

Baodi 50MW Distributed PV Power  
Generation Project in Tianjin and  
Dashiqiao 50MW Distributed PV  
Power Generation Project in  
Liaoning

Report on

Environmental and Social Impact

Assessment and Environmental and Social  
Management Plan

Project sponsor: Beijing Xiangju New Energy Technology Co., Ltd.

Prepared by: POWERCHINA HUADONG Engineering Corporation

Limited

August 2022

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## Foreword

As the world energy issues rank first among the top ten hot issues in the world, especially with the development of the world economy, the sharp increase in world population, and the continuous improvement of people's living standards, the world energy demand continues to increase, which thereby leads to the gradual depletion of global fossil energy, the aggravation of environmental pollution and the increasing pressure of environmental protection. China is one of the largest coal producers and consumers in the world, and also one of the few countries with coal as the main energy source. In energy production and consumption, coal accounts for about 70% of commodity energy consumption, and has become the main source of air pollution in China. Therefore, vigorously developing new and renewable energy technologies such as solar energy, wind energy, biomass energy, geothermal energy and ocean energy will become one of the important measures to reduce environmental pollution. According to China's National Climate Change Programme and the Medium-and Long-Term Development Plan of Renewable Energy, China will vigorously develop renewable energy and optimize the energy consumption structure. In the future, the focus and main task of China's work in the energy field will still be to speed up the adjustment of the energy industry structure and strive to improve the development and production capacity of clean energy. Focusing on solar power, wind power, solar water heaters, and large-scale methane gas projects, and aiming at "equipment localization, product standardization, large industrial scale, and market standardization", we will accelerate the development of renewable energy. Therefore, accelerating the development of renewable energy, optimizing the energy consumption structure, increasing the proportion of clean energy and reducing the emission of greenhouse gases and harmful gases are the top priorities for China's sustainable energy and environmental development.

In this context, Beijing Xiangju New Energy Technology Co., Ltd. plans to build a 50MW distributed PV power generation project in Baodi District, Tianjin and a 50MW distributed PV power generation project in Dashiqiao City, Liaoning. The

construction of the Project complies with the sustainable development principle and the national energy development policy, can relieve the environmental protection pressure, and speed up local economic development.

In accordance with the relevant requirements of the Bank's Environmental and Social Framework, the Environmental Protection Law of the People's Republic of China, the Law of the People's Republic of China on Environmental Impact Assessment, the Notice of the National Development and Reform Commission on Issuing the Interim Measures for Social Stability Risk Assessment of Major Fixed Assets Investment Projects of the National Development and Reform Commission, and the relevant provisions of Order No.253 of the State Council Regulations on the Administration of Environmental Protection of Construction Projects, Beijing Xiangju New Energy Technology Co., Ltd. entrusted POWERCHINA HUADONG Engineering Corporation Limited to prepare a report on ESIA and ESMP. After accepting the entrustment, we carefully analyzed and studied the preliminary work results of the Project, collect relevant data, carried out a field survey and investigation, paid attention to the whole process of risk management and ecologically sensitive area protection, and carried out public participation investigation in accordance with relevant national regulations. This Report is prepared on the basis of the results of related studies, expert advice, and public participation opinions on the Project.

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## 1 General

### 1.1 Basis of preparation

#### 1.1.1 Relevant regulations and documents

##### 1.1.1.1 Relevant national laws

(1) Environmental Protection Law of the People's Republic of China (January 2015)

(2) Law of the People's Republic of China on Environmental Impact Assessment (December 2018);

(3) Law of the People's Republic of China on the Prevention and Control of Water Pollution (January 2018);

(4) Law of the People's Republic of China on Prevention and Control of Atmospheric Pollution (October 2018);

(5) Laws of the People's Republic of China on Prevention and Control of Environmental Noise Pollution (June 2022);

(6) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste (September 2020);

(7) Water and Soil Conservation Law of the People's Republic of China (March 2011);

(8) Law of the People's Republic of China on Land Administration (August 2004);

(9) Water Law of the People's Republic of China (January 2013);

(10) Urban and Rural Planning Law of the People's Republic of China (April 2015);

(11) Water Law of the People's Republic of China (June 2013);

##### 1.1.1.2 Relevant national regulations and documents

(1) The Notice of the National Development and Reform Commission on Issuing the Interim Measures for Social Stability Risk Assessment of Major Fixed Assets

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Investment Projects of the National Development and Reform Commission (FGTZ [2012] No.2492), National Development and Reform Commission, August 16, 2012;

(2) The Notice of the General Office of National Development and Reform Commission on Printing and Distributing the Preparation Outline for Analysis Articles and Assessment Report of Social Stability Risk of Major Fixed Assets Investment Projects (Trial) (FGBTZ [2013] No. 428) (February 17, 2013);

(3) Guidance on Establishing and Improving the Social Stability Risk Assessment Mechanism for Major Decision-Making (trial) (ZBF [2012] No.2);

(4) Several Opinions on Deepening the Participation of Third-party Institutions in Social Stability Risk Assessment (trial);

(5) Regulations on the Administration of Environmental Protection for Construction Projects (amended by Order No.682 of the State Council) (October 1, 2017);

(6) Decision of the State Council on Implementing Scientific Concept of Development and Strengthening Environmental Protection (GF [2005] No. 39) (December 3, 2005);

(7) Regulations on Land Reclamation (November 8, 1988);

(8) Regulation on Land Reclamation (Order of the State Council of the People's Republic of China (No. 592), (March 5, 2011)

(9) Regulations of the People's Republic of China on the Protection of Basic Farmland (Order No.257 of the State Council) (July 1, 2021);

(10) List of National Key Protected Wildlife in China (February 5, 2021);

(11) List of National Key Protected Wild Plants in China (September 7, 2021);

(12) National Overall Emergency Plan on Public Emergency, State Council (January 8, 2006);

(13) Opinions on Strengthening the Supervision of Ecological Environment Protection for Resource Development (HF [2004] No.24) (February 12, 2004);

(14) Notice on Issuing the List of Major Changes in Construction Projects in

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Partial Industries in Environmental Impact Assessment Management (HB [2015] No.52)  
(June 4, 2015);

(15) Several Opinions of the General Office of the CPC Central Committee and the General Office of the State Council on Delineating and Strictly Observing the Red Line of Ecological Protection (February 7, 2017);

(16) Implementation Opinions on Strengthening the In-process and Post-event Supervision of Environmental Impact Assessment of Construction Projects, HHP [2018] No. 11, (January 25, 2018);

#### 1.1.2 Technical guidelines and relevant standards

- (1) Technical Guidelines for Construction Environmental Impact Assessment - General Programme (HJ 2.1-2016);
- (2) Technical Guidelines for Environmental Impact Assessment – Atmospheric Environment (HJ2.2-2018);
- (3) Technical Guidelines for Environmental Impact Assessment - Surface Water Environment (HJ 2.3-2018);
- (4) Technical Guidelines for Environmental Impact Assessment - Acoustic Environment (HJ 2.4-2021);
- (5) Technical Guidelines for Environmental Impact Assessment - Ecological Impact (HJ 19-2022);
- (6) Technical Criterion for Eco-environmental Status Evaluation (HJ192-2015);
- (7) Technical Specifications Requirements for Monitoring of Surface Water and Wastewater (HJ/T 91-2002);
- (8) Technical Specifications for Quality Assurance and Quality Control for Monitoring of Stationary Pollution Sources (trial) (HJ/T 373-2007);
- (9) Standard for Monitoring Ambient Air Quality (trial) (Announcement No.4 of the State Environmental Protection Administration in 2007);
- (10) Environmental Quality Standard for Surface Water (GB 3838-2002)
- (11) Ambient Air Quality Standards (GB3095-2012);

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- (12) Environmental Quality Standards for Noise (GB 3096-2008);
  - (13) Integrated Wastewater Discharge Standard (GB 8978-1996);
  - (14) Comprehensive Emission Standard of Atmospheric Pollutant (GB 16297-1996);
  - (15) Emission Standard of Environment Noise for Boundary of Construction Site (GB 12523-2011);
  - (16) Emission Standard for Industrial Enterprises Noise at Boundary (GB 12348-2008);
  - (17) Current Land Use Classification (GB/T 21010-2007).

#### 1.1.3 Relevant planning and zoning documents

- (1) Outline of the 14th Five-Year Plan for National Economic and Social Development of Baodi District, Tianjin;
- (2) Tianjin Ecological Protection Red Line;
- (3) 14th Five-Year Plan for Ecological Environmental Protection of Tianjin City;
- (4) 14th Five-Year Plan of National Economic and Social Development of Yingkou City;
- (5) Yingkou Ecological Protection Red Line;
- (6) 14th Five-Year Plan for Ecological Environment Protection of Yingkou City.

#### 1.1.4 Technical Data

- (1) Feasibility Study Report of Dashiqiao 50MW Distributed PV Power Generation Project in Liaoning;
- (2) Feasibility Study Report of Baodi 50MW Distributed PV Power Generation Project in Tianjin.

#### 1.1.5 Relevant Requirements of the Bank

This Report is prepared in accordance with the Environmental and Social Framework issued by the Bank. The relevant policy requirements in the *Environmental and Social Framework* include the following aspects.

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#### 1.1.5.1 Basic definitions and provisions in the Environmental and Social Framework

**Client:** means the recipient of the Bank financing for a Project and any other entity responsible for the implementation of the Project.

**Project:** means the specific set of activities for which the Bank financing is provided, as defined in the agreement governing such financing, regardless of the financing instrument or the source of such financing or whether the Project is financed in whole or in part by the Bank.

**The environmental and social framework includes:**

- Environmental and Social Policy (ESP), including mandatory environmental and social requirements for each project.

- Environmental and social standard. Three associated mandatory environmental and social standards (ESSs) set out more detailed environmental and social requirements relating to the following:

ESS1: Environmental and Social Assessment and Management;

ESS2: Involuntary Resettlement

ESS3: Indigenous Peoples

- List of environmental and social exclusions. The Bank will not knowingly finance a Project that involves activities or items specified in this list (Exclusion List).

ESP applicable scope:

Applicable to all projects. The Bank requires each client to manage the environmental and social risks and impacts associated with its Project in a manner designed to meet the ESP and the applicable ESSs in accordance with the environmental and social management plan (ESMP), and environmental and social management planning framework (ESMPF), as applicable, required for the Project under this ESP and ESSs.

#### 1.1.5.2 Project classification

The Bank classifies the proposed projects into four categories as follows:

- Category A. A project is classified as Category A if it is likely to have significant

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adverse environmental and social impacts that are irreversible, cumulative, diverse or unprecedented. These impacts may affect areas outside the project site, either temporarily or permanently. The Bank requires the Client to conduct an Environmental and Social Impact Assessment (ESIA) or equivalent environmental and social assessment, for each Category A Project, and to prepare an Environmental and Social Management Plan (ESMP) or Environmental and Social Management Planning Framework (ESMPF), which is included in the ESIA report for the Project. The ESIA for a Category A Project examines the Project's potential environmental and social impacts, both positive and adverse, compares them with those of feasible alternatives (including the "without Project" situation), and recommends any measures needed to avoid, minimize, mitigate, or compensate for adverse impacts and improve the environmental and social performance of the Project.

- Category B. A Project is categorized B when: it has a limited number of potentially adverse environmental and social impacts; the impacts are not unprecedented; few if any of them are irreversible or cumulative; they are limited to the Project area, and can be successfully managed using good practice in an operational setting. The Bank requires the Client to conduct an initial review of the environmental and social impacts of the Project. Based on the initial review, the Bank, in consultation with the Client, will identify appropriate tools for the Client to assess the environmental and social risks and impacts of the Project one by one. The Bank may determine an environmental and social assessment or other similar assessment applicable to the Project. The scope of the assessment may vary from project to project but is narrower than the ESIA scope for Category A projects. As in the case of a Category A Project, the assessment examines the Project's potentially negative and positive environmental and social impacts and recommends any measures needed to avoid, minimize, mitigate, or compensate for adverse impacts and improve the environmental and social performance of the Project.

- Category C. A project is classified as Category C when it is likely to have minimal

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or no adverse environmental and social impacts. The Bank does not require an environmental and social assessment of the Project, but requires the Client to review the environmental and social impacts of the Project.

- Type FI. A project is classified as FI if it involves investment in or through a financial intermediary (FI). Whereby the Bank delegates to the FI the decision-making on the use of the Bank funds, including the selection, evaluation, approval, and monitoring of the Bank-financed components. The Bank requires the FI Client, through the implementation of appropriate environmental and social policies and procedures, to screen and categorize components as category A, B or C; review; conduct due diligence on; and monitor the environmental and social risks and impacts associated with the Bank-financed subprojects, all in a manner consistent with this ESP. A Project categorized as FI is also subject to: (a) the Environmental and Social Exclusion List and applicable host country national laws for all Bank-financed components; and (b) the applicable ESSs for the Bank-financed components that are classified as Category A components (and if the Bank so determines, some or all of the Bank-financed components that are classified as Category B components).

#### 1.1.5.3 Environmental and social standard requirements

When the Bank has determined, in consultation with the Client, that the Project has potentially adverse environmental or social risks and impacts, it requires the Client:

To conduct an environmental and social assessment relating to these risks and impacts, and design appropriate measures to avoid, minimize, mitigate, offset or compensate for them, all as required under ESS 1.

- If the Project will result in Involuntary Resettlement, this issue should be addressed in the social section of the assessment report, complemented by further elaboration as required under ESS2. The Client shall include Involuntary Resettlement in the Resettlement Plan (RP) or Resettlement Planning Framework (RPF), which is provided to the Bank as a freestanding document, an annex to the assessment report, or incorporated into the report as a recognizable element.

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If the Project will affect Indigenous Peoples, this issue should be addressed in the social section of the assessment report, complemented by further elaboration as required under ESS3. The Client covers impacts on Indigenous Peoples in an Indigenous Peoples plan (Indigenous Peoples plan) or Indigenous Peoples planning framework (IPPF), which is provided to the Bank as a freestanding document, an annex to the assessment report, or incorporated into the report as a recognizable element.

#### 1.1.5.4 Involuntary resettlement

Involuntary resettlement: It covers physical displacement (relocation, loss of residential land or loss of shelter) and economic displacement (loss of land or access to land and natural resources; loss of assets or access to assets, income sources or means of livelihood).

The Bank screens each Project to determine whether or not it involves Involuntary Resettlement (which covers both physical and economic displacement, as defined in ESS2). Where it is impossible to avoid involuntary resettlement, the Client is required to ensure that resettlement activities are conceived and implemented as a sustainable development plan and that adequate resources are provided to ensure that the resettlers in the Project can share the project benefits. If the Project involves Involuntary Resettlement, AIIB requires the Client to prepare an RP or RPF (as applicable) that is proportional to the extent and degree of the impacts. The degree of impact is determined by: (1) the scope of physical and economic displacement; and (2) the vulnerability of the affected population. The RP complements the social risks and impacts and provides specialized guidance to address the specific issues associated with Involuntary Resettlement, including land expropriation, livelihood restoration for resettled people and resettlement. The Bank does not endorse illegal settlement; however, it recognizes that significant populations have already inhabited both urban and rural land without title or recognized land rights. In view of this, the Bank requires the Client to ensure that resettlers without title to land or any identifiable legal land rights are eligible for and receive resettlement assistance and compensation for non-land assets and are

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included in the resettlement consultation process within the deadlines established in the Resettlement Plan.

**Relevant facilities.** Related facilities refer to activities not included in the project description in the project management agreement, but determined by the Bank, after consulting with the Client, as being or to be: (1) directly and substantially related to the Project; (2) carried out or planned to be carried out simultaneously with the Project; (3) essential to the feasibility of the Project and not be constructed or expanded if the Project does not exist. Related facilities controlled or not controlled by the Client. The Bank requires the Client to identify and assess the potential environmental and social risks and impacts of the related facilities as part of the environmental and social assessment. More specifically,

- To the extent that the Client controls or influences the related facilities, the bank requires the Client to: (1) within the sphere of its control or influence over the related facilities, the Client must meet the requirements of ESP and ESS for such facilities; (2) if the related facilities are funded by another multilateral development bank or bilateral development organization, AIIB may use the requirements of the said development partner in place of all or part of the requirements in ESP and ESS, provided that, in its judgment, there is no material difference between these requirements and those specified in ESP and ESS.

- If the Client does not control or influence the related activities, the potential environmental and social risks and impacts of such facilities on the Project will be identified in the environmental and social assessment.

- The Client must demonstrate to the satisfaction of the bank that it has no control or influence over the related facilities by providing details of its considerations, including legal, regulatory and institutional factors.

#### 1.1.5.5 Resettlement Plan

To avoid Involuntary Resettlement wherever possible; to minimize Involuntary Resettlement by exploring Project alternatives; where avoidance of Involuntary

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Resettlement is not feasible, to enhance, or at least restore, the livelihoods of all resettled people in real terms relative to pre-Project levels; to improve the overall socioeconomic status of the resettled poor and other vulnerable groups; and to conceive and implement resettlement activities as sustainable development programs, providing sufficient resources to enable the persons displaced by the Project to share in Project benefits.

#### 1.1.6 Relevant regulations of the World Bank

The contractor and subcontractor will follow the environmental and social security policies of the World Bank, especially following the business policies/World Bank's Procedures below.

- OP/BP 4.01 Environmental evaluation;
- OP/BP 4.04 Natural habitats;
- OP/BP 4.11 Physical cultural resources;
- OP/BP 4.12 Involuntary resettlement;
- BP 17.50 Information disclosure;
- EHS Codes.

### 1.2 Work Contents

The Project is a report on ESIA and ESMP of Dashiqiao and Baodi Distributed PV Projects. The report mainly includes two aspects: ESIA and ESMP.

#### (1) ESIA

Identify environmental and social factors and determine the environmental and social impact assessment level and corresponding standards according to the basic situation of Dashiqiao and Baodi Distributed PV Projects. A project risk assessment scheme is formulated. With the cooperation of the Project sponsor, the site survey and investigation are carried out, and the locations of the stakeholders involved in the Project are publicized. A questionnaire is issued to some relevant units and individuals to solicit appeals and opinions on the Project. Investigate the basic situation of the project environment, and analyze and predict the impact of the Project on the

environment.

## (2) ESMP

Put forward corresponding environmental protection measures and monitoring plans according to the environmental impact assessment. On the basis of site investigation and consultation with all parties, the legality and compliance of the project construction are fully, objectively and scientifically demonstrated, and the corresponding social management plan and monitoring plan are put forward. Establish information disclosure consultation channels, and establish grievance redress mechanisms (GRMs) and other social risk precautionary approaches. The social and economic benefits of the Project are analyzed, and finally the conclusions of ESIA and ESMP are given.

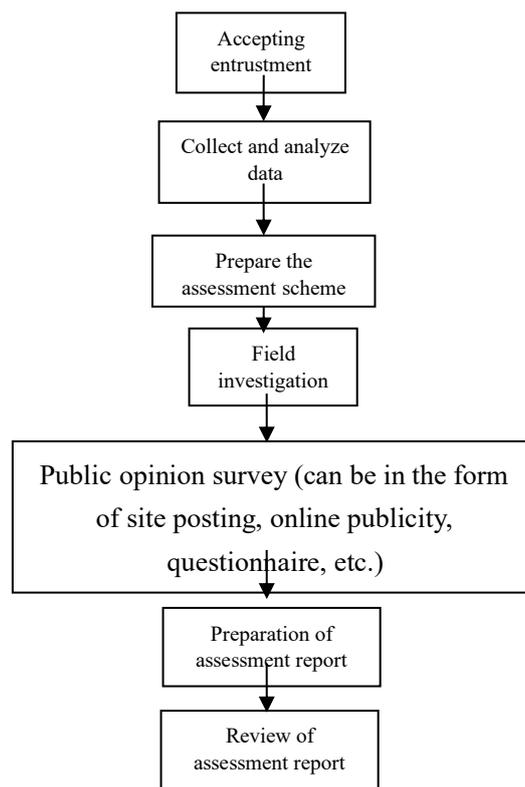


Figure 1.2-1 Workflow for Preparation of ESIA and the ESMP Report

## 1.3 Scope of work

### 1.3.1 Water Environment

According to the relevant provisions of Technical Guidelines for Environmental

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Impact Assessment-Surface Water Environment (HJ 2.3-2018) and Technical Guidelines for Environmental Impact Assessment-Groundwater Environment (HJ610-2016), the scope of water environment assessment is the surface water bodies involved in the Project.

The surface water bodies around the distributed PV project in Dashiqiao City, Liaoning Province mainly include Daqing River, Daliao River, Shengtian River, Erdao River, and other rivers and their tributaries. The surface water bodies that may be involved in the distributed PV project in Baodi District of Tianjin City mainly include Chaobaixin River, Qinglongwan River, the open channel leading the Luanhe River into Tianjin, the Juhe River, and other rivers and their tributaries.

### 1.3.2 Atmospheric Environment

The assessment scope of the atmospheric environment is within the area with a radius of 500m centered on each construction area, and 200m on both sides of the construction road.

### 1.3.3 Acoustic Environment

According to relevant provisions of Technical Guidelines for Environmental Impact Assessment-Acoustic Environment (HJ 2.4-2021), the assessment scope of the acoustic environment is determined to be 200m outside the boundary of each construction area and construction road.

### 1.3.4 Social Environment

The preliminarily selected site of the Dashiqiao 50MW distributed PV project includes 17 towns and subdistricts in Dashiqiao City, Liaoning Province, namely Jinqiao Subdistrict, Gangdu Subdistrict, Baizhai Subdistrict, Meidu Subdistrict, Shuiyuan Town, Gouyan Town, Shifo Town, Gaokan Town, Qikou Town, Huzhuang Town, Guantun Town, Boluopu Town, Yong'an Town, Tangchi Town, Jianyi Town, Huangtuling Town, and Zhoujia Town.

The preliminarily selected site of Baodi 50MW Distributed PV Project in Tianjin includes 10 towns and subdistricts in Baodi District, Tianjin, namely Chaoyang

Subdistrict, Wangbuzhuang Town, Fangjiazhuang Town, Xin'an Town, Huogezhuang Town, Xinkaikou Town, Niudaokou Town, Shigezhuang Town, Haogezhuang Town, and Niujiapai Town.

## 1.4 Assessment Standard

### 1.4.1 Environmental Quality Standards

#### (1) Surface Water Environmental Quality Standard

According to the water function zoning of Liaoning Province, the main rivers and their water function zones and water quality objectives involved in the 50MW distributed PV power generation project in Dashiqiao City, Liaoning Province and the 50MW distributed PV power generation project in Baodi District, Tianjin are shown in Table 1.4-1 and Table 1.4-2.

