85%	0
1-November-2022-30-November-2022	1,007.92	96.36	0	911.56			93,622

¹⁸ Winter heating season of Luohe City is usually from November 1 to March 31 of the next year. So, data from 1-April-2022 to 31-October-2022 is 0.

1-December-2022-31-December-2022	1,007.64	99.57	0	908.07			93,263
1-January-2023-31-January-2023	1,007.64	99.57	0	908.07			93,264
1-February-2023-28-February-2023	910.43	89.93	0	820.50			84,269
1-March-2023-31-March-2023	1,008.25	99.57	0	908.68			93,326
1-April-2022-31-December-2022	2,015.55	195.93	0	1,819.63			186,885
1-January-2023-31-March-2023	2,926.32	289.07	0	2,637.25			270,859
1-April-2022-31-March-2023	4,941.88	485.00	0	4,456.88			457,744
Total	9,852.58	961.79	0.00	8,890.79	/	/	913,132

Baseline emissions was 184,007 tCO₂e from 01-November-2021 to 31-December-2021, and 271,381 tCO₂e from 01-January-2022 to 31-March-2022. Baseline emissions was 186,885 tCO₂e from 01-April-2022 to 31-December-2022, and 270,859 tCO₂e from 01-January-2023 to 31-March-2023. Total baseline emissions of the 2nd monitoring period (01-April-2021-31-March-2023) was 913,132 tCO₂e.

5.2 Project Emissions

As per the signed heating contract, heating areas (2021-2022 and 2022-2023 heating season) are summarized as the following table.

Table 5-4 Heating areas of each sub-area

Sub-areas	Heat Substations	01- November -2021-31- March-2022	01- November -2022-31- March-2023
		A_m (m ²)	A_m (m ²)
Binhuguoji	1# BHGJ	295,260.00	300,884.00
	2# BHGJ		
	3# BHGJ	358,176.00	365,064.00
	4# BHGJ		
	5# BHGJ	263,340.00	268,380.00
	6# BHGJ		
	7# BHGJ	523,566.00	533,596.00
	8# BHGJ		
	9# BHGJ	323,232.00	329,388.00
	10# BHGJ		
Xiangwanyihao	1# XWYH	478,737.00	487,917.00
	2# XWYH		
	3# XWYH	114,705.00	116,913.00
	4# XWYH		
	5# XWYH	543,892.00	549,067.00
	6# XWYH		
	7# XWYH	731,456.00	752,576.00
	8# XWYH		
	9# XWYH	423,904.00	432,017.00
	10# XWYH		
Weinisi	1#WNS	437,902.00	437,902.00
	2#WNS		
Yuehugongguan	1# YHGG	361,118.00	365,937.00
	2# YHGG		
	1# CYGJ	442,360.00	447,003.00

Changyuanguoji	2# CYGJ		
	3# CYGJ		
Lvdicheng	1# LDC	392,805.00	400,330.00
	2# LDC		
	3# LDC		
Xixihuayuan	1# XXHY	439,944.00	448,339.00
	2# XXHY		
	3# XXHY		
Jiangshanyin	1# JSY	363,938.00	370,910.00
	2# JSY		
	3# JSY		
Jianyeyunxifu	1# JYYXF	422,436.00	430,482.00
	2# JYYXF		
	3# JYYXF		
Danjiangfu	1# DJF	392,326.00	398,310.00
	2# DJF		
	3# DJF		
Total		7,309,097.00	7,435,015.00

For the 2nd monitoring period from 01-November-2021 to 31-March-2023,

From 01-November-2021 to 31-March-2022, 7,309,097 m² of residential buildings can access to geothermal energy-based space heating system in winter season.

From 01-April-2022 to 31-March-2023, 7,435,015 m² of residential buildings can access to geothermal energy-based space heating system in winter season.

Project emissions are calculated taking into consideration fugitive carbon dioxide and methane released from geothermal vents (PE_{FE}), electricity consumption from the use the pumps to extract the geothermal water (PE_{EC}) and fossil fuel used to operate the geothermal facility (PE_{FF}).

$$PE_y = PE_{FE,y} + PE_{EC,y} + PE_{FF,y} \quad (12)$$

Step 1: Calculate project emissions from fugitive emissions resulting from non-condensable gases from the geothermal vents during the year y

The geothermal system of the proposed project is designed to operate by extracting geothermal water at approximately 75°C, which is a low-temperature system. As per paragraph 84 of AM0072 (Version 03.0), fugitive emissions from low temperature geothermal system are considered negligible. Therefore, $PE_{FE,y} = 0$ tCO₂.

Step 2: Calculate project emissions from additional electricity consumption as a result of the project activity

Project emissions from electricity consumption (PE_{EC}) used to pump geothermal water and operate the geothermal facility shall be calculated using *Tool 05 Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation* (Version 03.0). Electricity consumption from each relevant source should be monitored and summed up to EC_y .

As per paragraph 16 of Tool 05 (Version 03.0), project emissions from consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses, as follows:

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}) \quad (13)$$

Where:

$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (t CO ₂ /yr).
$EC_{PJ,j,y}$	=	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr).
$EF_{EL,j,y}$	=	Emission factor for electricity generation for source j in year y (t CO ₂ /MWh).
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source j in year y.

The electricity consumed by facilities of the geothermal system is sourced from local power grid connected to central China Power Grid (CCPG). Scenario A: Electricity consumption from the grid is applied to the proposed project. For project electricity consumption sources, a default value of 20% is used for $TDL_{j,y}$.

Calculation results of project emissions during the year y (PE_y) are summarized as Table 5-5,

Table 5-5 Calculation results of project emissions

Date	$EC_{PJ,j,y}$ (kWh)	$EC_{PJ,j,y}$ (MWh)	$EF_{EL,j,y}$ (tCO ₂ /MWh)	(1+ $TDL_{j,y}$)	$PE_{EC,y}$ (tCO _{2e} /yr)
01-April-2021-31-October-2021 ¹⁹	0	0	0.5721	1.2	0
1-November-2021-30-November-2021	9,456,027.12	9,456.03	0.5721	1.2	6,492
1-December-2021-31-December-2021	9,694,967.39	9,694.97	0.5721	1.2	6,656

¹⁹ Winter heating season of Luohe City is usually from 01-November to 31-March of the next year. So, data from 01-April-2021 to 31-October-2021 is 0.

1-January-2022-31-January-2022	9,987,436.17	9,987.44	0.5721	1.2	6,857
1-February-2022-28-February-2022	8,780,729.15	8,780.73	0.5721	1.2	6,029
1-March-2022-31-March-2022	9,719,019.96	9,719.02	0.5721	1.2	6,673
1-April-2021-31-December-2021	19,150,994.51	19,150.99	0.5721	1.2	13,148
1-January-2022-31-March-2022	28,487,185.28	28,487.19	0.5721	1.2	19,559
1-April-2021-31-March-2022	47,638,179.79	47,638.18	0.5721	1.2	32,707
1-April-2022-31-October-2022 ²⁰	0.00	0.00	0.5721	1.2	0
1-November-2022-30-November-2022	9,619,099.01	9,619.10	0.5721	1.2	6,604
1-December-2022-31-December-2022	9,862,393.51	9,862.39	0.5721	1.2	6,771
1-January-2023-31-January-2023	10,160,091.31	10,160.09	0.5721	1.2	6,976
1-February-2023-28-February-2023	8,932,072.04	8,932.07	0.5721	1.2	6,133
1-March-2023-31-March-2023	9,886,838.11	9,886.84	0.5721	1.2	6,788
1-April-2022-31-December-2022	19,481,492.52	19,481.49	0.5721	1.2	13,375
1-January-2023-31-March-2023	28,979,001.46	28,979.00	0.5721	1.2	19,897
1-April-2022-31-March-2023	48,460,493.98	48,460.49	0.5721	1.2	33,272

²⁰ Winter heating season of Luohe City is usually from November 1 to March 31 of the next year. So, data from 1-April-2022 to 31-October-2022 is 0.

Total	96,098,673.7 7	96,098.67	/	/	65,979
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No fossil fuel was used to operate the geothermal facilities. Therefore, $PE_{FF,y}=0$ tCO₂.

Therefore, for the 2nd monitoring period, $PE_y=PE_{EC,y}$.

In summary, project emissions were 13,148 tCO₂e from 01-November-2021 to 31-December-2021, and 19,559 tCO₂e from 01-January-2022 to 31-March-2022. 13,375 tCO₂e from 01-April-2022 to 31-December-2022, and 19,897 tCO₂e from 01-January-2023 to 31-March-2023. Total project emissions of the 2nd monitoring period (01-April-2021-31-March-2023) was 65,979 tCO₂e.

5.3 Leakage

No leakage emissions have been identified for the project activity. Therefore, $LE_y=0$ tCO₂e.