#### Water Quality Objectives of Main Rivers of Dashiqiao 50MW Distributed PV Project in Liaoning

Table 1.4-1:

S/N	Code of Water Functional Zone	Name of Water Functional Zone	River	Water quality target
1	B0402000303000	Yingkou Development and Utilization Zone of Daliao River	Daliao River	IV
2	B0402000303013	Sanchahekou Agricultural Water Consumption Zone of Daliao River	Daliao River	IV
3	B0402000303022	Industrial Water Consumption Zone and Agricultural Water Consumption Zone of Shangkouzi of Daliao River	Daliao River	IV
4	B0402000303037	Sewage Discharge Control Zone at the Estuary of Huzhuang River in Daliao River	Daliao River	*
5	B0402000404000	Yingkou Buffer Zone, Daliao River	Daliao River	IV
6	B0601007703000	Gaizhou Development and Utilization Zone, Shengtian River	Shengtian River	V
7	B0601007703013	Gaizhou Agricultural Water Consumption Zone, Shengtian River	Shengtian River	V
8	B0601007901000	Dashiqiao Source Water Conservation Zone, Daqing River	Daqing River	II
9	B0601008003000	Gaizhou Development and	Daqing	II~IV

S/N	Code of Water Functional Zone	Name of Water Functional Zone	River	Water quality target
		Utilization Zone, Daqing River	River	
10	B0601008003011	Drinking Water Source Zone and Industrial Water Consumption Zone of Shimen Reservoir, Daqing River	Daqing River	II
11	B0601008003021	Agricultural Water Consumption Zone and Drinking Water Source Zone of Railway Bridge, Daqing River	Daqing River	III
12	B0601008003037	Railway Bridge Sewage Control Zone, Daqing River	Daqing River	*
13	B0601008003046	Xihai Barrage Transition Zone, Daqing River	Daqing River	IV
14	B0601008104000	Gaizhou Buffer Zone, Daqing River	Daqing River	IV
15	B0601009003000	Gaizhou Development and Utilization Zone, Erdao River	Erdao River	III
16	B0601009003013	Gaizhou Agricultural Water Consumption Zone and Fishery Water Consumption Zone, Erdao River	Erdao River	III

Water Quality Objectives of Main Rivers of Baodi 50MW Distributed PV Project in  
Tianjin

Table 1.4-2

S/N	Name of Water Functional Zone	Initial section	Termination section	River	Water quality target
<b>Tianjin First-class Water Environment Function Zoning</b>					
1	Conservation area	Jiuwangzhuang	Dazhangzhuang	Open channel leading the Luanhe River into Tianjin	II
2	Buffer zone	Tianjin-Hebei border	Huangjiaji Bridge	Lead the Juhe River into the Caobaixin River	III~IV
3	Development and utilization area	Huangjiaji Bridge	Zhuliuzhuang Gate	Lead the Juhe River into the Caobaixin River	IV
4	Buffer zone	Niumutun	Zhuliuzhuang Gate	Chaobaixin River	IV
5	Development and utilization area	Zhuliuzhuang Gate	Ningchegu Gate	Chaobaixin River	III~IV
6	Buffer zone	Tumen Tower	Dakoutun	Qinglongwan Jianhe River	III
7	Development and utilization area	Dakoutun	Chaobaixin River	Qinglongwan Jianhe River	III
8	Buffer zone	Maoshan	Huangyaguan	Juhe River	III
9	Development and utilization area	Huangyaguan	Luozhuangzi	Juhe River	III
10	Buffer zone	Sanhe River	Xinzhuang	Juhe River	III
11	Development and utilization area	Xinzhuang	Jiuwangzhuang	Juhe River	IV
12	Development and utilization area	Jiuwangzhuang	Xin'an Town	Jiyun River	IV
13	Buffer zone	Xin'an Town	Jiangwakou	Jiyun River	IV
14	Development and utilization area	Jiangwakou	Jiyun River Gate	Jiyun River	IV
<b>Tianjin Second-class Water Environment Function Zoning</b>					

15	Water space for agriculture	Huangjiayi Bridge	Zhuliuzhuang Gate	Lead the Juhe River into the Caobaixin River	IV
16	Water space for fishery	Zhuliuzhuang Gate	Lizigu Gate	Chaobaixin River	III
17	Water space for industry	Lizigu Gate	Ningchegu Gate	Chaobaixin River	IV
18	Water space for agriculture			Chaobaixin River	IV
19	Water space for agriculture	Dakoutun	Chaobaixin River	Qinglongwan Jianhe River	III
20	Water space for industry			Qinglongwan Jianhe River	III
21	Drinking water source area	Huangyaguan	Luozhuangzi	Juhe River	III
22	Water space for agriculture	Xin Zhuang Gate	Jiuwangzhuang	Juhe River	IV
23	Water space for industry			Juhe River	
24	Water space for agriculture	Jiuwangzhuang	Xin'an Town	Jiyun River	IV
25	Water space for agriculture	Jiangwakou	Lutai Bridge	Jiyun River	IV
26	Water space for industry	Lutai Bridge	Jiyun River Gate	Jiyun River	IV
27	Water space for agriculture			Jiyun River	IV

## (2) Ambient Air Quality Standard

The project site is located in rural towns, so the secondary concentration limit in Ambient Air Quality Standard (GB3095-2012) shall be implemented.

### Ambient Air Quality Standards (GB3095-2012)

Table 1.4-3

Pollutants	Value-taking time	Concentration limit	Concentration unit
		Level II standard	
Sulfur dioxide (SO <sub>2</sub> )	Annual average	<b>60</b>	μg/m <sup>3</sup>
	24-hour average	<b>150</b>	
	1-hour average	<b>500</b>	
Nitrogen dioxide (NO <sub>2</sub> )	Annual average	<b>40</b>	
	24-hour average	<b>80</b>	
	1-hour average	<b>200</b>	
Carbon monoxide (CO)	24-hour average	<b>4</b>	mg/m <sup>3</sup>
	1-hour average	<b>10</b>	
Ozone (O <sub>3</sub> )	Daily maximum 8-h average	<b>10</b>	μg/m <sup>3</sup>
	1-hour average	<b>160</b>	
Particulate matter (PM <sub>10</sub> )	Annual average	<b>70</b>	
	24-hour average	<b>150</b>	

#### (3) Acoustic environmental quality standard

The project site is located in rural towns, and the Class 1 standard in the Acoustic Environmental Quality Standard (GB3096-2008) shall be implemented, and the Class 4a standard in the Acoustic Environmental Quality Standard (GB3096-2008) shall be implemented in the area within 50m outside the boundary lines of roads on both sides of the traffic trunk road. See Table 1.4-4 for the specific towns and subdistricts involved in the Project.

#### Acoustic Environmental Quality Standard (GB3096-2008)

Table 1.4-4

Unit: dB (A)

Classification of Acoustic Environment Functional Zone	Time		Execution Area
	Daytime	Nighttime	
Class 1	55	45	Sensitive points in the village where the Project is located and beyond 30m outside the boundary line of roads on both sides of the traffic trunk road
Class 4a	70	55	Within 30m outside the boundary line of roads on both sides of the traffic trunk road

#### 1.4.2 Pollutant Emission Standards

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The pollutant emission standards of the Project mainly include sewage and wastewater discharge standards, ambient air emission standards and noise emission standards.

(1) Wastewater (sewage) treatment objectives and discharge standards

No living area is arranged on the construction site. It is planned to rent residential houses outside the station to accommodate workers, so no domestic sewage will be generated on site. The construction area is only provided with an office area, reinforcement processing yard, wood formwork processing plant, and equipment and material stacking area. Among them, the office area relies on the original office building of the Project, including hardware and valuables warehouses, offices, meeting rooms, etc., and the sewage and wastewater are not discharged outside the municipal pipe network. Since there is basically no production wastewater during the construction of distributed PV projects, only a small amount of construction vehicle washing wastewater is generated, and the main pollutant in the wastewater is only a small amount of SS.

Vehicle washing tanks and sedimentation tanks shall be set up in the main construction area of the Project to wash the vehicles entering and leaving the construction site, so as to prevent the vehicles from bringing dust into the social roads. After sedimentation of vehicle washing wastewater, the supernatant shall meet the corresponding standards of The Reuse of Urban Recycling Water—Water Quality Standard for Urban Miscellaneous Use (GB/T 18920-2020) before being reused as construction water or watering for dust suppression. A certain area of the drying site shall be set up in the construction site, and the sediment shall be transported to the designated place for soil covering after drying.

During the operation of the Project, solar panels will be cleaned. Since the composition of cleaning sewage is basically the same as that of rainwater and the number of PV modules installed in each household is definite, a large amount of cleaning wastewater will not be generated. The cleaning wastewater can be treated by

local rainwater ditches.

(2) Ambient air pollution prevention and control objectives and emission standards

The Project is a distributed PV project, which converts solar energy into electric energy. No fossil fuel is involved in the power generation process, and no waste gas pollutants or environmental air pollution is generated.

(3) Noise pollution prevention and control objectives and emission standards

The noise emission in the construction area shall be subject to the noise limit specified in the Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011). During the operating period, the operation of PV panels is basically free of noise.

Emission Standard of Environment Noise for Boundary of Construction Site  
(GB12523-2011)

Table 1.4-5

Unit: dB (A)

Daytime	Nighttime
70	55

## 1.5 Environmental Protection Objectives and Stakeholders

(1) Surface water environmental protection objects

The surface water environmental protection objective of the Project is the surface water body near the project site. See Table 1.4-1 and Table 1.4-2 for details.

(2) Acoustic environment and ambient air protection objectives

The acoustic environmental protection objectives of the Project are the buildings and building concentration areas that need to be kept quiet in the town and subdistrict areas specifically implemented by the (50MW) distributed PV project in Dashiqiao City of Liaoning Province and the (50MW) distributed PV project in Baodi District of Tianjin.

The ambient air protection objectives of the Project are the residential area, cultural area and rural area where people are concentrated in the town and subdistrict areas specifically implemented by the (50MW) distributed PV project in Dashiqiao City of Liaoning Province and the (50MW) distributed PV project in Baodi District of

Tianjin, totalling 27. See Table 1.5-1 for details.

### Acoustic Environment and Ambient Air Protection Objectives

Table 1.5-1

Project location	Name of towns and subdistricts	Functional Zoning
Dashiqiao City, Liaoning Province	Jinqiao Subdistrict	Acoustic Environmental Quality Standard (GB3096-2008) Class 1 and Class 4a; Class II standard in Ambient Air Quality Standard (GB3095-2012).
	Gangdu Subdistrict	
	Baizhai Subdistrict	
	Meidu Subdistrict	
	Shuiyuan Town	
	Gouyan Town	
	Shifo Town	
	Gaokan Town	
	Qikou Town	
	Huzhuang Town	
	Guantun Town	
	Boluopu Town	
	Yongan Town	
	Tangchi Town	
Jianyi Town		
Baodi District, Tianjin	Huangtuling Town	Acoustic Environmental Quality Standard (GB3096-2008) Class 1 and Class 4a; Class II standard in Ambient Air Quality Standard (GB3095-2012).
	Zhoujia Town	
	Chaoyang Subdistrict	
	Wangbuzhuang Town	
	Fangjiazhuang Town	
	Xin'an Town	
	Huogezhuang Town	
	Xinkaikou Town	
	Niudaokou Town	
	Shigezhuang Town	
Haogezhuang Town		
Niujiapai Town		

#### (4) Surrounding stakeholders of the Project

The stakeholders of the Project can be roughly divided into five groups: governments at all levels and relevant institutions in the project area, project implementation institutions and construction units, various groups served by the Project, households providing roof rental for the Project and groups affected by construction. The specific stakeholders are shown in the following table.

## Identification of Stakeholder

Table 1.5-2

Stakeholder groups	Specific stakeholders
Relevant government agencies of the Project	Baodi District and Dashiqiao Municipal Bureau of Planning and Resource Management, Baodi District and Dashiqiao Municipal Housing and Urban-Rural Development Bureau, Baodi District and Dashiqiao Municipal Ecological Environment Bureau as the planning and environmental management units of the Project
Project implementation institutions and construction contractor	Beijing Xiangju New Energy Technology Co., Ltd., Yingkou and Dashiqiao Project Company, Yingkou and Dashiqiao Construction Contractor
Groups served by the Project	SPIC Northeast Electric Power Co., Ltd. Benxi Thermal Power Branch
Households providing roof rental for the Project	About 4,209 farmer households in Baodi District and about 2,500 farmer households in Dashiqiao City plan to rent roofs and courtyards.
Groups affected by construction	

According to the site survey, the preliminarily selected site of the Dashiqiao 50MW Distributed PV Project includes 17 towns and subdistricts in Dashiqiao City, Liaoning Province, namely Jinqiao Subdistrict, Gangdu Subdistrict, Baizhai Subdistrict, Meidu Subdistrict, Shuiyuan Town, Gouyan Town, Shifo Town, Gaokan Town, Qikou Town, Huzhuang Town, Guantun Town, Boluopu Town, Yong'an Town, Tangchi Town, Jianyi Town, Huangtuling Town, and Zhoujia Town; the preliminarily selected site of Tianjin Baodi 50MW Distributed PV Project includes 10 towns and subdistricts in Baodi District, Tianjin, namely Chaoyang Subdistrict, Wangbuzhuang Town, Fangjiazhuang Town, Xin'an Town, Huogezhuang Town, Xinkaikou Town, Niudaokou Town, Shigezhuang Town, Haogezhuang Town, and Niujiapai Town.

### FARMERS AFFECTED BY THE PROJECT

Table 1.5-3

Project	S/N	Township and subdistrict	The Project's closest proximity	Impact factors
Baodi 50MW Distributed PV Project	1	Chaoyang Subdistrict	The Project will rent the roof of farmers, which can be directly used.	Environmental impacts such as dust and noise during the
	2	Wangbuzhuang Town		
	3	Fangjiazhuang Town		
	4	Xin'an Town		

Project	S/N	Township and subdistrict	The Project's closest proximity	Impact factors
in Tianjin	5	Huogezhuang Town	The Project will rent the roof or courtyard of farmers, which can be directly used.	construction period; roof occupation during the operation period, which has a certain impact on house repair.
	6	Xinkaikou Town		
	7	Niudaokou Town		
	8	Shigezhuang Town		
	9	Haogezhuang Town		
	10	Niujiapai Town		
Dashiqiao 50MW Distributed PV Project	1	Jinqiao Subdistrict		
	2	Gangdu Subdistrict		
	3	Baizhai Subdistrict		
	4	Meidu Subdistrict		
	5	Shuiyuan Town		
	6	Gouyan Town		
	7	Shifo Town		
	8	Gaokan Town		
	9	Qikou Town		
	10	Huzhuang Town		
	11	Guantun Town		
12	Boluopu Town			
13	Yongan Town			
14	Tangchi Town			
15	Jianyi Town			
16	Huangtuling Town			
17	Zhoujia Town			



Dalanggezhuang Village, Chaoyang  
Subdistrict



Shishihu Village, Haogezhuang Town



Chenjiakou Village, Huogezhuang Town

Zhaijiashen Village, Niudaokou Town



Liujiakou Village, Xinkaikou Town

Figure 1.5-2 Aerial Photograph of Farmhouses Involved in Baodi 50MW Distributed  
PV Project in Tianjin



Wangmatai Village, Boluopu Town



Huzhuang Village, Huzhuang Town



Yaotun Village, Qikou Town



Tangchi Village, Tangchi Town





Woniushi Village, Tangchi Town



Huizhuang Village, Yong'an Town



Xitianjiatun Village, Yong'an Town

Figure 1.5-3 Aerial Photograph of Farmhouses Involved in the Dashiqiao 50MW Distributed PV Project in Yingkou

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## 2 Project Overview

### 2.1 Project sponsor's Information

The sponsor of the Project is Beijing Xiangju New Energy Technology Co., Ltd. under CHONGHO BRIDGE.

CHONGHO BRIDGE is a comprehensive service organization specialized in serving rural small and micro clients. It is composed of Chongho Bridge Management Limited and its small and micro-financial institutions and rural service enterprises. CHONGHO BRIDGE is committed to helping low- and middle-income groups and small and micro-enterprises in rural areas to develop production, improve their lives, and integrate into the process of agricultural and rural modernization by providing a variety of services such as credit, production, living and public welfare, thus narrowing the gap between urban and rural, rich and poor, gender and digital development, and helping rural revitalization and common prosperity. Up to now, CHONGHO BRIDGE has covered more than 430 counties/cities in 20 provinces in China, with more than 6000 employees, more than 100,000 part-time village-level station managers, over 1.2 million clients served throughout the year, and more than tens of millions of clients accumulated.

Beijing Xiangju New Energy Technology Co., Ltd. is based in the county, coordinates resources, and provides full-process distributed PV integrated services such as development, survey, design, installation, operation and maintenance, and asset management for partners who have the ability to support household assets. The main business lines of Beijing Xiangju New Energy Technology Co., Ltd. include:

(1) Become the optimal cooperation channel (PV+) for state-owned enterprises/central enterprises to implement the rural revitalization strategy. Become a landing service provider for rural distributed PV, PV "county-wide promotion" and clean energy station operation, focusing on the scale of PV household use. In three years, the household scale will be over 200,000, the installed capacity will reach more than 3GW, and the total investment scale will exceed RMB10 billion.

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(2) Alliance of financial empowerment service providers (finance+) based on rural assistance platform. Capital turnover services for the procurement of county and township installers (HVAC/PV, etc.) that have obtained subcontract service orders; large-scale installment service for end-users; with brand parties or distributors settled on the "township assistance" platform to put relevant goods on shelves, national or regional customer managers will receive commissions for sales, and distribution can support regional protection.

## 2.2 Geographical Location

The Project includes Dashiqiao 50MW Distributed PV Project and Baodi 50MW Distributed PV Project in Tianjin.

The preliminarily selected site of the Dashiqiao 50MW distributed PV project includes 17 towns and subdistricts in Dashiqiao City, Liaoning Province, namely Jinqiao Subdistrict, Gangdu Subdistrict, Baizhai Subdistrict, Meidu Subdistrict, Shuiyuan Town, Gouyan Town, Shifo Town, Gaokan Town, Qikou Town, Huzhuang Town, Guantun Town, Boluopu Town, Yong'an Town, Tangchi Town, Jianyi Town, Huangtuling Town, and Zhoujia Town.

The preliminarily selected site of Baodi 50MW Distributed PV Project in Tianjin includes 10 towns and subdistricts in Baodi District, Tianjin, namely Chaoyang Subdistrict, Wangbuzhuang Town, Fangjiazhuang Town, Xin'an Town, Huogezhuang Town, Xinkaikou Town, Niudaokou Town, Shigezhuang Town, Haogezhuang Town, and Niujiapai Town.

## 2.3 Necessity of Project Construction

### **(1) Renewable energy development**

China is one of the largest coal producers and consumers in the world, and also one of the few countries with coal as the main energy source. In energy production and consumption, coal accounts for about 70% of commodity energy consumption, and has become the main source of air pollution in China. Therefore, vigorously developing

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new and renewable energy technologies such as solar energy, wind energy, biomass energy, geothermal energy and ocean energy will become one of the important measures to reduce environmental pollution.

In recent years, international PV power generation has developed rapidly. PV power generation has transitioned from supplementary energy to alternative energy and is developing towards grid-connected power generation. China has also introduced a series of policy measures to encourage and support the development of solar PV power generation industry, such as Regulations on the Administration of Renewable Energy Power Generation, Trial Measures on the Administration of the Price and Cost Allocation of Renewable Energy Power Generation, Interim Measures on the Allocation of Additional Revenue from Renewable Energy Electricity Price, Measures on the Administration of Special Funds for Renewable Energy Development, Notice on the Requirements for the Construction of Large-scale Grid-connected PV Demonstration Stations, Notice on the Implementation of Golden Solar Demonstration Projects, etc. Support was given in terms of policies, investment, finance and taxation, and electricity prices, and the prices of PV modules and grid-connected inverters continued to fall. A large number of 100-MW PV power stations (PVPSs) have been put into operation throughout the country and a large number of experiences in manufacturing, construction and installation, operation and maintenance have been accumulated. Therefore, PV power generation is one of the renewable energy power generation modes with the most mature technology, the most large-scale development conditions, and commercial development prospects.

The development of new energy is an important part of China's energy development strategy. As a large storage area of primary energy and clean energy, Tianjin and Yingkou, while developing primary energy in an orderly and step-by-step manner, actively developing and utilizing clean renewable energy, will have special significance for improving the local micro-ecological environment.

Therefore, the construction of the Project is very necessary and can play an

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exemplary role.

## **(2) Rational utilization of energy resources**

In accordance with the spirit of the Notice of the State Council on Issuing the Comprehensive Work Plan for Energy Conservation and Emission Reduction (GF [2007] No.15) and the Notice of the Ministry of Finance and the Ministry of Construction on Issuing the Interim Measures for the Administration of Special Funds for Renewable Energy Building Applications (CJ [2006] No.460), the central financial department arranges part of the funds from the special funds for renewable energy to support the demonstration and promotion of solar PV applications in urban and rural buildings.

In order to promote the development of China's renewable energy industry, in accordance with the requirements of the Renewable Energy Law of the People's Republic of China, the National Development and Reform Commission issued the Guiding Catalogue for the Development of Renewable Energy Industry in November 2005, covering 88 renewable energy development and utilization and system equipment manufacturing projects in six fields, including wind energy, solar energy, biomass energy, geothermal energy, ocean energy and hydro energy. For the projects with large-scale promotion and utilization in the Catalogue, relevant departments of the State Council will formulate and improve preferential policies on technology research and development, project demonstration, fiscal taxation, product price, market sales, and import and export.

In order to promote the progress of energy conservation technology, improve energy utilization efficiency, promote energy conservation and optimize energy consumption structure, and build a resource-conserving and environmental-friendly society, the National Development and Reform Commission and the Ministry of Science and Technology issued a new Outline of China's Energy Conservation Technology Policy in December 2006, emphasizing that renewable energy (including non-fossil energy such as wind energy, solar energy, hydro energy, biomass energy,

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geothermal energy, and ocean energy) is an important energy resource in China, and plays an important role in meeting energy demand, improving energy structure, and building a resource-saving and environment-friendly society. The Outline of China's Energy Conservation Technology Policy proposes that in terms of solar energy technology, the production technology of solar PV silicon materials, solar PV power generation technology and solar thermal utilization technology shall be researched and developed; in terms of new energy-saving materials, we will develop new efficient energy conversion and energy storage devices and materials, and promote the application and development of fuel cells, solar cells, metal air batteries, supercapacitors and related materials.

According to the Notice of the National Energy Administration on Further Implementing Relevant Policies on Distributed PV Power Generation (GNXN [2014] No.406), various forms of distributed PV power generation applications are encouraged. It is necessary to make full use of the resources of qualified building roofs (including ancillary vacant sites), and encourage development zones and large industrial and commercial enterprises with large roof areas, large power loads and high power grid prices to take the lead in PV power generation applications. Local governments at all levels are encouraged to formulate supporting financial subsidy policies on the basis of state subsidies, and appropriately increase support for public institutions, affordable housing and rural areas. It is encouraged to promote PV power generation in the public facility systems such as railway stations (including high-speed railway stations), expressway service areas, airport terminals, large-scale comprehensive transportation hub buildings, large-scale stadiums and parking lots, and take PV power generation application as an important element in the planning and design of relevant buildings and other facilities, and encourage large enterprise groups to uniformly organize and construct distributed PV power generation projects for their subordinate enterprises. Distributed PVPSs for local consumption are constructed by utilizing abandoned land, barren hills and slopes, agricultural greenhouses, tidal flats, fish ponds and lakes

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according to local conditions. It is encouraged to combine distributed PV power generation with poverty alleviation for rural households, new rural construction, and agricultural facilities to promote the improvement of rural residents' lives and agricultural and rural development. For various distributed PV power generation projects mainly for self-generation and self-consumption, when limited by the construction scale indicator, the provincial energy department shall timely coordinate and solve or apply to the National Energy Administration for additional scale indicators.

The demand for a new installed capacity of PV power generation in the 14th Five-Year Plan will be much higher than that in the 13th Five-Year Plan. The application scenarios will be continuously expanded, the business model will be innovated, and the supporting policies for the photovoltaic industry will be continuously improved. On December 12, 2020, Xi Jinping, President of the People's Republic of China, delivered an important speech entitled Continuing the Past and Starting a New Journey to Global Climate Change at the Climate Ambition Summit, further announcing that by 2030, China will lower CO<sub>2</sub> emissions per unit GDP by 65% from 2005 levels, increase the share of non-fossil fuels in primary energy consumption to around 25%, increase forest stock by 6 billion m<sup>3</sup> above 2005 levels and bring the total installed capacity of wind and solar power to over 1,200GW.

Baodi District is dominated by a warm temperate semi-humid continental monsoon climate. It has four distinctive seasons, short spring and autumn, long summer and winter, annual average temperature of 11.6°C, annual precipitation of 612.5 mm, and annual frost-free period of about 184 days on average. The annual total solar radiation value ranges from 4200 MJ/m<sup>2</sup> to 5400 MJ/m<sup>2</sup> in all parts of Tianjin, and the annual total solar radiation in most parts of Tianjin is more than 4500 MJ/m<sup>2</sup>, which is rich in solar energy resources and suitable for the construction of PVPSs. Dashiqiao City is dominated by a warm temperate semi-humid continental monsoon climate. There are four distinct seasons in the year, namely, short spring and autumn, long summer and winter, annual average temperature of 8°C-9°C, annual precipitation of

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640-750mm, and frost-free period of about 175 days over the years. The area where the proposed site is located has sufficient sunshine and the average annual total radiation is 5172.3MJ/m<sup>2</sup>. Its solar energy resources belong to Class B "rich in resources" area, which is suitable for the construction of large-scale PVPSs.

Baodi District of Tianjin City and Dashiqiao City of Liaoning Province have excellent conditions for the development of solar energy resources. The active development of solar energy resources and the use of renewable energy for power generation can improve the power supply structure of the region, and replace some power generation equipment with high energy consumption and high pollution. While improving the environmental quality, it can also increase employment opportunities for local residents, drive the development of relevant industries and meet the power demand of residents, bringing good social and environmental benefits.

Therefore, the Project conforms to the national policy of encouraging the development of PV industry and supporting the energy industry policy of PV power generation and grid connection.

### **(3) Energy conservation and emission reduction to improve ecology**

Protecting and improving the environment on which human beings depend and realizing sustainable development are the common wishes of people all over the world. Our government has made sustainable development a basic strategy for economic and social development and has taken a number of major initiatives. The reasonable development and economical use of natural resources, improvement of resource utilization mode, adjustment of resource structure allocation and improvement of resource utilization rate are all effective ways to improve the ecology and protect the environment.

Solar energy is clean and renewable energy. The development of solar energy in line with national policies on environmental protection and energy-saving, the development and construction of PVPSs can effectively reduce the consumption of conventional energy, especially coal resources, protect the ecological environment and

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create tourist attractions with beautiful mountain and river.

The Clean Development Mechanism (CDM) is one of the three flexible mechanisms under the Kyoto Protocol, i.e. the project-based cooperation mechanism between developed countries and developing countries in the United Nations Framework Convention on Climate Change (UNFCCC).

China is one of the developers with great greenhouse gas emission reduction potential. It has a good investment environment and a broad market prospect for CDM cooperation. The power industry, especially the PV power generation industry, is a key area of CDM projects. The development of CDM projects in the PV power generation field has great potential and advantages.

If the Project can be successfully registered as a CDM project, the investment and technical obstacles faced by the Project can be overcome to a certain extent, which will bring great benefits to the Project. Therefore, it is recommended that the Sponsor of the Project entrust the Consultant to apply for CDM project in time to maximize the CDM revenue.

#### **(4) Contribution to social and economic development**

The proposed project can effectively utilize local solar energy resources. While generating clean energy, it can also increase employment opportunities for local residents and drive the development of relevant industries. The local government is very supportive of the construction of solar PVPSs. Through the introduction of projects, the local government will inject funds into the local economy, improve the level of fixed assets investment, and establish good cooperative relations with large national enterprises and internationally renowned enterprises, laying a solid foundation for follow-up investment attraction, which can also improve the regional status and establish a good regional image.

The proposed project adopts renewable energy for power generation, which will not have an adverse impact on the environment and ecology, but also replaces some power generation equipment with high energy consumption and high pollution,

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improves environmental quality and has positive externalities for local residents. At the same time, it can also increase employment opportunities for local residents, drive the development of relevant industries and meet the electricity demand of residents. Therefore, the residents also have a positive attitude towards the proposed project.

## 2.4 Project Task and Scale

### 2.4.1 Project tasks

The main task of the project construction is to build distributed PV projects, promote the development of new energy industries, improve the income level of farmers, and contribute to the construction of new rural areas.

### 2.4.2 Project scale

Dashiqiao 50MW Distributed PV Power Generation Project is a household PVPS, and the mode of "full feed-in grid" is adopted. Each household is equipped with 30~90 pieces of 540Wp monocrystalline silicon solar modules. The actual installed capacity is determined according to the actual installable area of the leased farmers, usually 15~50kWp. One PV inverter is configured according to the actual installed capacity, and the outgoing line is connected to the combined LV distribution box. According to the total installed capacity, the irradiation quantity of inclined surface, the system efficiency and the nominal efficiency attenuation of PV modules, etc., it is calculated that the average annual energy output of the PVPS is 65,898,000 kWh, the average annual utilization hours are 1,329h, and the total energy output in 25 years is 1,647,438,800 kWh.

The 50MW Distributed PV Power Generation Project in Baodi District is a household PVPS, and the mode of "full feed-in grid" is adopted. Each household is equipped with 22 pieces of 540Wp monocrystalline silicon solar modules, with an actual installed capacity of 11.88kWp. One 10kW PV inverter is installed, and the outgoing line is connected to the residential LV distribution box. According to the total installed capacity, the irradiation quantity of inclined surface, the system efficiency and the nominal efficiency attenuation of PV modules, etc., it is calculated that the average

annual energy output of the PVPS is 68,087,800 kWh, the average annual utilization hours are 1,361.68h, and the total energy output of 25 years is 1,702,195,000 kWh.

## 2.5 Project Composition

The PV power generation system constructed by the Project adopts the full feed-in grid mode.

The schematic diagram of grid-connected PV power generation in the project is as follows:

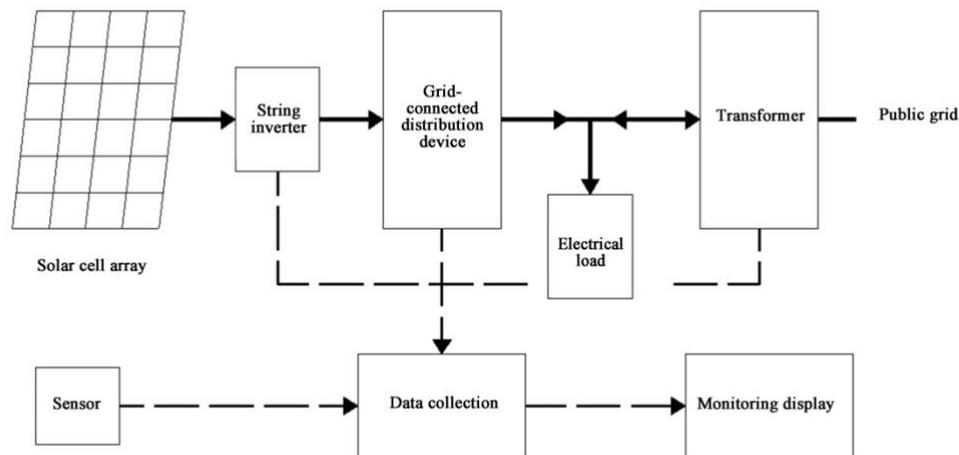


Figure 2.5-1 Schematic Diagram of Grid-connected PV Power Generation

The main components of the Project include PV modules, inverters, PV brackets, environmental monitors and secondary electrical access cables.

### (1) PV modules

The PV power generation system connects a large number of PV modules with the same specifications and characteristics in series through a number of solar modules to reach the rated input voltage of the inverter, and then connects such cell panels in parallel to reach the predetermined rated power of the system. These devices are numerous. In order to avoid mutual shielding between them, they must be arranged at a certain spacing to form an array, which is called PV power generation array. A circuit consisting of several PV modules of the same specification and characteristics connected in series is a basic array unit. Each PV power generation array consists of a solar module, inverter and step-up power distribution room with a predetermined power.

Several PV arrays form a PVPS through the connection of electrical systems. The selection of appropriate PV modules has a great impact on the investment, operation and benefit of the whole power station.

At present, the highest laboratory efficiency of solar cells in the world is: 24% (4cm<sup>2</sup>) for monocrystalline silicon cells, 18.6% (4cm<sup>2</sup>) for polycrystalline silicon cells, 30.28% (AM1) for InGaP/GaAs double junction cells, 14.5% (initial), 12.8% (stable) for amorphous silicon cells, 15.8% for cadmium telluride cells, 14.6% for silicon ribbon cells, and 10.96% for TiO<sub>2</sub> nanocrystalline organic solar cells. Crystalline silicon solar cells are proposed for the Project.

Considering various factors such as module efficiency, technical maturity, market share, module production capacity, project construction period, manufacturer's supply capacity, etc., solar modules with large unit area power shall be preferred to reduce floor area, save cable and reduce module installation. Based on the current industrial status and production capacity of the domestic PV module market, the mainstream and leading crystalline silicon PV modules in the market are selected for comparison. Through preliminary investigation, the module efficiency of each manufacturer reaches the full mark, mainly including monocrystalline modules. Therefore, the single crystal module is recommended in this technical scheme.

Considering the module efficiency, technical maturity, market share and the available options when purchasing and ordering, it is proposed to select the high-efficiency monocrystalline silicon 540Wp module for the Project, with a module efficiency of 20.4%.

#### PERFORMANCE PARAMETER TABLE OF PV MODULE

Table 2.5-1

Parameters	Value
Maximum output power P <sub>max</sub> (W)	540
Open-circuit voltage V <sub>oc</sub> (V)	49.5
Short-circuit current I <sub>sc</sub> (A)	13.85
Working voltage V <sub>mppt</sub> (V)	41.65
Working current I <sub>mppt</sub> (A)	12.97
Conversion efficiency of modules	20.71

Peak power temperature coefficient (%/°C)	0.35
Open circuit voltage temperature coefficient (%/°C)	0.204
Short circuit current temperature coefficient (%/°C)	0.05
Output power tolerance (W)	0 - +5
Operating temperature (°C)	-40~+85
Outline dimensions (L × W× H) (mm)	2256×1133×35

Note: The nominal power of the above modules under standard test conditions (STC): 1000W/m<sup>2</sup>, solar battery temperature 25°C, AM1.5.

## (2) Inverter

The Project adopts string inverter. Compared with centralized inverter, it has a series of advantages such as no increase in system investment, higher investment income and availability.

Product model	SG8.0RT-20	SG10RT-20	SG12RT-20	SG15RT-20	SG17RT-20	SG20RT-20
<b>Input (DC)</b>						
Maximum input voltage	1100V					
Start-up voltage	180V					
Rated input voltage	600V					
MPPT voltage range	160V~1000V					
Full-load MPPT voltage range	330V~850V	430V~850V	510V~850V	430V~850V	365V~850V	430V~850V
Quantity of MPPT	2					
MPPT voltage range per channel	1 / 1	1 / 1	1 / 1	2 / 1	2 / 2	2 / 2
Maximum input current	25A (12.5A/12.5A)	25A (12.5A/12.5A)	25A (12.5A/12.5A)	37.5A (25A/12.5A)	50A (25A/25A)	50A (25A/25A)
Maximum allowable current of input terminal	16A					
Maximum DC short-circuit current	32A (16A/16A)	32A (16A/16A)	32A (16A/16A)	48A (32A/16A)	64A (32A/32A)	64A (32A/32A)
<b>Output (AC)</b>						
Rated output power	8000W	10000W	12000W	15000W	17000W	20000W
Maximum output apparent power	8800VA	11000VA	13200VA	16500VA	18700VA	22000VA
Maximum output current	13.3A	16.7A	20A	25A	28.3A	31.9A
Rated grid voltage	3 / N / PE, 400V					
Grid voltage range	270V~480V					
Rated grid frequency	50Hz					
Range of grid frequency	45~55Hz					
Total harmonic distortion	<3% [Rated power]					
DC component	<0.5% In					
Power factor	> 0.99 @ full power (adjustable range 0.8 lead ~ 0.8 lag)					
<b>Efficiency</b>						
Maximum efficiency	98.5%	98.5%	98.5%	98.6%	98.6%	98.6%
Efficiency in Europe	98.0%	98.1%	98.1%	98.1%	98.2%	98.2%
<b>Protection</b>						
Islanding protection	Available					
AC short circuit protection	Available					
Leakage current protection	Available					
DC switch	Optional					
Overvoltage class	Grade III [grid side], Grade II [PV side]					
Surge protection	DC secondary lightning protection and AC secondary lightning protection					
<b>General parameters</b>						
Dimension (width × height × thickness)	370mm × 480mm × 195mm					
Installation method	Backplane wall-mounted					
Weight	17kg	17kg	17kg	17kg	20kg	20kg
Isolation mode	Without transformer					
Protection grade	IP65					
Self-consuming at night	<1W					
Temperature	-25°C ~ +60°C					
Humidity	0%~100%					
Cooling mode	Natural cooling	Natural cooling	Natural cooling	Air cooling	Air cooling	Air cooling
Altitude	4000m (> 2000m frequency reduction)					
Display	LED					
Communication	GPRS					
Type of DC side terminal	MC4					
Type of AC side terminal	OT/DT terminal					
Certification	IEC62109-1/-2, EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4, NB/T32004-2018					

Figure 2.5-2 Main Nominal Parameters of String Inverters

### (3) Electrical access

In the distributed PV project in Baodi District, each household is equipped with 22 modules on the red brick and tile roof, one 10kW string inverter, and each inverter is connected to two strings, totaling 11.88kW. A total of 92,598 modules are arranged in the Distributed PV Project in Baodi District, with a total installed capacity of 50.00292MWp on the DC side, which is connected to each household's LV distribution cabinet after inverter inversion.

The existing 10kV transformers in the villages and towns in the Dashiqiao area have a capacity of more than 600,000kVA, which fully meets the access conditions of

the Project. A total of 92,594 modules are arranged in the distributed PV project in Dashiqiao City, with a total installed capacity of 50.0008MWp on the DC side, which is connected to the combiner LV grid-connected distribution cabinet after inverter inversion.

It is preliminarily considered to connect the 380V grid to the lower end of the original LV distribution cabinet of each household, and connect the generated energy to the public grid along the original power line. No new transmission line is required for the Project. The PV DC cable of the Project is proposed to be PV1-F DC 1kV 1x4mm<sup>2</sup> special cable. The DC cable is laid under the array, exposed outside the array and led up to the inverter through PE pipes. ZRC YJV22 0.6/1kV 3x6mm<sup>2</sup> AC power cable is proposed to be used from the inverter to the LV distribution box.



(a) Inverter

(b) LV power distribution cabinet

Figure 2.5-3 Photo of Electrical Access Site

## 2.6 Roof Resources Required for Project Construction and Acquisition Methods

The Project does not involve land acquisition for engineering construction, rents the roof or courtyard of farmers and installs household PVPSs thereon by signing the

Letter of Cooperation Intent for Household PV Project or the Agreement on Intent for PV Rental Roof with farmers, and reaches an agreement on the income mode. The number of rented farm households of Baodi PV Project is about 4,209, and the number of rented users of Dashiqiao PV Project is about 2,500. The lease contract of the Project is signed with rural housing owners or their immediate family members.

The Project is a distributed PV project, and the PV construction site is the roof or courtyard of farmhouses, which does not involve resettlement.

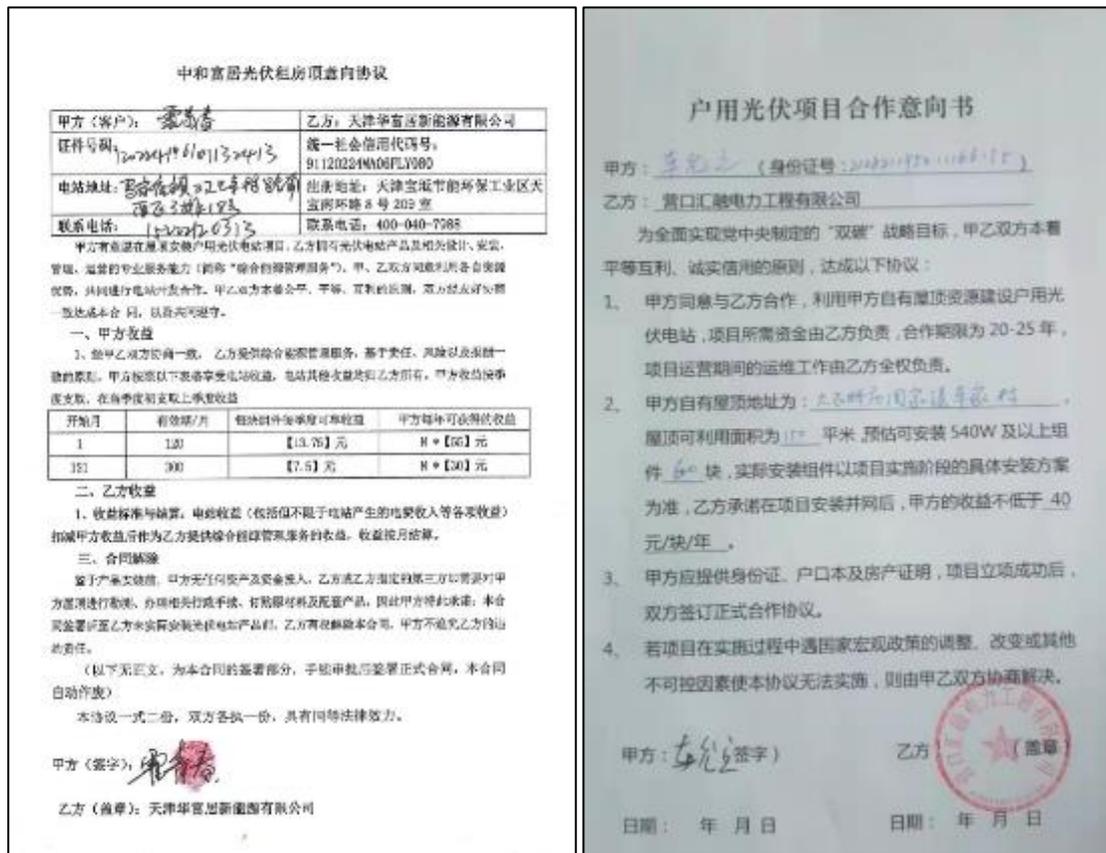


Figure 2.6-1 Cooperation Agreement with Some Intended Farmer Households

## 2.7 Construction Organization Design

### 2.7.1 Construction Conditions

Dashiqiao City is located in the south of Liaodong Peninsula, northeast of Yingkou City, on the left bank of the lower reaches of Liao River, with a total area of 1,610 km<sup>2</sup>. Dashiqiao City is adjacent to Laobian District in the west, to Dawa District of Panjin City in the northwest across the river, to Gaizhou City in the south, and to Haicheng City in Anshan and Xiuyan Manchu Autonomous County in the east. The geographic

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coordinates are between longitude 122°07' and 122°59'E and latitude 40°18' and 40°56'N.

Baodi District is located in the north of Tianjin City, adjacent to Yutian County of Hebei Province and Ninghe District of Tianjin City in the east and southeast; borders Ninghe District and Wuqing District in the south and southwest; connects Xianghe County and Sanhe City of Langfang City of Hebei Province in the west and northwest; faces Jizhou District of Tianjin City and Yutian County of Tangshan City of Hebei Province across the river in the north and northeast. Baodi District covers a total area of 1,450 km<sup>2</sup>, with a length of 65km from north to south and a width of 24km from east to west, ranging from 117°8'~117°40'E to 39°21'~39°50'N.

The construction site of the Project is all villages and towns, and the transportation of materials and equipment can rely on the existing roads in villages and towns. The equipment and materials are mainly transported by car and road, among which PV modules are mainly transported by container trucks and electrical equipment are transported by medium-sized trucks.

Because the construction area is scattered, the construction water consumption is not large. The construction water of PV panel bracket foundation is connected with the water of the municipal water supply network nearby. The main electromechanical equipment in site construction includes the electric welding machine, electric cutting saw, electric drill, etc. The electric welding machine has the largest power consumption. The layout of the circuit shall take the layout of the electric welding machine as the main consideration, and the total power load is about 200kW.

#### 2.7.2 General Layout of Construction

The construction facilities of Dashiqiao Distributed PV Project and Baodi Distributed PV Project include the office area, living area, reinforcement processing yard, wood formwork processing yard, equipment and material stacking yard, etc. The office area is equipped with hardware and valuables warehouses, offices, meeting rooms, etc. The layout of the office area is subject to the arrangement of the General

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Contractor. No living area will be arranged on site, and all workers employed will be local workers, so no accommodation facilities are required. The estimated area of the reinforcement processing yard of Dashiqiao Distributed PV Project and Baodi Distributed PV Project is about 200m<sup>2</sup>, the estimated area of the wood formwork processing yard is about 150m<sup>2</sup>, and the estimated area of the equipment and material stacking yard is about 500m<sup>2</sup>.

### 2.7.3 Construction of Main Works

There is basically no installation and lifting of large pieces in the Project. The PV module mounting bracket shall be supplied in bulk. It shall be assembled into modules on the construction site, and then lifted and installed in place one by one. Before installation, PV modules with relatively similar performance shall be installed in strings according to the performance parameters calibrated before delivery of PV modules, so as to ensure that PV modules operate under the best operating parameters as far as possible. The size and height of PV modules shall be controlled according to the site conditions.

### 2.7.4 Construction Progress and Workers

The Project is constructed on the existing roof and in the courtyard, with a short construction period of about 6 months.

The workers of the Project are all local people, and the main recruitment methods include online recruitment, recruitment by the Labor and Employment Bureau and recruitment in the talent market. The average number of site construction personnel in Dashiqiao City and Baodi District is 20, and the number of site construction personnel in peak period is 50. The workers will receive professional training before construction to ensure HSE-compliant construction and avoid conflicts and disputes. The average number of site operation and maintenance personnel during the operation period is about 6.

## PRELIMINARY SCHEDULE OF PROJECT IMPLEMENTATION

Table 2.7-1

Item	Schedule					
	Construction period (months)					
	1	2	3	4	5	6
Feasibility study and review	█					
Grid connection procedure		█	█	█	█	
Tender for main equipment		█				
Preliminary design, and construction drawing design			█	█		
Procurement of equipment and materials			█	█		
Civil works				█	█	
Electrical installation				█	█	
Equipment commissioning and completion acceptance					█	

## 2.8 Project Investment Estimate

### (1) Dashiqiao 50MW Distributed PV Project

The Project is a PV power generation project with a planned installed capacity of 50MW, a total cost of about RMB 350.6779 million and a dynamic investment per kilowatt of about RMB 3969.79/kW.

After the completion of the Project, the average annual on-grid energy is 65.898 million kWh (the operation period is calculated as 25 years), and the net profit is about RMB 195.8565 million. The design estimate of the Project is prepared according to this scale.

### ECONOMIC INDICATORS OF DASHIQIAO PROJECT (GRID CONNECTION OF INDUSTRIAL AND COMMERCIAL MODE)

Table 2.8-1

S/N	Content of economic indicators	Unit	Economic indicators
1	Installed capacity	Megawatt	50
2	Utilization hours in the	Hours	1431

	first year		
3	Total dynamic investment (Not Including current capital)	RMB 10,000	19698.95
4	Interests incurred during construction	RMB 10,000	198.95
5	Current capital	RMB 10,000	150
6	Rent	RMB/W	0.074
7	Operation and Maintenance	RMB/W	0.03
8	Static Investment per Kilowatt	Yuan/kilowatt	3900
9	Dynamic investment per kilowatt	Yuan/kilowatt	3969.79
10	Electricity price (including taxes)	RMB/kwh	0.3749
11	Total cost	RMB 10,000	35067.79
12	Net profit	RMB 10,000	19585.65
13	IRR (all investments before tax)	%	9.63%
14	IRR (all investments after tax)	%	7.62%
15	IRR (capital after tax)	%	13.59%
16	Investment repayment period (before tax)	Year	9.65
17	Investment recovery period (after tax)	Year	11.08

The financial assessment report indicates that the project is financially feasible and economically beneficial, and can promote local economic development. Therefore, it also has significant social benefits.

#### (2) Baodi 50MW Distributed PV Project

The Project is a PV power generation project with a planned installed capacity of 50MW, a total cost of about RMB 419.38 million and a dynamic investment per kilowatt of about RMB 4018/kW.

After the completion of the Project, the average annual on-grid energy is 68.0878 million kWh (the operation period is calculated as 25 years), and the net profit is about RMB 95,180,000. The design estimate of the Project is prepared according to this scale.

**ECONOMIC INDICATORS OF BAODI DISTRICT PROJECT (GRID  
CONNECTION OF INDUSTRIAL AND COMMERCIAL MODE)**

Table 2.8-2

S/N	Content of economic indicators	Unit	Economic indicators	Remarks
1	Installed capacity	Megawatt	50.00292	
2	Utilization hours in the first year	Hours	1460	
	Total static investment	RMB 10,000	19752	
3	Total dynamic investment	RMB 10,000	20093	
4	Static Investment per Kilowatt	Yuan/kilowatt	3950	
5	Dynamic investment per kilowatt	Yuan/kilowatt	4018	
6	Interests incurred during construction	RMB 10,000	341	
7	Current capital	RMB 10,000	150	
8	Project rent	RMB/pcs.	40	Total 92,589 modules
9	Electricity price (before tax)	RMB/kwh	0.3655	
10	Total cost	RMB 10,000	41938	25-year operation period
11	Net profit	RMB 10,000	9518	25-year operation period
12	IRR (all investments before tax)	%	6.81%	
13	IRR (all investments after tax)	%	6.00%	
14	IRR (capital after tax)	%	9.01%	
15	Investment repayment period (before tax)	Year	12.27	
16	Investment recovery period (after tax)	Year	12.89	

The financial assessment report indicates that the project is financially feasible and economically beneficial, and can promote local economic development. Therefore, it also has significant social benefits.