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01-April-2021-31-October-2021 ²¹	0	0	0	0
1-November-2021-30-November-2021	90,477	6,492	0	83,985
1-December-2021-31-December-2021	93,530	6,656	0	86,874
1-January-2022-31-January-2022	93,471	6,857	0	86,614
1-February-2022-28-February-2022	84,420	6,029	0	78,391
1-March-2022-31-March-2022	93,490	6,673	0	86,817

²¹ Winter heating season of Luohe City is usually from November 1 to March 31 of the next year. So, data from 1-April-2021 to 31-October-2021 is 0.

1-April-2021-31-December-2021	184,007	13,148	0	170,859
1-January-2022-31-March-2022	271,381	19,559	0	251,822
1-April-2021-31-March-2022	455,388	32,707	0	422,681
1-April-2022-31-October-2022 ²²	0	0	0	0
1-November-2022-30-November-2022	93,622	6,604	0	87,018
1-December-2022-31-December-2022	93,263	6,771	0	86,492
1-January-2023-31-January-2023	93,264	6,976	0	86,288
1-February-2023-28-February-2023	84,269	6,133	0	78,136
1-March-2023-31-March-2023	93,326	6,788	0	86,538
1-April-2022-31-December-2022	186,885	13,375	0	173,510
1-January-2023-31-March-2023	270,859	19,897	0	250,962
1-April-2022-31-March-2023	457,744	33,272	0	424,472
1-April-2021-31-December-2021	184,007	13,148	0	170,859
1-January-2022-31-December-2022	458,266	32,934	0	425,332

²² Winter heating season of Luohe City is usually from November 1 to March 31 of the next year. So, data from 1-April-2022 to 31-October-2022 is 0.

1-January-2023-31-March-2023	270,859	19,897	0	250,962
Total	913,132	65,979	0	847,153

The estimated ex-ante GHG emission reductions and removals and the achieved emission reductions and removals for this monitoring period is shown in below Table.

Year	Ex-ante emissions reductions/removals	Achieved emissions reductions/removals	Percent difference	Justification for the difference
01-April-2021 to 31-December-2021	194,612 tCO ₂ e ²³	170,859 tCO ₂ e	-12.21%	The estimated outcomes for the 2nd monitoring period (01-April-2021– 31-March-2023) is 990,578 tCO ₂ e. The actual heating area lost due to the influence of the actual occupancy rate in year y (A_m), average temperature difference between inlet and outlet temperatures at the downstream of each substation heat exchanger in year y ($\Delta t_{j,d,y}$), average flow rate at the downstream of each heat exchanger in year y ($FR_{j,d,y}$), hours per hear heat utilization in well j (T_j) and electricity consumption for the year y in operating the geothermal heating system($EC_{PJ,j,y}$ (EC_y)) should be
01-January-2022 to 31-December-2022	481,744 tCO ₂ e	425,332 tCO ₂ e	-11.71%	
01-January-2023 to 31-March-2023	287,132 tCO ₂ e ²⁴	250,962 tCO ₂ e	-12.6%	
01-April-2021 to 31-March-2023	963,488 tCO ₂ e ²⁵	847,153 tCO ₂ e	-12.07%	

²³ The annual heating season of Luohe City is usually from November 1 to March 31 of the next year. The duration from November 1st to December 31st is totally 61 days, so the ex-ante emissions reduction during this period is 481,744 tCO₂e * (61d/151d) = 194,612 tCO₂e

²⁴ The annual heating season of Luohe City is usually from November 1 to March 31 of the next year. The duration from January 1st to March 31st is totally 90 days, so the ex-ante emissions reduction during this period is 481,744 tCO₂e * (90d/151d) = 287,132 tCO₂e

²⁵ The annual heating season of Luohe City is usually from November 1 to March 31 of the next year. The duration from November 1st 2021 to March 31st 2022 and November 1st 2022 to March 31st 2023 is totally 302 days, so the ex-ante emissions reduction during this period is 481,744 tCO₂e * (302d/151d) = 963,488 tCO₂e

				monitored. Emission reductions for the 2nd monitoring period was 847,153 tCO_{2e}. Net heating area for construction, and the changes of the five parameters lead to the difference between the estimated value and actual value for emission reductions.
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APPENDIX 1: <EVIDENCE OF ACHIEVED SDGS>

Supporting evidence for contribution to SDG 13.0 Tons of greenhouse gas emissions avoided or removed

The project has estimated that 495,289 tCO₂e emission reductions will be produced annually. This is the 2nd monitoring period, which is covering from 01-November-2021 to 31-March-2023 and the emission reductions of the 2nd monitoring period is 847,153 tCO₂e. please see Section 5 of Monitoring Report for details.