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## 3. Environmental and Social Profile

### 3.1 Natural Environment

#### 3.1.1 Meteorology

##### (1) Meteorology of Baodi District

Baodi District is dominated by a warm temperate semi-humid continental monsoon climate. It has four distinctive seasons, short spring and autumn, long summer and winter, annual average temperature of 11.6°C, annual precipitation of 612.5 mm, and annual frost-free period of about 184 days on average.

##### (2) Meteorology of Dashiqiao City

Dashiqiao city is dominated by a warm temperate semi-humid continental monsoon climate. The whole year is characterized by sufficient sunlight, distinct seasons, synchronous rain and heat, concentrated rainfall, annual average temperature of 8°C-9°C, annual average rainfall of 640-750mm, and frost-free period of about 175 days.

#### 3.1.2 Hydrology

##### (1) Hydrology of Baodi District

Baodi District is criss-crossed by rivers and water networks, with a water area of 303,300 mu. At present, there are 6 primary flood discharge river channels, i.e. Chaobaixin River, Qinglongwan Jianhe River, leading Juhe River into Chaohe River, Jiyun River, Beijing Sewage Discharge River; 8 secondary river channels, i.e. Wuhe River, Baoqiu River, Baili River, Wotou River, Xiuzhen River, Jiangan River, diversion river and Qinglongwan Old Road; 87 main canals and 508 branch canals.

##### (2) Hydrology of Dashiqiao City

In addition to the Daliao River on the western border, the main rivers in Dashiqiao City also include the Daqing River and its tributaries running through the eastern and central parts. The Daqing River in Dashiqiao City belongs to the upper reaches of the Daqing River. It is divided into East Daqing River and West Daqing River according to the basin. Originating from Lv Wang, Jianyi and Huangtuling Town, the three

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tributaries of Hupiyu of East Daqing River flow into Shimen Reservoir after flowing into Huangtuling, and then flow into the mainstream of Daqing River in Gaizhou and then into the West Sea. There are Xiangfang Reservoir and Hupiyu Reservoir on the East Daqing River. The West Daqing River originates from Dajin Temple, Sheligou, Wafanggou of Zhoujia Town and Yingluo of Haicheng City. There are "Zhoujia Reservoir" and "Sandaoling Reservoir" on the West Daqing River. The two streams of water converge in Tangchi, through lower Tangchi from eastern Tangchi, exiting from Cigou and flowing into the mainstream of Daqing River in Gaizhou. Because the East and West Daqing River originate from the mountainous area and flow through the river channel with sandstone as the bottom, the river water is crystal clear and it is called Daqing River.

### 3.1.3 Topography and Geology

#### (1) Topography and geology of Baodi District

Baodi District has a multi-layer geological structure. According to the geological age, there are Sinian system in Proterozoic, Cambrian, Ordovician, Carboniferous, Permian in Paleozoic and Quaternary in Cenozoic. The geology in the territory is divided according to its internal structural position, bounded by the "Baodi Fault". The northern part is the southeastern edge of the Yinshan latitudinal tectonic zone, and the southern part is the northeastern part of the Neocathaysian secondary subsidence zone.

Baodi District is located in the northeast of North China Plain, which is a river alluvial and coastal plain landform. The terrain is relatively flat. The general trend of the whole terrain is higher in the northwest, with a ground elevation of 5~7m (Yellow Sea elevation, the same below), while the southeast is lower, with an elevation of 0.5~1m in general and a bottom elevation of 0.3m. The natural gradient from northwest to southeast in the territory is 1:5000~1:10000.

#### (2) Topography and geology of Dashiqiao City

Dashiqiao City is located in the south of Liaodong Peninsula, northeast of Yingkou City, on the left bank of the lower reaches of Liao River, with a total area of 1,610 km<sup>2</sup>.

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Dashiqiao City is adjacent to Laobian District in the west, to Dawa District of Panjin City in the northwest across the river, to Gaizhou City in the south, and to Haicheng City in Anshan and Xiuyan Manchu Autonomous County in the east. The geographic coordinates are between longitude 122°07' and 122°59'E and latitude 40°18' and 40°56'N.

The terrain of Dashiqiao inclines from east to northwest. In the west is the Liaohe River alluvial plain, with a minimum altitude of only about 2m. The central part is a buffer zone of plains and hills. In the east, it ranges upon a range of mountains, with winding mountains and valleys. There are Jinniu Mountain, Zunlong Mountain, Xiucai Mountain, Mizhen Mountain, Hailong Mountain, Panlong Mountain, etc. The old Jiaoding Mountain on the eastern border is 1033m above sea level.

## 3.2 Social Environment

### 3.2.1 Administrative Division and Population

#### (1) Baodi District, Tianjin

As of 2019, Baodi District has 6 subdistricts and 18 towns: Baoping Subdistrict, Yuhua Subdistrict, Haibin Subdistrict, Zhouliang Subdistrict, Zhaoxia Subdistrict, Chaoyang Subdistrict, Dabaizhuang Town, Koudong Town, Huogezhuang Town, Shigezhuang Town, Niudaokou Town, Dakoutun Town, Xinkaikou Town, Niujiapai Town, Haogezhuang Town, Datangzhuang Town, Erwangzhuang Town, Wangbuzhuang Town, Fangjiazhuang Town, Lintingkou Town, Bamencheng Town, Huangzhuang Town, Dazhongzhuang Town, Xin'an Town. The Baodi District Government is located in Baoping Subdistrict.

In 2020, the registered population of Baodi District was 748,700, an increase of 0.8% over the previous year. To be specific, there were 243,500 urban population and 505,200 rural population. The Han nationality is dominant, and there are 15 ethnic groups including Hui, Manchu, Zhuang, Mongolian, Korean, Yao, Tujia, Miao, Tibetan and Dong. According to the data of the seventh census, as of zero o'clock on November 1, 2020, the permanent population of Baodi District was 722,367.

## (2) Dashiqiao City, Yingkou City

As of June 2020, Dashiqiao City has jurisdiction over 4 subdistricts and 13 towns, as well as 2 township-level units: Jinqiao Subdistrict, Shuiyuan Town, Qikou Town, Yong'an Town, Zhoujia Town, Gangdu Subdistrict, Gouyan Town, Huzhuang Town, Tangchi Town, Dashiqiao Rice Seed Farm, Baizhai Subdistrict, Shifo Town, Guantun Town, Jianyi Town, Dashiqiao Demonstration Park, Meidu Subdistrict, Gaokan Town, Boluopu Town and Huangtuling Town. The Dashiqiao Municipal People's Government is located in Meidu Subdistrict.

By 2020, the total population of Dashiqiao City was 685,000 including 222,000 urban population and 463,000 rural population. There are Han, Manchu, Mongolian, Hui, Korean and other ethnic groups. According to the data of the seventh census, as of zero o'clock on November 1, 2020, the permanent population of Dashiqiao City was 607,098.

## (3) Characteristic distribution of sampled objects in the project area

In the Project, 302 and 151 farmers were selected from Baodi District of Tianjin City and Dashiqiao City of Yingkou City of Liaoning Province respectively for questionnaire survey. The age group, gender distribution and ethnic distribution of the sample survey respondents are shown in the table below.

## Characteristic distribution of sampled objects in the project area

Table 3.2-1

Investigation scope	Item	Age group			Gender		Ethnic group		
		Youth	Middle aged	Old aged	Female	Male	Han	Manchu	Hui
Baodi District	Number of Personnel	86	62	3	59	92	148	2	1
	Proportion	57%	41%	2%	39%	61%	98%	1%	1%
Dashiqiao City	Number of Personnel	130	161	11	232	70	302	0	0
	Proportion	43%	53%	4%	77%	23%	100%	0	0

Note: Young people are under 45 years old, middle-aged people are 45 to 60 years old (excluded), and elderly people are 60 years old and above.

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The ages of the respondents in Baodi District and Dashiqiao City were mainly young and middle-aged, accounting for 98% and 96% respectively. The gender ratios of male and female respondents in the sample surveys in the two places are different: males account for about 61% in Baodi District, and females account for about 77% in Dashiqiao City. The sample survey in Baodi District involved 3 ethnic minority farmers, including 1 Hui and 2 Manchus. The sample survey objects in Dashiqiao City do not involve ethnic minority farmers.

According to the site survey, although there are mainly Hui and Manchu ethnic minority residents in the area where the project is located, they have long been integrated with the local Han people for a long time. Chinese is the common local language, and there is no language barrier. Ethnic minority groups live scatteredly, do not form concentrated residential areas, and enjoy national preferential policies for a long time, and do not meet the Bank's definition of Indigenous Peoples.

### 3.2.2 Socio-economic Profile

#### (1) Baodi District, Tianjin

In 2020, the annual GDP of Baodi District was RMB 35.437 billion, a decrease of 4.3% compared with the previous year, calculated at comparable prices. By industries, the added value of the Primary Industry was RMB 3.097 billion with a growth of 1.7%, that of the Secondary Industry was RMB 11.74 billion with a decrease of 9.5%, and that of the Tertiary Industry was RMB 20.601 billion, with a decrease of 1.3%. Structure of the three industries: 8.8 : 33.1 : 58.1. The added value of private economy was RMB 21.561 billion, accounting for 60.8% of the GDP. In 2020, the general public budget revenue of Baodi District was RMB 3.173 billion, down 43.9%. Among them, the tax revenue was RMB 2.335 billion, down 19.1%, accounting for 73.6% of the general public budget revenue, up 22.6% from the previous year. From the perspective of main taxes, the value-added tax was RMB 764 million, down 19.9%; the corporate income tax was RMB 349 million, up 0.4%; the individual income tax was RMB 73 million, up 48.1%. The annual general public budget expenditure was RMB 8.542

billion, down 32.3%, of which the general public service expenditure was RMB 1.132 billion, up 2.9%; public security expenditure was RMB 473 million, up 0.5%; education expenditure was RMB 1.959 billion, down 26.6%; social security and employment expenditure was RMB 1.326 billion, down 0.8%. In 2020, the per capita disposable income of rural permanent residents in Baodi District was RMB 24,531. The average annual rental income of the rented farmers in the Project is about RMB 1,500, equivalent to an increase of 6.1% in per capita disposable income.

(2) Dashiqiao City, Yingkou City

In 2019, the GDP of Dashiqiao City reached RMB 33.5 billion, an increase of 6.5%; general public budget revenue reached RMB 2.23 billion, an increase of 0.5%; the per capita disposable income of urban and rural permanent residents was RMB 38,400 and RMB 18,902 respectively, with an increase of 7.6% and 6.8%. In 2020, the GDP of Dashiqiao increased by 0.5%; fixed assets investment increased by 2%; general public budget revenue fell by 12.1%; tax revenue fell by 22.5%; industrial value added above designated size declined by 7%; retail sales of consumer goods fell by 3%; the per capita disposable income of urban and rural permanent residents increased by 5.5% and 7% respectively. In 2021, the per capita disposable income of rural residents in Dashiqiao City was RMB 23,493. The average annual rental income of the rented farmers in the Project is about RMB 2,500, equivalent to an increase of 10.6% in per capita disposable income.

### 3.2.3 Traffic and Transportation

(1) Baodi District, Tianjin

Baodi District has a developed railway system, including Jitang Railway, Beijing-Binhai Intercity Railway, Tianjin-Chengde Intercity Railway, Tangtong Highway, Tanggu-Chengde Expressway, Tanglang Expressway, Jinji Highway, Tianjin-Jizhou Expressway, Baoping Highway, Jinwei Highway, Beijing-Shenyang Expressway, Daheilin Road, Jingtang Highway, and Jinji Railway passing through Baodi District.

(2) Dashiqiao City, Yingkou City

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There are 2 railway freight marshalling stations in Dashiqiao City, and Dashiqiao Railway Station is a national first-class station. Shenyang-Dalian-Beijing-Shenyang Expressway, Harbin-Dalian Highway, Harbin-Dalian Electrified Railway and Harbin-Dalian High-speed Railway Passenger Dedicated Line run through the whole territory. It is 200 kilometers away from Dalian Port, 20 kilometers away from Yingkou Port and 40 kilometers away from Bayuquan Port. It takes only one and a half hours to drive to Shenyang and Dalian Airport, 15 minutes to Yingkou Lanqi Airport and 5 hours to Beijing.

### 3.2.4 Minerals, cultural relics and military installations

#### (1) Baodi District, Tianjin

In the southeast of Beitan Village, Baodi District, there is coal underground, with a burial depth of 300~500m. The reserves are rich, with 25 million tons of coal per square kilometer. In 2010, the proven reserves were 306.06 million tons. The coal grades are gas coal and fat gas coal, with strong cohesiveness and tar content of more than 10%. After the intrusion of shallow igneous rock, it locally becomes lean coal and anthracite.

Cultural relics in Baodi District include Baodi Dajue Temple, Beiyinrensi Martyrs Cemetery, Lintingkou Wangjia Courtyard, etc. Dajue Temple is located in the north of Dongjie Road, Baodi District, Tianjin. Founded during the reign of Chongxi, Liao Dynasty (1032-1054), it is one of the eight sceneries of Baodi. Beiyinrensi refers to the martyr's cemetery. Located on the west side of Zhaoxia Park, it covers an area of 27,900 square meters from south to north, of which the mausoleum area covers an area of 2,250 square meters.

#### (2) Dashiqiao City, Yingkou City

There are 27 kinds of proven mineral deposits in Dashiqiao City, including 21 kinds of nonmetallic ores such as magnesite, talc, boric spar, limestone and silica; there are 6 kinds of precious and rare metal deposits including gold, silver, copper, cobalt, uranium and iron. To be specific, the total proven reserves of magnesium ore are 4.456

billion tons, and the retained reserves are 4.363 billion tons.

The cultural relics in Dashiqiao City include the ruins of Yingshougou. Yingshougou ruins are located in Yingshougou Village, Tangchi Town, Dashiqiao City, distributed in the residential area of villagers and on both sides of Zhoutang Highway. There are Han tombs in the mountains in the northeast and southeast of the ruins. In 1984, Yingkou Municipal People's Government announced the Yingshougou ruins as a municipal cultural relic's protection unit.

No restrictive factors such as minerals, cultural relics and military facilities are involved in the Project.

### 3.2.5 Public security

It is understood that the social security in Baodi District of Tianjin and Dashiqiao City of Yingkou City involved in the Project is generally stable and good. The incidence of traditional public security incidents and civil disputes such as theft, robbery, traffic accidents and disputes among the masses near the project area is generally stable, and there is no obvious upward trend.

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## 4. Comparison and Analysis of Project Schemes

### 4.1 With/without Project Analysis

(1) The project construction will promote the development of new energy industry

Our government has regarded the development of PV industry as an important aspect in the field of energy, and incorporated it into the basic policy of national energy development. The Renewable Energy Law, which was officially implemented on January 1, 2006, clearly specifies the responsibilities and obligations of the government and society in the development and utilization of PV power generation. A series of systems and measures have been established to encourage the development of PV industry, support the grid connection of PV power generation, preferential on-grid price and cost-sharing of the whole society, and give various preferential treatment to PV industry in many aspects such as loans and taxes. Under the severe situation of energy and environment in China, this law will guide and encourage various economic entities at home and abroad to participate in the development and utilization of PV technology in China.

In accordance with the spirit of the Notice of the State Council on Issuing the Comprehensive Work Plan for Energy Conservation and Emission Reduction (GF [2007] No.15) and the Notice of the Ministry of Finance and the Ministry of Construction on Issuing the Interim Measures for the Administration of Special Funds for Renewable Energy Building Applications (CJ [2006] No.460), the central financial department arranges part of the funds from the special funds for renewable energy to support the demonstration and promotion of solar PV applications in urban and rural buildings.

Therefore, the Project conforms to the national policy of encouraging the development of PV industry and supporting the energy industry policy of PV power generation and grid connection.

(2) The project construction will make rational use of local solar energy resources

Baodi District enjoys a warm temperate semi-humid continental monsoon climate,

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and Dashiqiao City enjoys a warm temperate semi-humid continental monsoon climate. The solar energy resources in the two places belong to Class B "rich in resources" area, which is suitable for the construction of large-scale PV power stations.

The project construction will make rational use of local abundant solar energy resources, improve the power supply structure of the region, and replace some power generation equipment with high energy consumption and high pollution. While improving the environmental quality, it can also increase employment opportunities for local residents, drive the development of relevant industries and meet the power demand of residents, bringing good social and environmental benefits.

(3) The project construction is conducive to energy conservation and emission reduction and improvement of the ecological environment

Protecting and improving the environment on which human beings depend and realizing sustainable development are the common wishes of people all over the world. Our government has made sustainable development a basic strategy for economic and social development and has taken a number of major initiatives. The reasonable development and economical use of natural resources, improvement of resource utilization mode, adjustment of resource structure allocation and improvement of resource utilization rate are all effective ways to improve the ecology and protect the environment.

(4) The project construction can promote social and economic development

Science and technology tourism is a new tourism form, which promotes tourism development and boosts the cultural and scientific qualities of the public. PVPSs are new green energy projects, and upon the completion of the PV station, it will become a new highlighted point of science and technology tourism and vigorously promote the development of the local tourist industry.

## 4.2 Analysis of Project Site Selection

### 4.2.1 Suitability of social conditions

(1) Locational conditions

Baodi District of Tianjin is located in the north of Tianjin, the north of North China Plain and the south foot of Yanshan Mountain. It is adjacent to Yutian County and Ninghe District of Tianjin in the east and southeast, and Ninghe District and Wuqing District in the south and southwest. The west and northwest are connected with Xianghe County and Sanhe City, Langfang City, Hebei Province. It faces Jizhou District of Tianjin in the north and Yutian County of Tangshan City, Hebei Province in the northeast across the river. According to the relevant literature, the agricultural land area in Baodi District of Tianjin is about 105,349.8 hectares, accounting for 69.77% of the total land area of the whole district; the total scale of construction land is 28,523.1 hectares, accounting for 18.89% of the total land area of the whole district. The urban and rural construction land is 22,422 hectares, providing sufficient construction sites for distributed PVPS projects. According to the site survey, the rural houses in Baodi District of Tianjin are basically single-storey tile houses or bungalows, with basically the same orientation and the same area and type, which have good construction conditions for household PVPSs.



Figure 4.2-1 Aerial Photos of Rural Housing in Baodi District

Dashiqiao City of Yingkou City is located in the south-central part of Liaoning Province, on the left bank of the lower reaches of the Liao River, bordering on Gaizhou

in the south, bordering on Haicheng in the north, connecting with Xiuyan Manchu Autonomous County in the east, and facing Yingkou City and Panjin across the river in the west. The construction land of Dashiqiao City is mainly composed of residential land, industrial land, public facility land and road square land. The residential land accounts for 51.79% of the total construction land, providing sufficient construction sites for distributed PVPS projects. According to the site survey, the rural houses in Dashiqiao City, Yingkou City are basically single-storey tile houses or bungalows, with large courtyards, which have good construction conditions for household PVPSs.



Figure 4.2-2 Aerial Photos of Rural Housing in Dashiqiao City

(2) External supporting conditions

① Water supply

Because the construction area is scattered, the construction water consumption is not large. The construction water of PV panel bracket foundation is connected with the water of municipal water supply network nearby.

② Power consumption

The main electromechanical equipment in site construction includes the electric welding machine, electric cutting saw, electric drill, etc. The electric welding machine has the largest power consumption. The layout of the circuit shall take the layout of the

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electric welding machine as the main consideration, and the total power load is about 200kW. When the power supply and water supply facilities of the General Contractor are used, separate meters shall be installed for measurement and payment shall be made according to the meters.

③ External transportation

The equipment and materials are mainly transported by car and road, among which PV modules are mainly transported by container trucks and electrical equipment are transported by medium-sized trucks.

#### 4.2.2 Suitability of natural resources and environmental conditions

(1) Baodi District

① Natural environment

Tianjin is located on the eastern bank of mid-latitude Eurasia and it has a continental climate, dominated by East Asian monsoon due to monsoon circulation. The climate there is characterized by four distinctive seasons. Specifically speaking, the spring is windy and dry without much rainfall; the summer is hot and has much rainfall; the autumn is cool and has comfortable weather; the winter is cold and dry without much snow. The average frost-free period in Tianjin is 196~246 days, the longest frost-free period is 267 days, and the shortest frost-free period is 171 days. Among the four seasons, summer and winter are about 120-150 days, and spring and autumn are about 40-65 days. The annual average precipitation in Tianjin is 520-660mm, and the precipitation days are 63-70 days. In terms of regional distribution, there are more mountains than plains and more coasts than inland areas. In terms of seasonal distribution, the precipitation in June, July and August accounts for about 75% of the annual precipitation. The sunshine time in Tianjin is relatively long, with annual sunshine hours of 2500~2900h.

② Solar resources

Tianjin is the birthplace of China's PV industry. On the whole, there are abundant solar energy resources. According to the distribution map of solar energy resources,

Tianjin is a second-class region with good conditions for utilizing solar energy.

The Project is located in Baodi District, Tianjin. Baodi District is dominated by a warm temperate semi-humid continental monsoon climate. It has four distinctive seasons, short spring and autumn, long summer and winter, annual average temperature of 11.6°C, annual precipitation of 612.5 mm, and annual frost-free period of about 184 days on average.

According to the annual total solar radiation generally used for solar energy resources, the annual total solar radiation values in all parts of Tianjin are 4200~5400MJ/m<sup>2</sup>, and the annual total solar radiation in most parts of Tianjin is >4500 MJ/m<sup>2</sup>. Most parts of Tianjin belong to the region rich in solar energy resources in China, suitable for the construction of PVPSs.

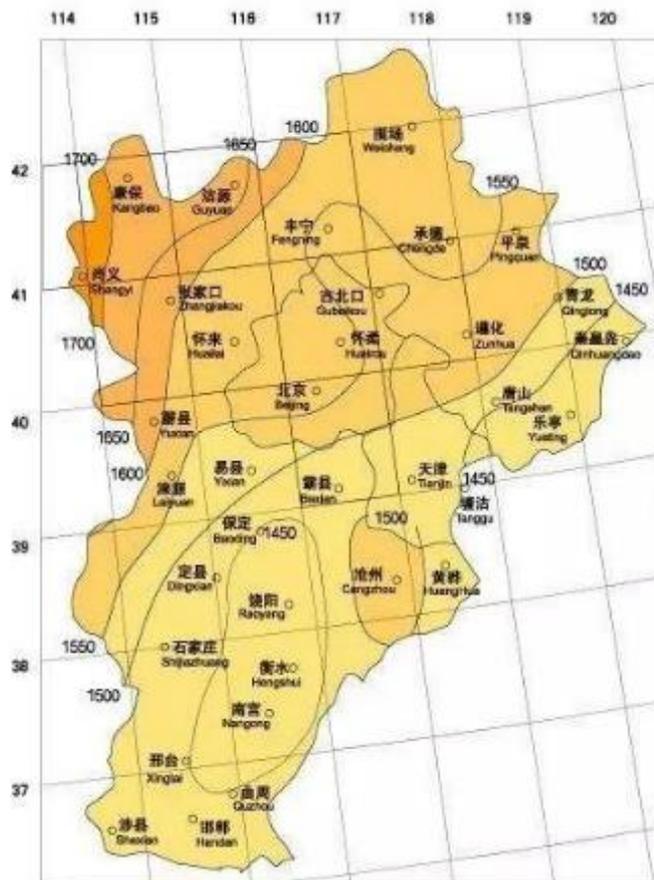


Figure 4.2-1 Distribution Map of Solar Energy in Beijing, Tianjin and Hebei Provinces

(2) Dashiqiao City

① Natural environment

Dashiqiao city is dominated by a warm temperate semi-humid continental monsoon climate. The whole year is characterized by sufficient sunlight, distinct seasons, synchronous rain and heat, and concentrated rainfall, with an annual average temperature of 8°C-9°C, annual average rainfall of 640-750mm, and a frost-free period of about 175 days.

② Solar resources

According to the Feasibility Study Report on 50MW Distributed PV Power Generation Project in Dashiqiao City, Liaoning Province, the average annual total solar radiation in Liaoning Province decreases from north to south, and is smaller in the west than in the east. The annual sunshine hours in Liaoning Province reached about 2523h, the annual cumulative solar radiation reached 5626.1MJ/m<sup>2</sup>, and the solar energy resources in Dashiqiao City were stable, providing extremely favorable natural conditions for the utilization of solar energy.

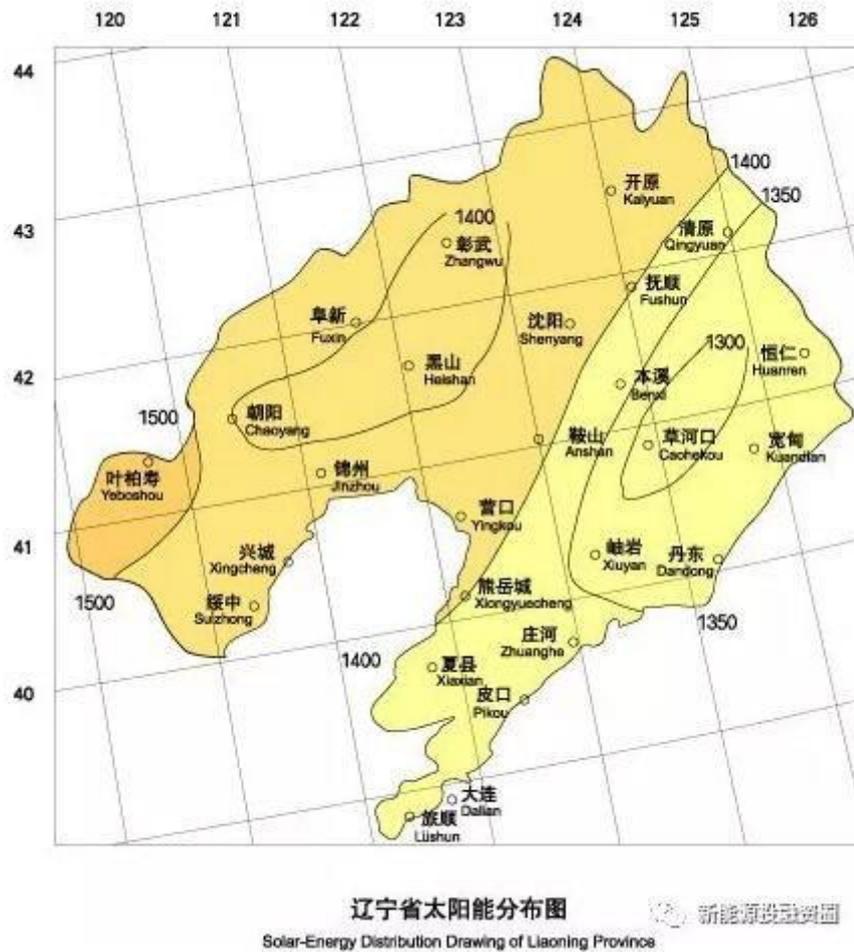


Figure 4.2-2 Distribution Map of Solar Energy in Liaoning Province

The area where the proposed site is located has sufficient sunshine and the average annual total radiation is 5172.3MJ/m<sup>2</sup>, which is suitable for the construction of large-scale PVPSs.

#### 4.2.3 Ecosystem suitability

To construct PV modules on existing roofs and courtyards of rural households, no land will be added. Only construction vehicles and personnel during the construction period may have a short-term impact on the surrounding environment, but this impact will disappear with the end of the construction period.

In addition, according to the project feasibility study report, the sunlight conditions in Baodi District of Tianjin and Dashiqiao City of Yingkou City of Liaoning Province are relatively sufficient and suitable for the implementation of distributed PV projects. Except that the traffic of construction vehicles and personnel during the construction

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period may cause temporary disturbance to the surrounding environment, it will not have an adverse impact on the local ecological environment.

#### 4.2.4 Suitability with surrounding development activities

The Project is a distributed PV project, and the construction site is the roof or courtyard of rural housing. The main development activities around the construction site mainly include production, living, transportation and other activities of farmers. The Project basically has no impact on the surrounding development activities.

### 4.3 Comparison and Analysis of Engineering Technology

#### (1) Comparison of solar power generation system modes

The distributed PV grid-connected power generation system can be divided into self-generated and self-consuming surplus feed-in grid mode and full feed-in grid mode.

The mode of “self-generation, self-consumption, surplus feed-in grid” means that part of the electric energy generated by the PV system is consumed by the local load, and the rest of the electric energy is directly fed into the grid.

The full feed-in grid mode is that all the electric energy generated by PV power generation is directly fed into the power grid and is not consumed by local loads.

**In comprehensive consideration, the PV power generation system constructed by the Project adopts the full feed-in grid mode.**

#### (2) Comparison and selection of PV modules

The PV power generation system connects a large number of PV modules with the same specifications and characteristics in series through a number of solar modules to reach the rated input voltage of the inverter, and then connects such cell panels in parallel to reach the predetermined rated power of the system. These devices are numerous. In order to avoid mutual shielding between them, they must be arranged at a certain spacing to form an array, which is called PV power generation array. A circuit consisting of several PV modules of the same specification and characteristics connected in series is a basic array unit. Each PV power generation array consists of a solar module, inverter and step-up power distribution room with a predetermined power.

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Several PV arrays form a PVPS through the connection of electrical systems. The selection of appropriate PV modules has a great impact on the investment, operation and benefit of the whole power station.

At present, the highest laboratory efficiency of solar cells in the world is: 24% (4cm<sup>2</sup>) for monocrystalline silicon cells, 18.6% (4cm<sup>2</sup>) for polycrystalline silicon cells, 30.28% (AM1) for InGaP/GaAs double junction cells, 14.5% (initial), 12.8% (stable) for amorphous silicon cells, 15.8% for cadmium telluride cells, 14.6% for silicon ribbon cells, and 10.96% for TiO<sub>2</sub> nanocrystalline organic solar cells. Crystalline silicon cells mainly have the following characteristics:

① The crystalline silicon cells are featured by mature technologies, stable performance and long service life.

② Among the solar cells used commercially, monocrystalline silicon has the highest conversion efficiency, followed by polycrystalline silicon, but the difference between the two is not significant.

③ The crystalline silicon cell assembly has an extremely low failure rate and the simplest mode of operation and maintenance.

④ In the open space, the crystalline silicon PV assembly can be installed simply and conveniently, and laid out compactly, with space saved.

⑤ Although the amorphous silicon film cell has certain advantages in price, weak light response and high-temperature performance, it has a relatively short service life.

**After taking the factors above into consideration, crystalline silicon solar cells are proposed to be used in the Project.**

Crystalline silicon modules are mainly divided into monocrystalline and polycrystalline. There are significant differences between monocrystalline silicon and polycrystalline silicon in crystal quality, electrical properties and mechanical properties. The production process of monocrystalline silicon is more complex than polysilicon, and the cost is higher than polysilicon. In the early stage of the rapid development of PV industry, it mainly pays attention to production capacity, and the production capacity

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of monocrystalline silicon is difficult to meet the market demand in terms of expansion speed. However, monocrystalline silicon has excellent properties, and more than 30 years of practice have proved the reliability of the monocrystalline technology route. Since 1994, the decay rate of the monocrystal PV system in Ningbo, China is only 3.1%, and the monocrystal rooftop PV system built in Munich, Germany in 1997 has an average annual decay rate of only 0.4%, the difference of which is obviously due to polysilicon. In addition, due to the irregular arrangement of polysilicon, the power station is prone to crack in the long-term alternation of high and low temperatures. The monocrystal structure has better mechanical performance and better crack resistance than polysilicon. On the whole, the unit power generation per unit area of monocrystalline silicon is about 5% higher than that of polysilicon. The main advantages of monocrystalline silicon power generation are low operating temperature, weak light response, low line loss, low attenuation, and so on. At high temperatures, the temperature difference between the monocrystalline and polycrystalline modules is about 3°C–5°C, and the power of the module will decrease by about 0.4% every time the temperature increases by 1°C.

With the continuous expansion of the installed capacity of PVPSs in China, the further improvement of the efficiency of PV modules, and the arrival of large-scale production, the low-cost advantage of polysilicon modules has become a secondary factor. In addition, with the development of diamond wire cutting and PERC (Passivated Emitter and Rear Cell) technology in recent two years, the cost of monocrystalline silicon modules has been greatly reduced, and the market share of monocrystalline silicon surpassed polysilicon for the first time in 2017. According to statistics, the market share of monocrystalline silicon in 2017 is about 49%, while that of polysilicon is 46%. By the end of 2018, all monocrystalline modules were basically converted to PERC production line, and the power of monocrystalline modules was generally increased.

PV modules are the core components of a PV power generation system, and their

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parameters and indexes have a direct influence on the power generation performance of the whole system. The parameters for the performance of PV modules mainly include module peak power, peak current, peak voltage, short-circuit current, open-circuit voltage, maximum system voltage, module efficiency, temperature coefficient of short-circuit current, temperature coefficient of open-circuit voltage, temperature coefficient of peak power, etc. under standard test conditions.

Considering various factors such as module efficiency, technical maturity, market share, module production capacity, project construction period, manufacturer's supply capacity, etc., solar modules with large unit area power shall be preferred to reduce floor area, save cable, and reduce module installation. Based on the current industrial status and production capacity of the domestic PV module market, the mainstream and leading crystalline silicon PV modules in the market are selected for comparison. Through preliminary investigation, the module efficiency of each manufacturer reaches the full mark, mainly including monocrystalline modules. **Therefore, the single crystal module is recommended in this technical scheme.**

### (3) Comparison and selection of crystalline silicon PV modules

Considering the module efficiency, technical maturity, market share and the available options when purchasing and ordering, it is proposed to select the high-efficiency monocrystalline silicon 540Wp module for the Project, with a module efficiency of 20.4%.

### (4) Comparison and selection of inverters

An inverter is the core equipment of PV system. During design and model selection, corresponding technical indicators shall be considered to ensure the stable operation of the PVPS and improve the energy output. At present, the mainstream inverters can be divided into centralized inverters, string inverters and distributed inverters. Compared with centralized inverters, string inverters have a series of advantages such as no increase in system investment, higher investment income and availability, which are specifically shown in the following aspects:

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① No increase in initial investment.

The initial investment cost of the string inverter PVPS is not higher than that of the traditional PVPS due to the simplified design, no DC combiner box and DC distribution cabinet, no civil engineering room, simple component installation and other characteristics. At the same time, due to the small volume, light weight and standardization of the string inverter, it can be manufactured on a large scale through automatic assembly line, with a small proportion of labor cost and obvious scale advantages.

② String-level intelligent monitoring and multi-channel MPPT tracking technology ensure that the power station is "visible, credible, manageable and controllable", and the power generation is increased by more than 3% compared to the centralized one.

The string inverter PVPS conducts independent voltage and current detection for each input string, and the detection accuracy is more than 10 times that of the traditional intelligent combiner box scheme, laying a foundation for accurately locating string faults and improving operation and maintenance efficiency. Multi-channel MPPT technology reduces the impact of shielding, dust and string mismatch, and increases the energy output by more than 5% under flat terrain installation conditions.

③ Reliable operation and maintenance-free design of the system for 25 years.

The IP66 protection grade is adopted for the string inverter to realize the internal and external environmental isolation, keep the device in a stable operating environment, and reduce the impact of external environment such as the temperature, sandstorm, and salt spray on the service life of the device. The system has no vulnerable parts, and there is no fuse and fan, etc., and the device needs to be replaced regularly to realize a maintenance-free system.

④ The actual utilization rate of the installed capacity of PVPSs is high.

The PVPS with string inverters has a simple structure and is essentially a distributed parallel system. The failure of a single inverter does not affect the operation

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of other equipment. Moreover, due to its small size, light weight, site spare parts for the whole machine and easy installation and maintenance, the availability of the system is greatly improved, and the impact of the failure on the energy output is much smaller than that of the centralized type.

⑤ The intelligent PVPS can be upgraded and evolved.

When the module technology progresses and the operating environment changes, the software of the string inverter can be remotely upgraded online, with backward-compatible design and other characteristics, without replacing the online operating equipment. The latest technical achievements can be enjoyed through algorithm upgrading, so as to maximize the reuse of existing equipment.

⑥ Intelligent active grid adaptive technology realizes grid friendliness.

The string inverter can actively monitor the harmonics of the grid and inject reverse harmonics into the grid, which is conducive to improving the power quality of the grid. Better realization of multi-machine parallel control, better grid-connected harmonic quality, better meeting the requirements of grid access, and improving adaptability in harsh grid environments.

⑦ High safety.

The string inverter PVPS is designed without DC combination. The DC output by the string directly enters the inverter and is inverted into AC for long-distance transmission, actively avoiding the safety and protection problems caused by DC transmission. At the same time, the PID effect is effectively solved.

⑧ String inverter PVPS is environmentally friendly.

The string inverter is designed without fans, which realizes a low environmental noise of 33dB; there is no need for a civil engineering room to reduce environmental damage to vegetation and soil; the electromagnetic radiation is small, which protects human health. The intelligent PVPS realizes harmonious coexistence between people and the environment, greatly increasing the applicable scope of the PVPS and creating conditions for PV households.

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**Considering the above aspects, string inverters are adopted for the Project.**

(5) Comparison and selection of PV arrays

The optimal inclination for fixed installations depends on many factors, such as the geographical location, distribution of solar radiation throughout the year, ratio of direct radiation and diffused radiation, supply power requirements for loads, and special on-site conditions. There are mainly three types of roofs in the Project: color steel tile roof, red brick tile roof and concrete roof.

The concrete roof is arranged according to the optimal inclination of  $32^\circ$ , and the color steel tile and red brick tile roof are arranged according to the slope of each roof.

The principle for the arrangement of PV modules in the Project: It must be ensured that on the winter solstice with the lowest sun altitude angle, all modules still have more than 6 hours of sunshine time.

The Project is a roof household PV project. Color steel tile and red brick tile roof components are tiled on the roof without shadows shielding each other. Only one array is arranged on each roof, which will not cause mutual shielding between arrays.

**In the northern hemisphere, the plane corresponding to the maximum solar radiation receiving amount is the inclined plane facing the due south and the inclination of the horizontal plane is equal to the local latitude. The fixed PV module shall be installed obliquely according to the inclination.** After the inclination of the array is determined, it shall be noted that a reasonable spacing shall be set between the front and rear arrays from the north to the south to avoid shadow shielding. And from 9:00 a.m. to 3:00 p.m. (true solar time) on the winter solstice (the day of the year when objects have the longest shadow length under the sun), the spacing between the front and rear arrays shall be no shadowing between the modules in the north and south directions.

PV array is obtained by series and parallel connection of the modules. The series connection of PV modules must meet the requirements for DC input voltage of the inverter, and their parallel connection must meet the requirements for input power of

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the inverter.

(6) Comparison and selection of PV brackets

① Scheme for brackets of color steel tile roof

The roof part of the existing building adopts the bracket scheme of adding bearing + guide rail to the roof, and replaces the connecting bolt between the rib of profiled steel sheet with color steel tile and the roof purlin with self-tapping screws, so that the connection between the bracket and the profiled steel sheet on the roof is firm, and waterproof measures are taken at the connection between the bracket and the profiled steel sheet on the roof. The guide rail and the bearing are hinged and connected by bolts, and the modules are bolted and connected with the guide rail by pressing blocks. Each array bracket is equipped with 36 ( $2 \times 18$ ) modules to meet the requirement of one string. The modules on the bracket are arranged in two rows horizontally, with a horizontal spacing of 20mm and a longitudinal spacing of 20 mm between adjacent modules. Color steel tile roof modules are installed in a flat way along the slope, and convenient and correct grounding must be considered.

② Scheme for brackets of concrete roof

The roof part of the existing building adopts the scheme of counterweight block foundation + bracket, and adopts the prefabricated plain concrete counterweight block foundation. The counterweight block foundation is embedded with anchor bolts, which are bolted to the upper bracket, and the modules are connected to the guide rail bolts through pressing blocks. The inclination of the bracket is  $32^\circ$ , and 36 ( $3 \times 12$ ) modules are mounted on a single array bracket. The horizontal spacing of the modules is 20mm and the longitudinal spacing is 20mm. Q235B and Q355B section steels are used.

③ Scheme for brackets of tile roof

The roof part of existing buildings adopts the bracket scheme of beam + guide rail + pressing block. Cross beams are arranged perpendicular to the roof ridge on the south slope roof, and the upper guide rails are arranged perpendicular to the cross beams. The cross beams and guide rails are connected by bolts through the purlin bracket, and

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rubber pads are used to separate the cross beams from the roof to avoid direct contact between the brackets and the roof. The modules are bolted to the guide rail by a pressing block. The guide rail and the east-west gable are supported and fixed by channel steel. The cross beam crosses the ridge, and then a cross beam is drawn to the north slope, which extends out of the roof to connect the support and is fixed to the rear eaves wall through hinged connectors. Each array bracket is equipped with 36 ( $2 \times 18$ ) modules to meet the requirement of one string. The modules on the bracket are arranged in two rows horizontally, with a horizontal spacing of 20mm and a longitudinal spacing of 20 mm between adjacent modules. Tile roof modules are installed in a flat way along the slope, and convenient and correct grounding must be considered.

#### ④ Courtyard ground bracket scheme

The courtyard ground bracket scheme refers to the concrete roof bracket scheme. It adopts the scheme of counterweight block foundation + bracket, and adopts the prefabricated plain concrete counterweight block foundation. The counterweight block foundation is embedded with anchor bolts, which are bolted to the upper bracket, and the modules are connected to the guide rail bolts through pressing blocks. The inclination of the bracket is  $32^\circ$ , and 36 modules are mounted on a single array bracket. The horizontal spacing and longitudinal spacing of the modules are both 20mm. Q235B and Q355B section steels are used.

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## 5. Social and Environmental Impact Assessment

### 5.1 Legitimacy of project establishment

The Baodi 50MW Distributed PV Project has been registered with the Administrative Examination and Approval Bureau of Baodi District, Tianjin for fixed-asset investment projects of domestic enterprises (see Annex 1), and the project code is 2112-120115-89-03-984322. The Dashiqiao 50MW Distributed PV Project has been registered with the Administrative Examination and Approval Bureau of Dashiqiao for fixed-asset investment projects of domestic enterprises (see Annex 2), and the construction of the Project is legal.

### 5.2 Conformity with Industrial Policies

According to the Guiding Catalogue for Structural Adjustment of Industry (2019 edition), distributed PV projects are not restricted or eliminated projects. Therefore, the Dashiqiao 50MW Distributed PV Project and the Baodi 50MW Distributed PV Project are allowed projects and conform to the national industrial policies.

### 5.3 Legitimacy of site selection and route selection

The preliminary site selection of Dashiqiao 50MW Distributed PV Project includes 17 towns and subdistricts in Dashiqiao City, Liaoning Province, and the preliminary site selection of Baodi 50MW Distributed PV Project, Tianjin includes 10 towns and subdistricts in Baodi District, Tianjin. At present, both projects have completed the registration of investment projects in the local administrative approval bureau. At the same time, the project planning and site selection does not involve ecological environmentally sensitive areas such as nature reserves, ecological red line areas and scenic spots.

Therefore, the site selection and route selection of the Project meets the requirements of relevant laws and regulations.

### 5.4 Legitimacy of approval procedures

The feasibility study design of the Project is carried out in accordance with the

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relevant design specifications of the PVPS project, and the project design scheme meets the requirements of relevant specifications. All approvals of the Project shall be carried out in accordance with relevant national laws, regulations and rules. The construction can be carried out according to the relevant approval scale and content only after obtaining the legal approval procedures for all links.

All procedures in the early stage of the Project shall be handled in accordance with the requirements of relevant laws and regulations, and relevant units shall review and approve them according to the scope of authority stipulated by laws and regulations, and there shall be no contents and procedures that do not meet the requirements of laws and regulations.

## 5.5 Understanding of Stakeholders

Stakeholders of the Project mainly include the project construction subject (Beijing Xiangju New Energy Technology Co., Ltd.), farmers directly contracted with the Project and government agencies in the project site.

### ① Impact on farmers contracted with the Project

According to the site survey, the main leased places are the roofs and courtyards of farmers. The main functions of the roofs of farmers are to bear loads and provide shelter. On the premise of meeting the requirements of safe construction, the Project basically has no impact on the functions of the roofs. The main functions of the courtyard include leisure walking, stacking articles, planting plants, etc. The Project has a slight impact on the function of the courtyard. Before signing the contract, farmers will be clearly informed of this impact, and they have absolute freedom to decide whether to sign the lease contract. Therefore, the Project will have a certain impact on the production and life of farmers, but it must be within the acceptable range of farmers.

In 2020, the per capita disposable income of rural permanent residents in Baodi District was RMB 24,531. The average annual rental income of the rented farmers in the Project is about RMB 1,500, equivalent to an increase of 6.1% in per capita disposable income. In 2021, the per capita disposable income of rural residents in

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Dashiqiao City was RMB 23,493. The average annual rental income of the rented farmers in the Project is about RMB 2,500, equivalent to an increase of 10.6% in per capita disposable income. It can be seen that the Project will bring about a significant increase in the per capita income of local farmers.

② Impact on government agencies in the project site

First of all, local workers will be employed during the construction period of the Project, which will solve some employment problems and stimulate local economic development to a certain extent. Secondly, during the operation period of the Project, considerable fixed annual income will be created for a large number of local farmers, which will improve the life of local rural people.

The Project is a PV power generation project, and the power generation will be fully connected to the grid. The total power generation of Dashiqiao City Project within 25 years will be 1,647,438,800kWh, and the total power generation of Baodi District Project within 25 years will be 1,702,195,000kWh, which can relieve the pressure of local power consumption and promote the development of local new energy industry.

## 5.6 Impact on Indigenous Peoples

According to the requirements of the Bank, the environmental and social standards of indigenous peoples will be triggered when they are currently within the planning scope of the Project or have a collective connection with the planning scope and are likely to be affected by the Project. The definition of Indigenous Peoples mainly includes the following characteristics:

(1) Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;

(2) Collective attachment to geographically distinct habitats, ancestral territories or areas of seasonal use or occupation in the Project area and to the natural resources in these areas;

(3) Customary cultural, economic, social or political institutions that are distinct or separate from those of the dominant society or culture;

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(4) A distinct language or dialect, often different from the official language of the country or region in which they live.

According to the site survey, the sample survey in Baodi District involved 3 ethnic minority farmers, including 1 Hui and 2 Manchus. The sample survey objects in Dashiqiao City do not involve ethnic minority farmers. The area where the Project is located mainly involves Hui and Manchu ethnic minorities. Chinese is the common local language and there is no language barrier. Hui and Manchu ethnic minority groups live in a scattered manner, and no concentrated residential area is formed. They are not socially vulnerable groups. Therefore, according to the Bank's framework document, the project does not involve indigenous peoples, so it will not trigger environmental and social standards for indigenous peoples.

## 5.7 Impact of Labor Inflow during Construction Period

The Project is constructed on the existing roof and in the courtyard, with a short construction period of about 6 months. The workers of the Project are all local people, and the main recruitment methods include online recruitment, recruitment by the Labor and Employment Bureau and recruitment in the talent market. The average number of site construction personnel in Dashiqiao City and Baodi District is 20, and the number of site construction personnel in peak period is 50. The workers will receive professional training before construction to ensure HSE-compliant construction and avoid conflicts and disputes. The average number of site operation and maintenance personnel during the operation period is about 6.

Since the labor force during the construction period and operation period of the Project comes from the local labor market, there is no risk of labor inflow. In addition, the workers of the Project will receive relevant training on occupational skills, safe construction, HSE-compliant construction, etc. before entering the site to ensure the smooth completion of construction, operation and maintenance work on the premise of HSE-compliant construction and safe construction.

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## 5.8 Analysis on Environmental Impact

### 5.8.1 Environment Impact Analysis during the Construction Period

#### 5.8.1.1 Analysis of impact on ambient air quality

The main sources of air pollution during the construction of the Project include: dust generated during the loading and unloading and stacking of construction building materials and the transportation of construction vehicles; waste gas emitted by various construction machinery and transportation vehicles; welding smoke generated during the installation of PV brackets.