Table showing the emission reductions during the 2nd monitoring period

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
1-November-2021-31-March-2022	455,388	32,707	0	422,681
1-April-2022-31-March-2023	457,744	33,272	0	424,472
Total	913,132	65,979	0	847,153

Supporting evidence for contribution to SDG 7.2 Renewable energy share in the total final energy consumption

It can supply geothermal heat to 8,283 thousand m² of residential buildings. It is affected by the actual occupancy rate. During 2nd monitoring period, the residential area where the project is located is newly built and the occupancy rate is 88.2% from 01-November-2021 to 31-March-2022, which the actual heating area is 7,309,097m². The occupancy rate is 89.7% from 01-November-2022 to 31-March-2023, which the actual heating area is 7,435,015m².

“漯河地热集中供热系统项目”用户供热协议

用户供热协议

甲方：河南建业物业管理有限公司

乙方：万江新能源集团有限公司

为提高漯河市综合热能利用效率,加快漯河市能源结构调整和节能减排。万江新能源集团有限公司（以下简称乙方）投资新建“漯河地热集中供热系统项目”，可实现河南省漯河市滨湖国际、象湾壹号、威尼斯、悦湖公馆、畅园国际、绿地城、西溪花园、江山印、建业云熙府、丹江府小区十个区域冬季清洁采暖面积828.3万平方米。供热协议具体事项如下：

一、供暖区域

漯河市象湾壹号地热空间采暖工程，供热机房1~10#XWYH。

二、收费标准

供暖期间收费标准为优惠价0.165元/m²/天（建筑面积），低于漯河市供热管网价格0.17元/m²/天。

三、供热面积

2022年-2023年供热季入住居民17820户，建筑面积共计2,338,490 m²。

四、供热期限

2022年11月1日-2023年3月31日（共计150天）。

五、费用总计及收费方式

入住用户取暖费由甲方代收，请于2022年10月15日前统一支付给乙方，具体费用如下：

“漯河地热集中供热系统项目”用户供热协议

用户供热协议

甲方：河南建业物业管理有限公司

乙方：万江新能源集团有限公司

为提高漯河市综合热能利用效率,加快漯河市能源结构调整和节能减排。万江新能源集团有限公司（以下简称乙方）投资新建“漯河地热集中供热系统项目”，可实现河南省漯河市滨湖国际、象湾壹号、威尼斯、悦湖公馆、畅园国际、绿地城、西溪花园、江山印、建业云熙府、丹江府小区十个区域冬季清洁采暖面积828.3万平方米。供热协议具体事项如下：

一、供暖区域

漯河市滨湖国际地热空间采暖工程，供热机房1~10#BHGJ。

二、收费标准

供暖期间收费标准为优惠价0.165元/m²/天（建筑面积），低于漯河市供热管网价格0.17元/m²/天。

三、供热面积

2021年-2022年供热季入住居民12200户，建筑面积共计1,763,574 m²。

四、供热期限

2021年11月1日-2022年3月31日（共计150天）。

五、费用总计及收费方式

入住用户取暖费由甲方代收，请于2021年10月15日前统一支付给乙方，具体费用如下：

Supporting evidence for contribution to SDG 8.5 Unemployment rate, by sex, age and persons with disabilities

The project activity generates permanent job opportunities for 30 persons including 15 females and 15 males during the operation period. During this monitoring period, total 30 jobs for local people were created (including 15 females and 15 males) by the project.

漯河地热集中供暖系统项目监测员工培训会签到表

培训时间：2022 年 10 月 10 日

序号	姓名	性别	签字
1	汤颖	女	汤颖
2	廖澜	女	廖澜
3	于荣	女	于荣
4	徐蕊	女	徐蕊
5	姚铭	女	姚铭
6	梁青	女	梁青
7	贾姬	女	贾姬
8	田曼	女	田曼
9	孙蕊	女	孙蕊
10	田然	女	田然
11	萧晓洁	女	萧晓洁
12	康萃萃	女	康萃萃
13	赖韵诗	女	赖韵诗
14	万津文	女	万津文
15	卢云亭	女	卢云亭
16	方嘉运	男	方嘉运
17	郭昂然	男	郭昂然
18	林凯乐	男	林凯乐
19	苏奇迈	男	苏奇迈

20	孔和正	男	孔和正
21	郭端	男	郭端
22	孟乾	男	孟乾
23	高琮	男	高琮
24	蒋翼	男	蒋翼
25	谢征	男	谢征
26	石仑	男	石仑
27	马朗	男	马朗
28	许守	男	许守
29	贺昱	男	贺昱
30	姜真	男	姜真