During the construction period of the Project, the dust will generate during the loading and unloading of construction materials, the running of transport vehicles, and the exposure of the site surface under windy conditions. The Sponsor shall supervise the Construction Contractor to take effective measures to prevent dust during construction. During the construction period of the Project, there are few factors affecting the atmospheric environment and the construction quantity is small. After effective prevention and control measures are taken, there will be no great impact on the surrounding environment and residents.

#### 5.8.1.2 Analysis of impact on water environment

Construction wastewater and domestic sewage are mainly produced during the construction period. The office area relies on the original permanent office building of the Project, and the domestic sewage is incorporated into the municipal pipe network for treatment. The workers' accommodation is not in the construction area, and the workers live in the surrounding villages. The basic living facilities in the villages around the project are relatively complete, and the domestic sewage can be effectively treated. The domestic sewage during the construction period has little impact on the surrounding surface water bodies.

Since there is basically no production wastewater during the construction of distributed PV projects, only a small amount of construction vehicle washing wastewater is generated, and the main pollutant in the wastewater is only a small

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amount of SS. Vehicle washing tanks and sedimentation tanks shall be set up in the main construction area of the Project to wash the vehicles entering and leaving the construction site, so as to prevent the vehicles from bringing dust into the social roads. After sedimentation, the wastewater from vehicle washing can be reused as construction water or for spraying for dust suppression. The sediment shall be dried in a certain area on the construction area, and then transported to the designated place for soil covering.

In addition, commercial concrete is adopted during the construction period of the Project, and no large-scale concrete mixing is carried out on site, and no mixing wastewater is generated. The construction wastewater will not have an impact on the surface water body after taking corresponding prevention and control measures.

#### 5.8.1.3 Acoustic environmental impact analysis

The impact of construction noise on the environment during the construction of the Project can be divided into several stages, including installation works (bracket installation, module installation and other electrical equipment installation), equipment and system commissioning, etc. Since there may be multiple machines working at the same time during the actual construction process, and the noises from various noise sources have a great impact on each other, the Sponsor shall strictly implement the national Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011) during the construction process, take effective noise reduction measures as far as possible, and avoid concentrated use of a lot of power mechanical equipment at the same time. There is no need for continuous construction such as large-scale concrete pouring in the Project, so nighttime construction shall be prohibited, the control of construction noise shall be strengthened, and the impact of construction on the surrounding environment and sensitive targets shall be minimized.

As the Project is installed and implemented on the roof or in the courtyard of each farmhouse, certain noise impacts may be generated during the construction process. However, the area of PV panels installed by each farmhouse is small, the construction

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time is short, and the impact on the farmer will disappear after the construction is completed.

#### 5.8.1.4 Impact analysis of solid waste

During the project construction period, the demolition of original buildings, a large amount of excavation and other works are not involved. The domestic waste of the workers is processed through the domestic waste storage and transportation facilities of surrounding villages. The domestic waste of office personnel is collected by the office building garbage bin and then uniformly collected and transported by the sanitation department. During the construction period, the solid waste mainly includes a small number of waste parts generated from the installation of PV modules, mainly including residual materials of cables and leftover materials of section steel brackets, which shall be recycled and processed in a timely manner so that they will not be scattered in the construction site and will not have an impact on the environment.

#### 5.8.1.5 Analysis of impact on ecological environment

##### (1) Impact on biodiversity

The Project is mainly built on the roof of the existing building roofs and courtyards, without new land occupation, and the surrounding areas are common local animals and plants. The construction of the Project will not affect the biodiversity of the regional ecosystem.

##### (2) Impact of vegetation destruction during construction period

The Project will not increase the new land occupation, does not need to clear the surface vegetation, and will not cause damage to the vegetation.

##### (3) Analysis of impact on animal activities during construction period

The land area of the Project is residential land, which is mainly built on the roof or courtyard of existing buildings. The surrounding vegetation coverage is average, and there are many human activities. It is not an ideal habitat for nearby wild animals, and will not have a great impact on the survival and reproduction of wild animals within the land area. There are no rare and protected wild animals requiring key protection

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within the assessment scope.

(4) Impact of water and soil loss

The Project is mainly built on the roof or courtyard of existing buildings, with no new land occupation and little impact on the regional ecological environment.

(5) Impact of land occupation

The Project is mainly built on the roof or courtyard of existing buildings, and does not involve occupation of basic farmland. No new land will be occupied during the construction of the Project, and solar modules will be erected above the roof of the villagers. The construction of the Project will not affect the current situation and planning of land use.

The Sponsor will also sign cooperation and lease contracts with cooperative farmers in accordance with the requirements of land management, so as to fully coordinate and jointly develop and construct. After properly handling the land occupation procedures, the project construction has little impact on the land use of the area.

The project construction area does not involve environmentally sensitive areas and wild animals and plants requiring key protection. During the construction process of the Project, the comprehensive protection measures combining engineering measures, vegetation measures, temporary measures and management measures will have little impact on the ecological environment in the Project area.

## 5.8.2 Analysis of Environmental Impact during Operation

### 5.8.2.1 Analysis of impact on ambient air quality

The PV power generation process does not involve fossil fuels, no waste gas is generated after it is put into operation, and there is no impact on the ambient air.

According to the feasibility study report of the Project, it is estimated that after the completion of Baodi 50MW Distributed PV Project, the annual average energy output will be 68,087,800 kWh, and about 20,800 tons of standard coal can be saved every year. Accordingly, about 55,400 tons of carbon dioxide (CO<sub>2</sub>), about 422.14 tons of

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sulfur dioxide (SO<sub>2</sub>), and about 142.98 tons of nitrogen oxides (NO<sub>x</sub>) can be reduced every year.

After the completion of Dashiqiao 50MW Distributed PV Project, it is estimated that the average annual energy output will be 65,898,000 kWh, and about 20776.325 tons of standard coal can be saved every year. Accordingly, about 55448.95 tons of carbon dioxide (CO<sub>2</sub>), 422.35 tons of sulfur dioxide (SO<sub>2</sub>) and 143.05 tons of nitrogen oxides (NO<sub>x</sub>) can be reduced every year.

The above data shows that the Project helps to improve the local atmospheric environment and promotes energy conservation and emission reduction. In addition, it can also save water and reduce the pollution of the water environment caused by hydraulic ash removal wastewater and warm drainage. Therefore, the PVPS has an obvious environmental benefit.

#### 5.8.2.2 Analysis of impact on water environment

No new facilities such as substations will be built in the Project, and no domestic sewage will be generated during the operating period. The main sewage is the sewage generated during the cleaning of PV panels.

During the operation of the Project, the water quality of PV panel cleaning water is basically the same as that of rainwater, and the main characteristic pollutant is SS, which enters the rainwater ditch through the local rainwater collection and drainage system and will not affect the water environment in the area. The PV panels of the Project are cleaned regularly, and the area of distributed PV panels in each household is not large, resulting in a small amount of cleaning wastewater, which can be consumed by rainwater ditches in surrounding villages.

#### 5.8.2.3 Acoustic environmental impact analysis

The noise during the operating period of the Project mainly comes from the noise generated during the operation of the inverter. According to the feasibility study report of the Project, it is planned to use string inverters in the Project. This type of inverter has a fanless design and does not require a civil engineering room. It can achieve a low

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ambient noise of 33dB, and there is basically no noise impact during operation.

#### 5.8.2.4 Solid waste

The solid waste during the operating period of the Project mainly includes waste PV modules, waste inverters, and oily rags that may be generated during repair and maintenance. According to the feasibility study report of the Project, the string inverter to be selected for the Project adopts IP66 protection grade to realize internal and external environmental isolation, keep the device in a stable operating environment, and reduce the impact of external environment such as temperature, sandstorm and salt spray on the service life of the device. The system has no vulnerable parts, no fuses, fans, and other devices that need to be replaced regularly to realize a maintenance-free system, which to a certain extent reduces the generation of solid waste during the operating period.

PV power generation itself does not generate solid waste. The design service life of the PV grid-connected power generation system is 25 years. There is basically no damage except man-made damage. To ensure the stability of the solar power station, the solar panel needs to be replaced during the design period of the system.

According to the project feasibility study report, the 50MW PV project in Baodi District has a total of 92,598 panels, each weighing about 27kg, totaling 2,500.146t. Therefore, the waste PV modules generated within the design life of 25 years are about 2500.146t, which is converted into an average annual waste PV module output of 100.006t. According to the National Hazardous Waste Inventory (2021 Edition), the replaced waste PV modules are not hazardous wastes. The above-mentioned wastes have recycling value and should be collected and temporarily stored in the courtyards of each household, and recycled by the manufacturers.

During the operation of the Project, the waste accessories that may be generated due to damage or replacement after the service life expires will be uniformly recycled by the maintenance team, and no solid waste will be generated.

To sum up, all kinds of solid wastes generated by the Project have been effectively

treated and disposed of, which will not cause secondary pollution and has little impact on the surrounding environment.

#### 5.8.2.5 Analysis of light pollution impact

According to the feasibility study report of the Project, crystalline silicon PV modules are proposed to be used in the Project. The surface of crystalline silicon plate in the PV modules is coated with anti-reflective coating, and the surface of the encapsulated glass has been subject to anti-reflective treatment, so the reflection of sunlight by PV modules is mainly scattering. Its total reflectivity is far lower than that of glass curtain bar, and there is no glare, so it will not produce light pollution.

#### 5.8.2.6 Analysis of impact of electromagnetic radiation

No new step-up substation or substation will be built in the Project, which will have little impact on the electromagnetic environment in the area.

#### 5.8.2.7 Analysis of impact on ecological environment

As the Project is to install PV modules on the original houses, after the Project is completed and put into operation, it will not change the original structure and function of the local ecosystem, will not have an obvious impact on the species and quantity of animals and plants in the assessment area, and will not have an impact on the stability and diversity of ecosystem types.

## 6. Stakeholder Engagement and Information Disclosure

### 6.1 Identification of Stakeholder

The stakeholders of the Project can be roughly divided into five groups: governments at all levels and relevant institutions in the project area, project implementation institutions and construction units, various groups served by the Project, households providing roof rental for the Project and groups affected by construction. The specific stakeholders are shown in the following table.

Identification of Stakeholder

Table 6.1-1

Stakeholder groups	Specific stakeholders
Relevant government agencies of the Project	Baodi District and Dashiqiao Municipal Bureau of Planning and Resource Management, Baodi District and Dashiqiao Municipal Housing and Urban-Rural Development Bureau, Baodi District and Dashiqiao Municipal Ecological Environment Bureau as the planning and environmental management units of the Project
Project implementation institutions and construction contractor	Beijing Xiangju New Energy Technology Co., Ltd., Yingkou and Dashiqiao Project Company, Yingkou and Dashiqiao Construction Contractor
Groups served by the Project	SPIC Northeast Electric Power Co., Ltd. Benxi Thermal Power Branch
Households providing roof rental for the Project	About 4,209 farmer households in Baodi District and about 2,500 farmer households in Dashiqiao City plan to rent roofs and courtyards.
Groups affected by construction	

### 6.2 Communication between the Government and State-owned Enterprises

In August 2021, Dashiqiao Municipal People's Government and SPIC Northeast Electric Power Co., Ltd. Benxi Thermal Power Branch signed the *Strategic Cooperation Framework Agreement on Promoting Roof Distributed PV Development in Dashiqiao City*. The agreement specifies that Dashiqiao Municipal People's Government agrees to SPIC Northeast Electric Power Co., Ltd. Benxi Thermal Power Branch's investment in promoting the development of building roofs in Dashiqiao City, including the 100MW rooftop distributed PV project for rural residents.

SPIC Northeast Electric Power Co., Ltd. Benxi Thermal Power Branch and

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Yingkou Huirong Electric Power Engineering Co., Ltd. (a subsidiary of Beijing Xiangju New Energy Technology Co., Ltd.) signed the *Strategic Cooperation Agreement for Rooftop PV Power Station Development Project* in April 2022, which clearly states that the Parties agreed to carry out all-round, multi-level and wide-ranging cooperation in the development, construction, investment and general contracting of rooftop distributed PV in Dashiqiao City, Yingkou.

The Project has achieved certain communication results with local governments and investment enterprises, and has been recognized and supported by local governments and investment enterprises, which is conducive to the smooth progress of the Project in the next stage.

### 6.3 Public Participation

#### (1) Investigation method

The public participation methods of the Project include site announcement, sampling and questionnaire.

#### (2) Investigation respondents

The survey objects of public participation in the Project include the township and subdistrict governments involved in Baodi District of Tianjin and Dashiqiao City of Yingkou City of Liaoning Province and the farmers who meet the construction conditions.

The towns and streets in public participation investigation of the Dashiqiao 50MW Distributed PV Project includes 17 towns and subdistricts in Dashiqiao City, Liaoning Province, namely Jinqiao Subdistrict, Gangdu Subdistrict, Baizhai Subdistrict, Maidu Subdistrict, Shuiyuan Town, Gouyan Town, Shifo Town, Gaokan Town, Qikou Town, Huzhuang Town, Guantun Town, Boluopu Town, Yong'an Town, Tangchi Town, Jianyi Town, Huangtuling Town, and Zhoujia Town.

The towns and streets in public participation investigation of Tianjin Baodi 50MW Distributed PV Project includes 10 towns and subdistricts in Baodi District, Tianjin, namely Chaoyang Subdistrict, Wangbuzhuang Town, Fangjiazhuang Town, Xin'an Town, Huogezhuang Town, Xinkaikou Town, Niudaokou Town, Shigezhuang Town,

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Haogezhuang Town, and Niujiapai Town.

(3) Content of investigation

The contents of the public opinion survey mainly include the relationship between the affected people and the Project, the main impacts during the construction and operating periods of the Project, the possible social risks of the Project, the measures to be strengthened by the Project, the attitude towards the Project and relevant suggestions.

#### 6.4 Public Opinion Survey Results and Analysis

A total of group questionnaires filled out by 11 towns and subdistricts and 151 individual questionnaires filled out by villagers in 17 towns and subdistricts were collected in Dashiqiao City. A total of group questionnaires filled out by 10 towns and subdistricts and 302 individual questionnaires filled out by villagers in 10 towns and subdistricts were collected in Baodi District. The specific filling statistics are shown in the table below.

## FILLING STATISTICS OF GROUP QUESTIONNAIRE IN DASHIQIAO CITY

Table 6.4-1

Questions	Answers	Selection of statistics	Proportion (%)
1. The relationship between your company and the Project	May involve long-term lease of space	11	100.00%
	May involve temporary lease of space	0	0.00%
	No rental space involved	0	0.00%
Distance from the Project	Within 100m	11	100.00%
	Within 100m~500m	0	0.00%
	Beyond 500m	0	0.00%
2. In your opinion, the construction of the Project may bring:	Favorable impact	11	100.00%
	Adverse impact	0	0.00%
	No impact	0	0.00%
	Adverse effects but acceptable	0	0.00%
3. If the project construction leases your company's land, the compensation method you want is:	Rental compensation	11	100.00%
	Miscellaneous	0	0.00%
4. During the project construction stage, the issues that your company is most concerned about are (multiple choices):	Lease compensation	10	90.91%
	Traffic impact	1	9.09%
	HSE-compliant construction	11	100.00%
	Ecological damage	0	0.00%
	Environmental Protection	3	27.27%
	Social Security	0	0.00%
	Miscellaneous	0	0.00%
5. During the project operation stage, the issues you are most concerned about are:	Safe operation of the Project	11	100.00%
	Physical health of the residents	9	81.82%
	Environmental Protection	5	45.45%
	Social Security	0	0.00%
	Miscellaneous	0	0.00%
6. What factors (multiple choices) do you think may cause public dissatisfaction or opposition to the construction of the Project:	People will oppose it	3	27.27%
	Deteriorating social security environment	0	0.00%
	Environmental pollution	1	9.09%
	Causing ecological damage	0	0.00%
	Unreasonable compensation	10	90.91%
	Compensation not paid in full and on	7	63.64%

Questions	Answers	Selection of statistics	Proportion (%)
	time		
	Non HSE-compliant construction	0	0.00%
	Miscellaneous	0	0.00%
7. Do you think the relevant measures proposed for the Project are reasonable:	Enhanced environmental and security measures	1	9.09%
	Development of relevant emergency plans	0	0.00%
	Enhanced communication with stakeholders	11	100.00%
	Strengthening for Construction Management	10	90.91%
	Miscellaneous	0	0.00%
8. Your attitude towards the Project after the above preventive measures are implemented	Supportive	11	100.00%
	Opposed	0	0.00%
	Indifferent	0	0.00%

FILLING STATISTICS OF INDIVIDUAL QUESTIONNAIRE IN DASHIQIAO CITY

Table 6.4-2

Questions	Answers	Selection of statistics	Proportion (%)
1. Your relationship with the Project	May involve long-term lease of space	131	86.75%
	May involve temporary lease of space	7	4.64%
	No rental space involved	13	8.61%
Distance from residence to the Project	Within 100m	143	94.70%
	Within 100m~500m	8	5.30%
	Beyond 500m	0	0.00%
2. Do you think that the construction of the Project may bring your family:	Favorable impact	129	85.43%
	Adverse impact	3	1.99%
	No impact	19	12.58%
	Adverse effects but acceptable	0	0.00%

Questions	Answers	Selection of statistics	Proportion (%)
3. If the project construction leases your house site, the compensation method you want is:	Rental compensation	151	100.00%
	Miscellaneous	0	0.00%
4. As for the construction of the Project, the issues you are most concerned about are (multiple choices):	Lease compensation	147	97.35%
	Environmental Protection	89	58.94%
	Physical health of the residents	125	82.78%
	Safe operation of the Project	81	53.64%
	HSE-compliant construction	50	33.11%
	Social Security	51	33.77%
	Miscellaneous	0	0.00%
5. The project construction will attract the attention of the masses. What do you think are the possible reasons (multiple choices):	People won't oppose it	136	90.07%
	Environmental pollution	106	70.20%
	Non HSE-compliant construction	90	59.60%
	Impact on residents' lives	99	65.56%
	Unreasonable compensation	50	33.11%
	Disruption of public order	60	39.74%
	Miscellaneous	0	0.00%
6. How do you think the Project sponsor should prevent the possible social risk impact (multiple choices):	Enhanced environmental and security measures	146	96.69%
	Development of relevant emergency plans	97	64.24%
	Enhanced communication with stakeholders	72	47.68%
	Strengthening for Construction Management	93	61.59%
	Compensation for land acquisition according to national and local policies	65	43.05%
	Miscellaneous	0	0.00%
7. Your attitude towards the Project after the above preventive measures are implemented:	Supportive	119	78.81%
	Opposed	4	2.65%
	Indifferent	28	18.54%

## FILLING STATISTICS OF GROUP QUESTIONNAIRE IN BAODI DISTRICT

Table 6.4-3

Questions	Answers	Selection of statistics	Proportion (%)
1. The relationship between your company and the Project	May involve long-term lease of space	18	90.00%
	May involve temporary lease of space	0	0.00%
	No rental space involved	2	10.00%
Distance from the Project	Within 100m	20	100.00%
	Within 100m~500m	0	0.00%
	Beyond 500m	0	0.00%
2. In your opinion, the construction of the Project may bring:	Favorable impact	18	90.00%
	Adverse impact	0	0.00%
	No impact	1	5.00%
	Adverse effects but acceptable	1	5.00%
3. If the project construction leases your company's land, the compensation method you want is:	Rental compensation	20	100.00%
	Miscellaneous	0	0.00%
4. During the project construction stage, the issues that your company is most concerned about are (multiple choices):	Lease compensation	9	45.00%
	Traffic impact	1	5.00%
	HSE-compliant construction	16	80.00%
	Ecological damage	1	5.00%
	Environmental Protection	2	10.00%
	Social Security	0	0.00%
	Miscellaneous	1	5.00%
5. During the project operation stage, the issues you are most concerned about are:	Safe operation of the Project	20	100.00%
	Physical health of the residents	10	50.00%
	Environmental Protection	2	10.00%
	Social Security	0	0.00%
	Miscellaneous	0	0.00%
6. What factors (multiple choices) do you think may cause public dissatisfaction or opposition to the construction of the Project:	People won't oppose it	14	70.00%
	Deteriorating social security environment	0	0.00%
	Environmental pollution	0	0.00%
	Causing ecological damage	0	0.00%
	Unreasonable compensation	6	30.00%
	Compensation not paid in full and on time	7	35.00%

Questions	Answers	Selection of statistics	Proportion (%)
	Non HSE-compliant construction	2	10.00%
	Miscellaneous	0	0.00%
7. Do you think the relevant measures proposed for the Project are reasonable:	Enhanced environmental and security measures	16	80.00%
	Development of relevant emergency plans	4	20.00%
	Enhanced communication with stakeholders	3	15.00%
	Strengthening for Construction Management	1	5.00%
	Miscellaneous	0	0.00%
8. Your attitude towards the Project after the above preventive measures are implemented	Supportive	18	90.00%
	Opposed	0	0.00%
	Indifferent	2	10.00%

**FILLING STATISTICS OF INDIVIDUAL QUESTIONNAIRE IN BAODI DISTRICT**

Table 6.4-4

Questions	Answers	Selection of statistics	Proportion (%)
1. Your relationship with the Project	May involve long-term lease of space	293	97.02%
	May involve temporary lease of space	0	0.00%
	No rental space involved	9	2.98%
Distance from residence to the Project	Within 100m	285	94.37%
	Within 100m~500m	17	5.63%
	Beyond 500m	0	0.00%
2. Do you think that the construction of the Project may bring your family:	Favorable impact	283	93.71%
	Adverse impact	0	0.00%
	No impact	19	6.29%
	Adverse effects but acceptable	0	0.00%

Questions	Answers	Selection of statistics	Proportion (%)
3. If the project construction leases your house site, the compensation method you want is:	Rental compensation	302	100.00%
	Miscellaneous	0	0.00%
4. As for the construction of the Project, the issues you are most concerned about are (multiple choices):	Lease compensation	282	93.38%
	Environmental Protection	3	0.99%
	Physical health of the residents	51	16.89%
	Safe operation of the Project	190	62.91%
	HSE-compliant construction	43	14.24%
	Social Security	0	0.00%
	Miscellaneous	0	0.00%
5. The project construction will attract the attention of the masses. What do you think are the possible reasons (multiple choices):	People won't oppose it	60	19.87%
	Environmental pollution	14	4.64%
	Non HSE-compliant construction	22	7.28%
	Impact on residents' lives	194	64.24%
	Unreasonable compensation	238	78.81%
	Disruption of public order	1	0.33%
	Miscellaneous	0	0.00%
6. How do you think the Project sponsor should prevent the possible social risk impact (multiple choices):	Enhanced environmental and security measures	262	86.75%
	Development of relevant emergency plans	0	0.00%
	Enhanced communication with stakeholders	223	73.84%
	Strengthening for Construction Management	27	8.94%
	Compensation for land acquisition according to national and local policies	49	16.23%
	Miscellaneous	0	0.00%
7. Your attitude towards the Project after the above preventive measures are implemented:	Supportive	302	100.00%
	Opposed	0	0.00%
	Indifferent	0	0.00%

(1) Analysis of the results of public opinion survey in Dashiqiao City

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① Analysis of statistical results of group questionnaire

A total of 11 towns and subdistricts in Dashiqiao City have filled in the group questionnaire, and all involve the long-term lease of the site. All 11 towns and subdistricts believe that the Project will bring beneficial impacts and require lease compensation in the form of rent.

For the impact of the project construction, the main concerns of each town and subdistrict in the construction stage include HSE-compliant construction (accounting for 100%), lease compensation (accounting for 90.91%), environmental protection (accounting for 27.27%) and traffic impact (accounting for 9.09%). Therefore, HSE-compliant construction shall be strengthened during the construction period of the Project, attention shall be paid to construction safety, and the impact of construction on the production and life of surrounding farmers shall be minimized; fully communicate and agree with farmers on lease compensation in a timely manner and sign lease agreements to avoid lease disputes; effectively implement environmental protection measures to minimize the impact of construction on the surrounding environment; strengthen construction management to avoid inconvenience caused by construction traffic jam.

For the impact of the project operation stage, the main concerns of the towns and subdistricts include safe operation of the Project (accounting for 100%), physical health of residents (accounting for 81.82%) and environmental protection (45.45%). Therefore, attention should be paid to maintaining the normal and safe operation of the PVPS during the operation period of the Project to avoid safety accidents such as electric leakage and falling objects. Environmental protection measures during the operation period should be strengthened to minimize adverse environmental impacts during the operation period.

Regarding the factors that may cause social risks, the main factors considered by the towns and subdistricts include unreasonable compensation (accounting for 90.91%), delayed payment of compensation (accounting for 63.64%) and environmental pollution (accounting for 9.09%). Therefore, the sponsor of the Project shall strengthen the communication with farmers, and actively communicate with farmers to reach an agreement on the compensation amount, payment method, payment time and other issues to avoid lease disputes.

Regarding the main measures to be proposed for the Project, the main measures advocated by the towns include strengthening communication with stakeholders

(accounting for 100%) and strengthening construction management (accounting for 90.91%). Therefore, attention should be paid to strengthening the disclosure of project information and establishing a sound GRM for affected people to ensure that the demands of stakeholders are coordinated and settled in a timely manner.

Finally, 11 towns and subdistricts supported the construction of the Project.

② Analysis of statistical results of individual questionnaire

151 farmers in 17 towns and subdistricts involved in the Project in Dashiqiao City filled in the individual questionnaire of the Project, of which 131 people may be involved in the long-term lease of the site, 13 people may not be involved in the lease of the site, and 7 people may be involved in the temporary lease of the site; 143 people are within 100m from the Project, and 8 people are within 100m~500m from the Project. The majority of farmers believe that the Project will have a favorable impact (accounting for 85.43%) or no impact (accounting for 12.58%). All farmers agreed on lease compensation for their house site in the form of rent.

Regarding the problems brought by the project construction, the main concerns of the relevant farmers in Dashiqiao City are lease compensation (accounting for 97.35%), physical health of residents (accounting for 82.78%), environmental protection (accounting for 58.84%), safe operation of the Project (accounting for 53.64%), social security (accounting for 33.77%) and HSE-compliant construction (accounting for 33.11%).

As for the causes of community impact caused by the Project, the relevant farmers in Dashiqiao City believe that the possible causes include environmental pollution (70.2%), impact on residents' lives (65.56%), non HSE-compliant construction (59.60%), disturbance of public security (39.74%) and unreasonable compensation (33.11%).

As for the measures to be strengthened by the sponsor, relevant farmers in Dashiqiao City believe that environmental protection and security measures should be strengthened (accounting for 96.69%), relevant disposal plans should be formulated (accounting for 64.24%), construction management should be strengthened (accounting for 61.59%), communication with stakeholders should be strengthened (accounting for 47.68%), and fair and transparent compensation for utilizing the rooftop or courtyard (accounting for 43.05%), etc.

Therefore, the construction of the Project should strengthen the communication of lease compensation, strengthen the disclosure of project information and the

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popularization of relevant knowledge, effectively implement various environmental protection measures, and ensure the safe operation and HSE-compliant construction of the Project.

Finally, most of the farmers (accounting for 78.81%) believe that they support the construction of the Project. There are still a few farmers (accounting for 18.54%) who held indifferent attitudes towards the construction of the Project, and a very small number (accounting for 2.65%) of farmers opposed the construction of the Project. In general, the construction of the Project is basically supported by local farmers.

(2) Analysis of the results of public opinion survey in Baodi District

① Analysis of statistical results of group questionnaire

The Project involves 10 towns and subdistricts in Baodi District, and 2 villages are sampled from each town and subdistrict for a sampling group questionnaire survey. Of all the 20 villages surveyed, 18 involve long-term lease of site and 2 do not involve site lease. A total of 18 surveyed villages believe that the Project will bring beneficial effects, 1 surveyed village believes that the Project has no impact, and 1 surveyed village believes that the Project has adverse effects but is acceptable. All the villages surveyed require lease compensation in the form of rent.

For the impact of the project construction, the main concerns of each town and subdistrict in the construction stage include HSE-compliant construction (accounting for 80%), lease compensation (accounting for 45%) and environmental protection (accounting for 10%). Therefore, HSE-compliant construction shall be strengthened during the construction period of the Project, attention shall be paid to construction safety, and the impact of construction on the production and life of surrounding farmers shall be minimized; fully communicate and agree with farmers on lease compensation in a timely manner and sign lease agreements to avoid lease disputes; effectively implement environmental protection measures to minimize the impact of construction on the surrounding environment; strengthen construction management to avoid inconvenience caused by construction traffic jam.

For the impact of the project operation stage, the main concerns of the towns and subdistricts include safe operation of the Project (accounting for 100%), physical health of residents (accounting for 50%) and environmental protection (10%). Therefore, attention should be paid to maintaining the normal and safe operation of the PVPS during the operation period of the Project to avoid safety accidents such as electric

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leakage and falling objects. Environmental protection measures during the operation period should be strengthened to minimize adverse environmental impacts during the operation period.

Regarding the factors that may cause social risks, the main factors considered by the towns and subdistricts include delayed payment of compensation (accounting for 35%), unreasonable compensation (accounting for 30%) and non HSE-compliant construction (accounting for 10%). Therefore, the sponsor of the Project shall strengthen the communication with farmers, and actively communicate with farmers to reach an agreement on the compensation amount, payment method, payment time and other issues to avoid lease disputes.

As for the main measures to be proposed for the Project, the main measures advocated by each town include strengthening environmental protection and security measures (accounting for 80%), formulating relevant disposal plans (accounting for 20%), and strengthening communication with stakeholders (accounting for 15%), etc. Therefore, attention should be paid to implementing various environmental protection and security measures, strengthening the disclosure of project information and establishing a sound GRM for affected people to ensure that the demands of stakeholders are coordinated and settled in a timely manner.

Finally, 18 surveyed villages support the construction of the Project, while 2 surveyed villages do not care about the construction of the Project. Among them, the 18 surveyed villages that may be involved in the Project all support the construction of the Project.

② Analysis of statistical results of individual questionnaire

302 farmers from 10 towns and subdistricts involved in the Project in Baodi District filled in the individual questionnaire of the Project, of which 293 may be involved in the long-term lease of the site and 9 do not involve the lease of the site; 285 are within 100m from the Project and 17 are within 100-500m from the Project. The majority of farmers believe that the Project will have a favorable impact (accounting for 93.71%) or no impact (accounting for 6.29%). All farmers agreed on lease compensation for their house site in the form of rent.

Regarding the problems brought by the project construction, the main concerns of relevant farmers in Dashiqiao City are lease compensation (accounting for 93.38%), safe operation of the Project (accounting for 62.91%), physical health of residents

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(accounting for 16.89%) and HSE-compliant construction (accounting for 14.24%).

As for the causes of negative social impacts that may be caused by the Project, the relevant farmers in Dashiqiao City think that the possible causes include unreasonable compensation (accounting for 78.81%), impact on residents' lives (accounting for 64.24%), non HSE-compliant construction (accounting for 7.28%), environmental pollution (accounting for 4.64%), etc.

As for the measures to be strengthened by the sponsor, relevant farmers in Dashiqiao City believe that environmental protection and security measures should be strengthened (accounting for 86.75%), communication with stakeholders should be strengthened (accounting for 73.84%), fair and transparent compensation for utilizing the rooftop or courtyard (accounting for 16.23%), and construction management should be strengthened (accounting for 8.94%), etc.

Therefore, the construction of the Project should strengthen the communication of lease compensation, strengthen the disclosure of project information and the popularization of relevant knowledge, effectively implement various environmental protection measures, and ensure the safe operation and HSE-compliant construction of the Project.

Finally, all farmers support the construction of the Project.

## 6.5 Project information disclosure

The ESIA information of the Project were disclosed on site. On June 8, 2022, the project sponsor posted the ESIA information on the Project in Jinqiao Subdistrict, Gangdu Subdistrict, Baizhai Subdistrict, Meidu Subdistrict, Shuiyuan Town, Gouyan Town, Shifo Town, Gaokan Town, Qikou Town, Huzhuang Town, Guantun Town, Boluopu Town, Yong'an Town, Tangchi Town, Jianyi Town, Huangtuling Town and Zhoujia Town of Dashiqiao City, Liaoning Province, as well as Chaoyang Subdistrict, Wangbuzhuang Town, Fangjiazhuang Town, Xin'an Town, Huogezhuang Town, Xinkaikou Town, Niudaokou Town, Shiguzhuang Town and Niujiapai Town of Baodi District, Tianjin. The information publicity is as follows. See Annex 3 for details of publicity of ESIA information.

The disclosure of ESIA information mainly includes the introduction of basic information about construction projects, the significance of project construction, the

groups involved in project implementation, the main contents of ESIA, the main contents of soliciting public opinions, and the main ways of soliciting public opinions. The contact persons and contact information of the project sponsor and the assessment unit are specified in the publicity as the grievance channels for the affected people. The affected people can express their opinions and demands on the Project by telephone or email.

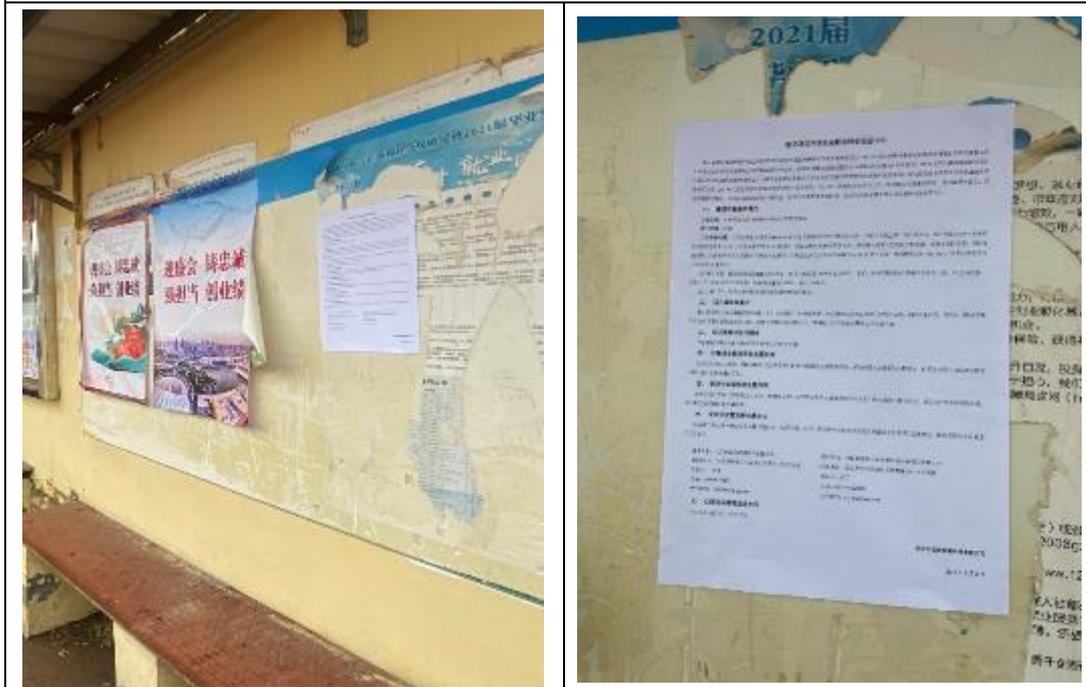
As of June 22 (two weeks after the publicity was posted), the project sponsor and the assessment unit have not received the opinions and demands of the affected people on the Project.



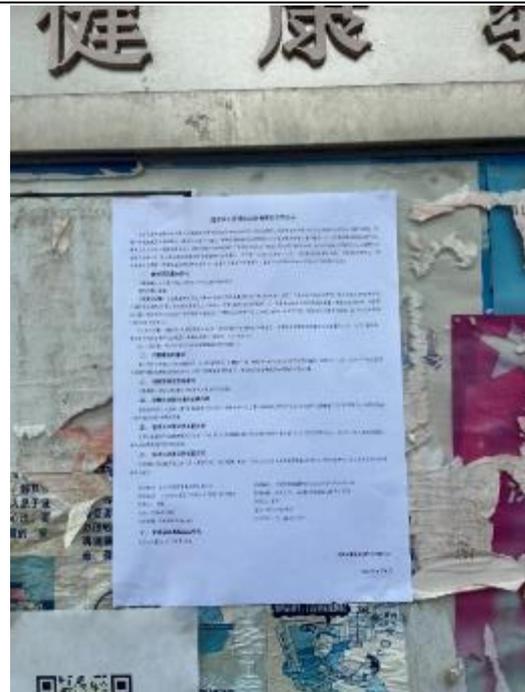
Aiyanggezhuang Village, Zhaoxia Subdistrict, Baodi District



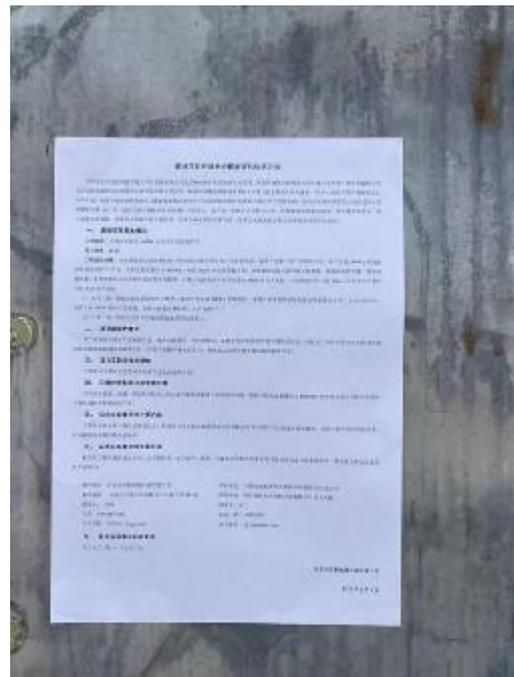
Houlianhua Village, Zhaoxia Subdistrict, Baodi District



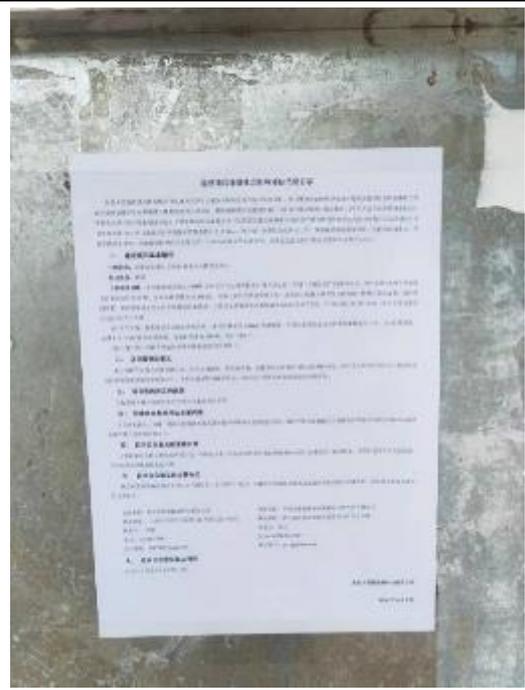
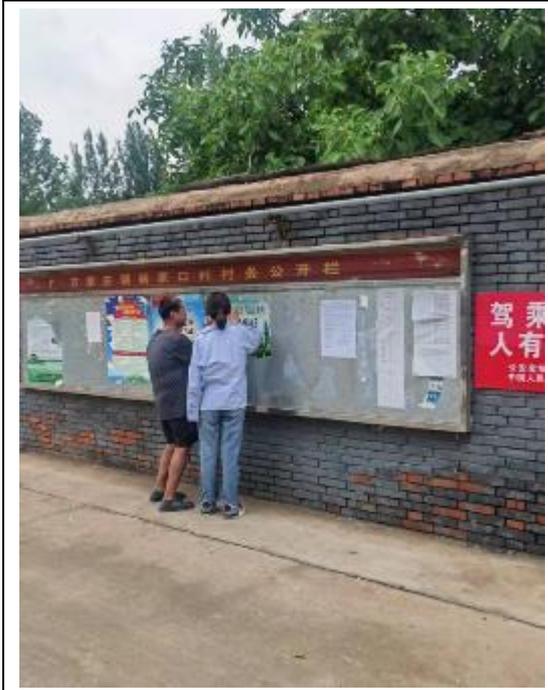
Shuangwangsi Village, Chaoyang Subdistrict, Baodi District



Xiaolan Village, Chaoyang Subdistrict, Baodi District



Liujuzhuang Village, Fangjiazhuang Town, Baodi District



Yangjiakou, Fangjiazhuang Town, Baodi District



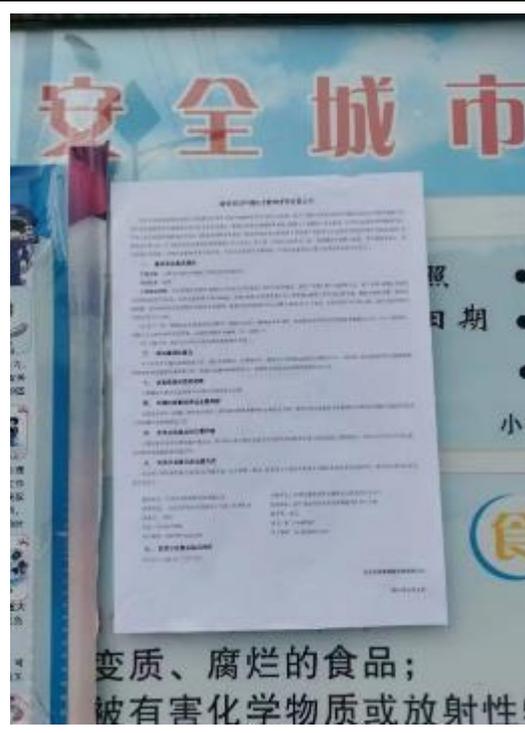
Li Huangzhuang Village, Fangjiazhuang Town, Baodi District



Xihaogezhuang Village, Haogezhuang Town, Baodi District



Xiliu Village, Haogezhuang Town, Baodi District



Gaobazhuang Village, Huogezhuang Town, Baodi District



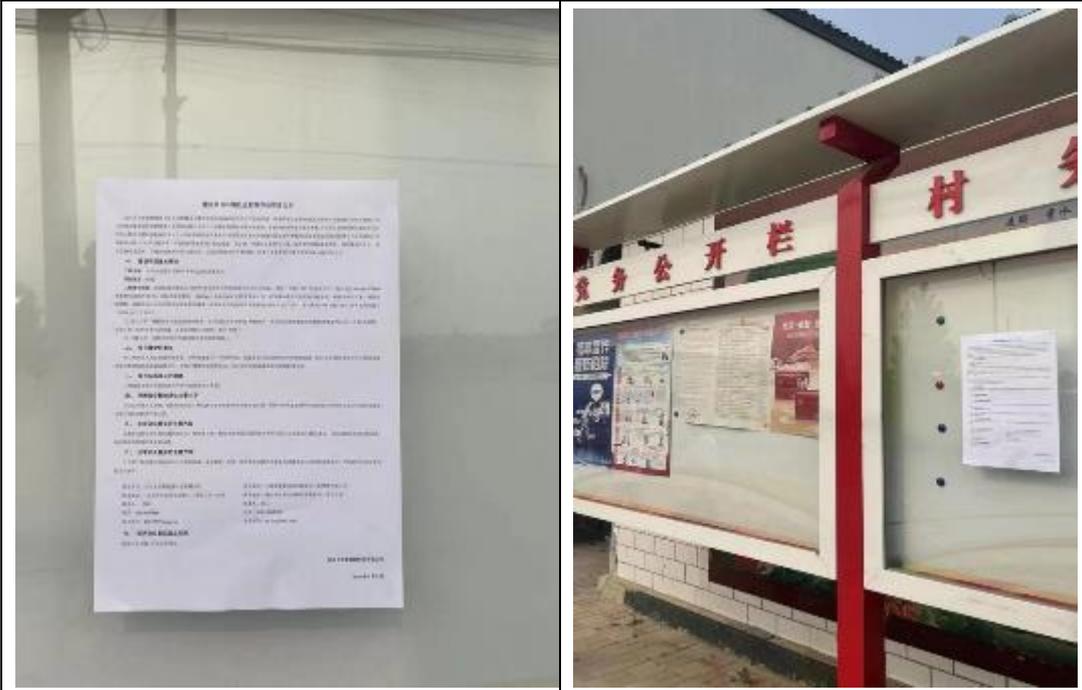
Wanghu Village, Huogezhuang Town, Baodi District



Huangshawu Village, Niudaokou Town, Baodi District



Zhaijiashen Village, Niudaokou Town, Baodi District



Houpuxiantuo Village, Niujiapai Town, Baodi District



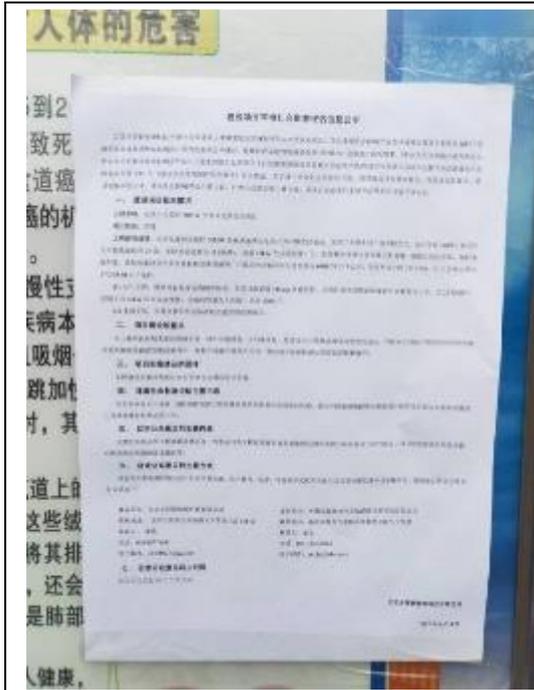
Xilaoyakou Village, Niujiapai Town, Baodi District



Chenfu Village, Shigezhuang Town, Baodi District



Zhuliuzhuang Village, Shigezhuang Town, Baodi District



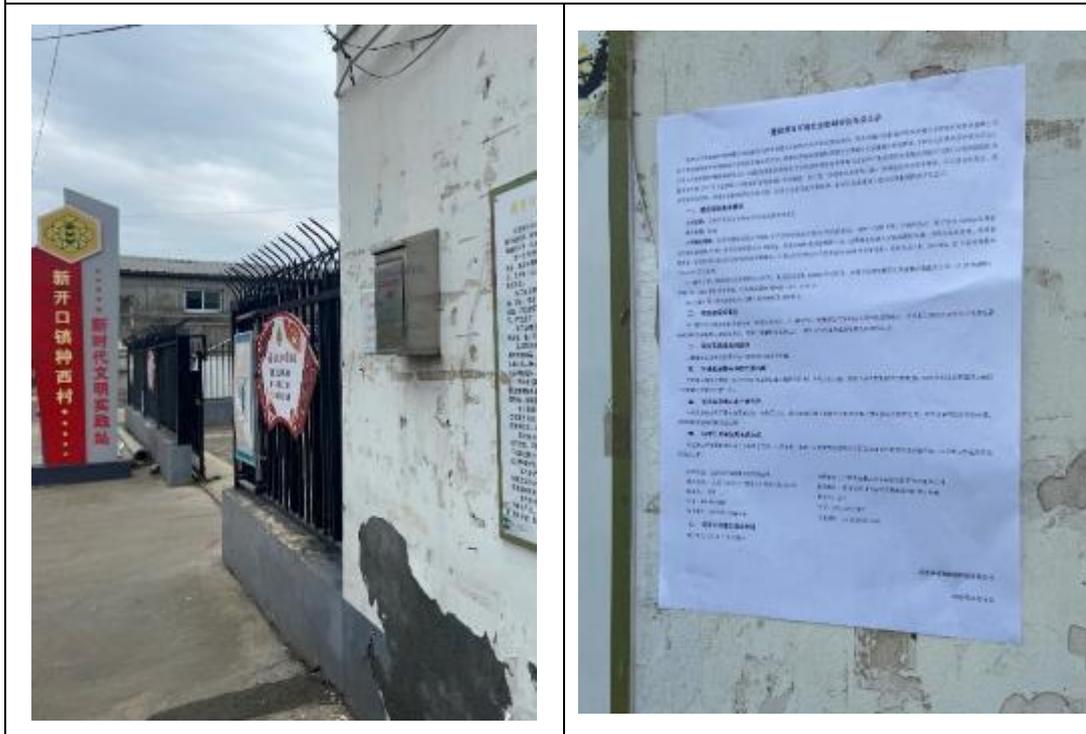
No.2 Village, Wangbuzhuang Town, Baodi District



Zhangsima Village, Wangbuzhuang Town, Baodi District

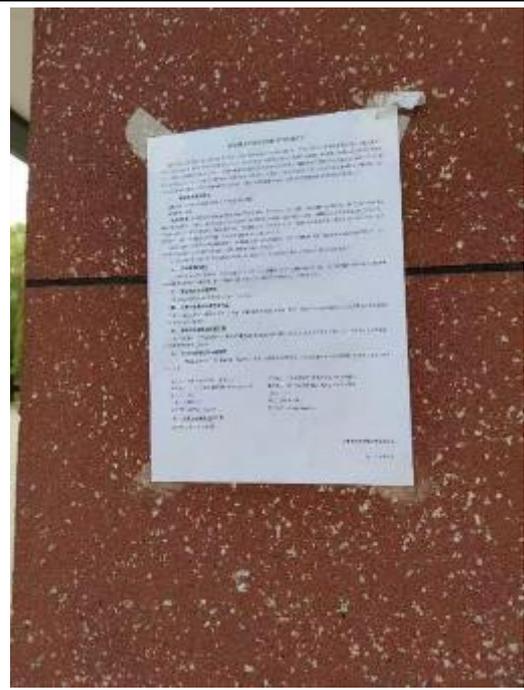


Zhongdong Village, Xinkaikou Town, Baodi District

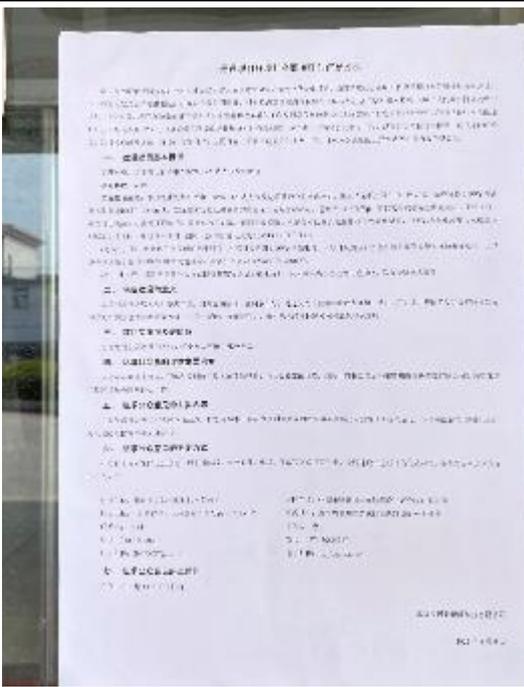


Zhongxi Village, Xinkaikou Town, Baodi District

Figure 6.5-1 Site Photo of ESIA Information Publicity in Baodi District



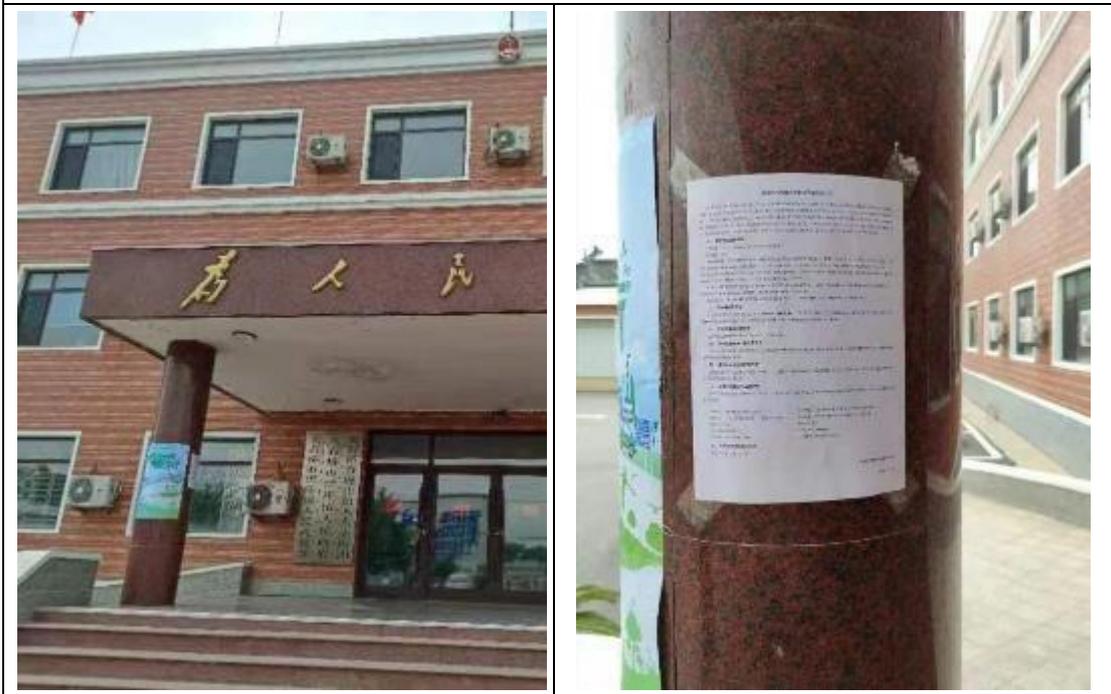
Gaokan Town, Dashiqiao City



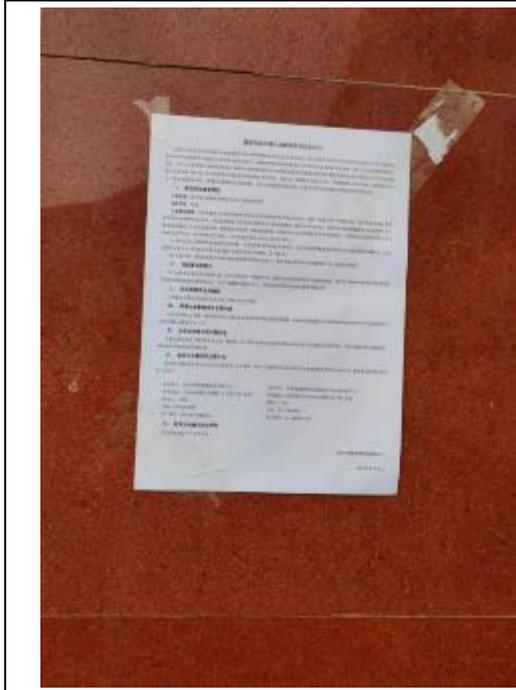
Gouyan Town, Dashiqiao City



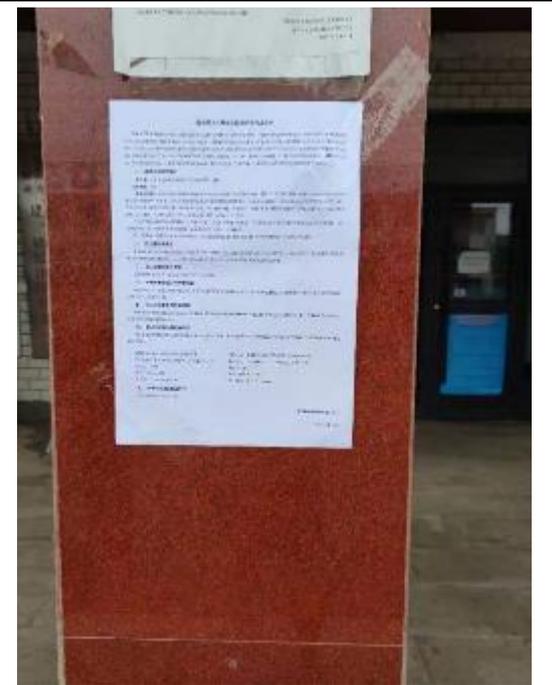
Guantun Town, Dashiqiao City



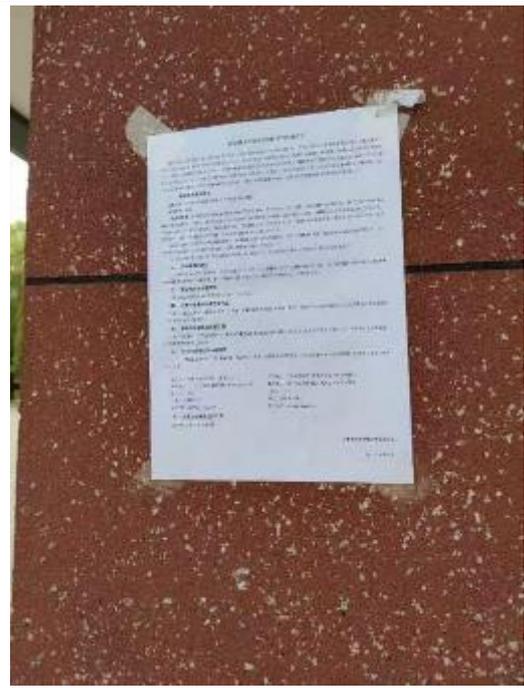
Huzhuang Town, Dashiqiao City



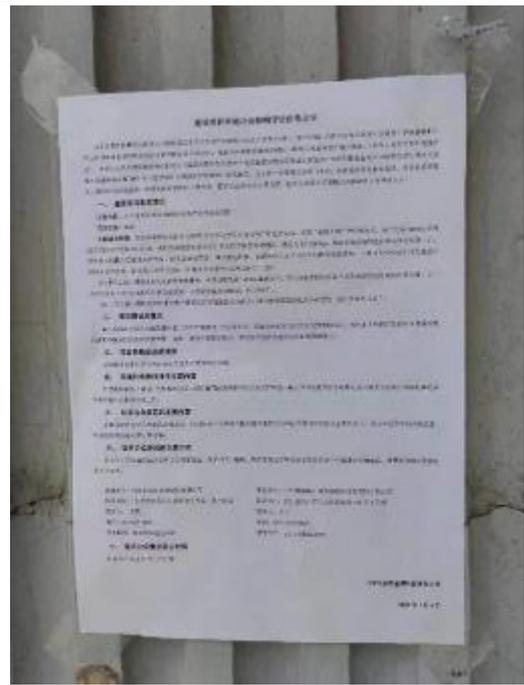
Huangtuling Town, Dashiqiao City



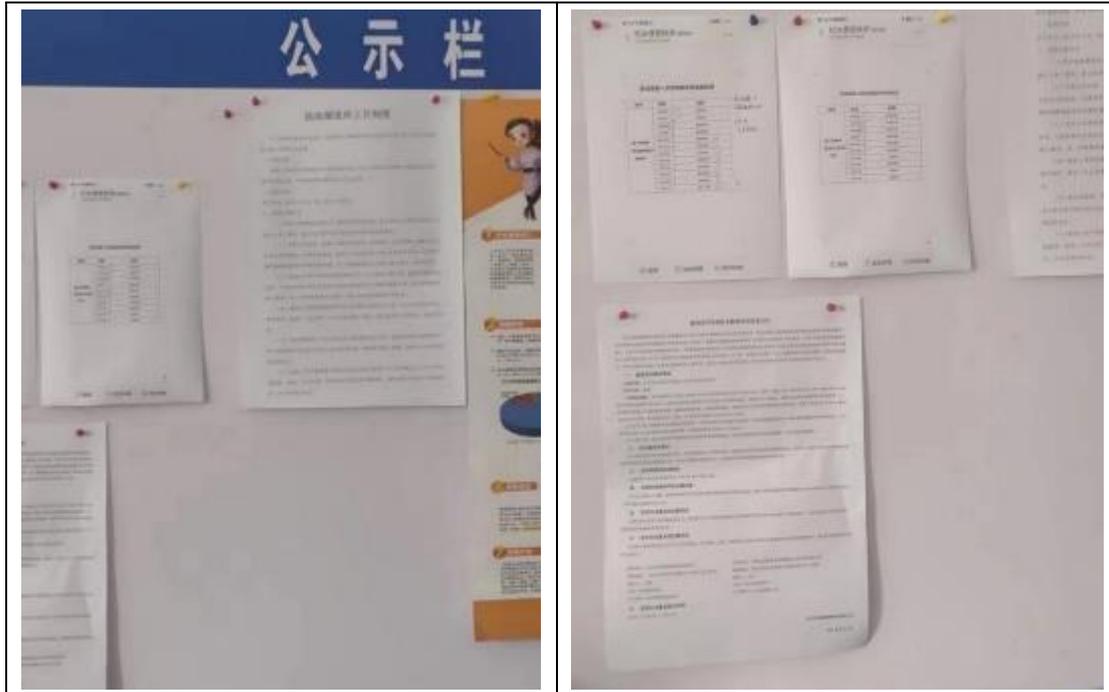
Jianyi Town, Dashiqiao City



Shifo Town, Dashiqiao City



Shuiyuan Town, Dashiqiao City



Tangchi Town, Dashiqiao City



Zhoujia Town, Dashiqiao City



Boluopu Town, Dashiqiao City

Figure 6.5-2 Publicity of ESIA Information in Dashiqiao City

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## 7. Establishment and Management of GRM

### 7.1 Establishment of GRM

In accordance with the requirements of the Bank's *Environmental and Social Framework*, the Project has established an appropriate GRM in accordance with the environmental and social policies and environmental and social standards, so as to understand and help those affected groups raise concerns, complaints and grievances in terms of rent compensation and construction-related environmental and social impacts of the Project, and ensure that relevant interest groups that may be negatively affected can use the GRM to safeguard their rights and interests.

#### (1) Establishment of the GRM Team

Beijing Xiangju New Energy Technology Co., Ltd. will take the lead to establish a GRM team at the level of the project company, including the Project Contractor, Construction Contractor and Supervisor. Clarify the main body and division of responsibility and cooperation department for grievance handling of the Project, and implement the responsibility for grievance handling to individuals. In the process of work promotion, the communication and coordination mechanism between government departments at all levels and village committees and villagers shall be established.

Establish a hierarchical GRM. Grievances that cannot be resolved at the level of the Project Working Team should be further appealed to Beijing Xiangju New Energy Technology Co., Ltd. or the Bank.

Considering that people in China are used to lodging grievances with relevant government departments, the working team shall jointly establish a grievance handling working team with the township government to actively respond to people's demands related to the Project. With the support from related functional departments of Dashiqiao City and Baodi District, the sponsor, Constructor and Construction Contractor will set up a compliant handling working team with the responsible person and permanent staff, to take charge of the compliant handling work of the Project; moreover, the team shall be staffed with township compliant handling personnel with experience of contradictory resolving.

#### (2) Contents of grievance handling

It is recommended that the compliant handling working team should carry out work from the following aspects:

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① Establish a reception point on the construction site to accept residents visited. The compliant handling team shall set up fixed visitor reception points to patiently and carefully answer the questions put forward by visited residents on concerned planned site selection, construction scheme and environmental protection, and timely discuss and reply to the comments & demands proposed by the visitors.

② Communicate/exchange with villagers, learn their opinions, suggestions and demands, and to timely communicate with related departments for answers through the communication platform built by the township and subdistrict governments.

③ Keep close contact with governments at all levels and know the dynamic state of residents; for possible social contradictions and risky events, to assist related departments of the government to take preventive and disposal measures, to prevent contradiction expansion and sharpening, and to prevent minor group events from transforming into major and great group events.

④ Strengthen the contact with the project approval departments such as Baodi District and Dashiqiao Municipal Political and Legal Affairs Commission, Development and Reform Bureau, Construction Bureau, Transportation Bureau, Bureau of Planning and Resource Management, Bureau of Land and Resources, Bureau of Ecological Environment, etc., and invite the project approval departments to jointly answer the relevant questions and policies concerned by the masses as required.

⑤ Strengthen the contact with the safety supervision department, etc. to complete the construction quality and safety management work. Timely report the comments on construction from enterprises and public institutions and residents near the Project to the Contractor, Construction Contractor and Supervisor, and assist related departments and offices to pacify and compensate the affected residents and enterprises.

⑥ Make a compensation plan for project construction influence, and well pacify and compensate the residents living in surrounding areas suffered a lot from noise, vibration and flying dust according to the demands of phased work of complaint handling; proper compensation means shall be taken to avoid causing new

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contradictions.

⑦ The records and results of all oral or written grievances shall be reported to the Bank in the annual environmental and social report.

## 7.2 Early Grievances of the Project

On June 8, 2022, the project sponsor posted the publicity of ESIA information on the Project in Jinqiao Subdistrict, Gangdu Subdistrict, Baizhai Subdistrict, Meidu Subdistrict, Shuiyuan Town, Gouyan Town, Shifo Town, Gaokan Town, Qikou Town, Huzhuang Town, Guantun Town, Boluopu Town, Yong'an Town, Tangchi Town, Jianyi Town, Huangtuling Town and Zhoujia Town of Dashiqiao City, Liaoning Province, as well as Chaoyang Subdistrict, Wangbuzhuang Town, Fangjiazhuang Town, Xin'an Town, Huogezhuang Town, Xinkaikou Town, Niudaokou Town, Shiguzhuang Town and Niujiapai Town of Baodi District, Tianjin. During the construction and operation periods of the Project, the project progress information shall be regularly publicized in the above-mentioned villages and towns to ensure that the affected people can timely and effectively give feedback on their demands during the construction and operation periods of the Project, and timely communicate and deal with them to prevent social impact disputes.

The contact persons and contact information of the project sponsor and the assessment unit are specified in the publicity as the appeal channels for the affected people. The affected people can feed back their opinions and demands on the Project by telephone or email. As of June 22 (two weeks after the publicity was posted), the project sponsor and the assessment unit have not received the opinions and demands of the affected people on the Project.

During the construction and operation of the Project, the grievance records and handling of the Project shall be sorted out on a quarterly basis, and the key issues, handling methods, and handling progress shall be publicized and posted on the bulletin board of the township government involved in the Project for stakeholders to read.

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## 8. Environmental and Social Management Measures

### 8.1 Protection of the Rights and Interests of Farmers

Strengthen project management and safety control, and avoid disputes such as arrears of farmers' rent settlement.

#### (1) Early warning guarantee for rent payment

The project sponsor shall put forward lease management requirements for each project company, and formulate a lease dispute settlement system, which shall be supervised and managed by the Project sponsor, and urge the project company to establish an early warning and guarantee system for rent payment. The early warning and guarantee system of rent payment can effectively prevent the occurrence of rent arrears, improve the rental management system and solve rental disputes.

#### (2) Emergency plan for failure to pay rent normally

After the implementation of the rent payment warning measures, if the contract still fails to pay the rent normally, consider using the PV power generation on-grid income to directly compensate the farmers.

① Feasibility analysis of power generation compensation for distributed PV project in Baodi district

The average annual energy output of the distributed PV project in Baodi District within 25 years of operation will be 68,780,800kWh. There are about 4,209 farmers contracted for the Project, and the average annual energy output of each household is about 16,300 kWh. If the electricity price is calculated as RMB 0.3655/kwh, the annual average household power generation compensation amount is about RMB 5,957, which is greater than the average annual household rent of RMB 1,500. Therefore, the power generation compensation method adopted in the Project can meet the rent payment of farmers.

② Feasibility analysis of power generation compensation for distributed PV project in Dashiqiao City

The average annual energy output of the distributed PV project in Dashiqiao City within 25 years of operation will be 65.898 million kWh. There are about 2,500 farmer

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households contracted for the Project, and the average annual power generation is about 26,400kWh per household. If the electricity price is calculated as RMB 0.3655/kwh, the annual average household power generation compensation amount is about RMB 9634, which is greater than the average annual household rent of RMB 2500. Therefore, the power generation compensation method adopted in the Project can meet the rent payment of farmers.

With compensation by power generation of the Project, the competent department of the local government shall coordinate in time, organize the representatives of the project sponsor and farmers to have a discussion, and communicate the payment of rent, subsequent lease payment plan and other matters.

## 8.2 Protection of Population Health

### (1) Hygiene cleaning in the construction area

During the project preparation period, the construction site and the places where workers are concentrated shall be cleaned and disinfected at one time.

### (2) Health and epidemic prevention of workers

The Construction Contractor and the project management department in the construction area shall specify the person responsible for health and epidemic prevention. The health and epidemic prevention work within the scope of management can be carried out by broadcasting, wall newspaper, printing and distributing brochures and other forms to publicize and educate the food hygiene of workers, so as to improve their health awareness of self-prevention of diseases.

The workers shall be subject to health quarantine before entering the site. According to the disease composition and epidemic situation of the workers' origin, the proposed inspection items shall be sampled for inspection, with a sampling rate of 20%. Patients with infectious diseases are not allowed to enter the construction team to prevent mutual infection and epidemic among the construction population. If a new infectious disease is found, the patient must be isolated for treatment, the transmission channel shall be cut off, and the health records of workers shall be established.

The health conditions of workers shall be sampled once a year, with a sampling

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rate of 10%. The examination contents include: general health physical examination, routine examination, malaria, hepatitis B and infectious hepatitis and other special examinations, and corresponding special examinations can be made for special groups. If an epidemic trend of diseases is found, the number of examination personnel should be expanded and corresponding treatment measures should be taken. For diseases that are harmful and easy to prevail in the construction area, preventive medication, immunization and other methods can be adopted to improve the resistance of workers to the disease and prevent the spread of disease.

(3) Sanitary facilities in the construction area

The Construction Contractor shall set up a medical point in the living area, provide commonly used therapeutic drugs, carry out simple treatment and emergency treatment of work-related accidents, and be responsible for health and epidemic prevention during the construction period.

(4) Health propaganda and management

Strengthen the health propaganda and management in the construction area. The contractors and the construction management unit shall designate a dedicated person and make use of various forms such as blackboard newspapers, wall newspapers and publicity pictorials to publicize prevention and treatment knowledge and planned immunoprophylaxis and vaccination knowledge for infectious diseases such as tuberculosis, hepatitis B, mumps, dysentery and influenza, and improve the level of hygienic knowledge and awareness of health protection for persons in the construction area.

### 8.3 HSE-compliant Construction Management

(1) Ensure legal and compliant construction and HSE-compliant construction. Beijing Xiangju New Energy Technology Co., Ltd. shall coordinate with the Construction Contractor to sign an HSE-compliant construction agreement with the town government where the construction section is located to clarify the responsibility requirements. At the same time, an assessment system for HSE-compliant construction shall be established, and a certain proportion of expenses shall be arranged as reward

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and punishment funds to strictly rectify those failing to meet the standards for HSE-compliant construction.

(2) Establish and improve the construction supervision and management system. The monthly assessment shall be implemented. The Project sponsor shall employ the management personnel with certain experience from the town government as the HSE-compliant construction management supervisor to carry out supervision and management according to the requirements of HSE-compliant construction management in Liaoning Province and Tianjin Municipality to ensure the implementation of various environmental protection measures and reduce the impact of construction noise, vibration, dust and muck. The Construction Contractor can leave the construction site only after the Project of this section meets the requirements of "three simultaneities" of environmental protection. In terms of construction organization, the construction site boundary shall be reasonably determined, engineering materials and machinery shall be stacked at designated places, and transport vehicles shall be driven according to the prescribed route; the operation time shall be reasonably arranged to avoid night construction as far as possible; if night construction is necessary, the construction permit shall be handled according to the provincial and municipal management measures, and relevant regulations and requirements shall be implemented.

(3) Repair (compensate) the facilities damaged by construction in time. Roads, bridges, canals and underground pipelines damaged during construction shall be repaired by the Construction Contractor in time. If they are not repaired in time, the Project sponsor shall be responsible for handling them. If other surrounding facilities are damaged during construction, the Project sponsor shall be responsible for organizing relevant responsible units to make compensation.

(4) Strengthen HSE-compliant construction, and carry out site leveling and reclamation in time according to the original land use type after the completion of temporary land borrowing construction such as temporary access roads.

(5) Strengthen the management of workers and establish a management system for workers to avoid conflicts between them and surrounding residents.

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(6) Establish a platform for communication between the Construction Contractor and residents. During the construction period, the Construction Contractor must establish a platform for communication with the surrounding residents, set up a special organization to communicate with the residents, and properly handle the social conflicts caused by the construction in a timely manner.

#### 8.4 Information Disclosure and Communication

Stakeholders of the Project mainly include the project construction subject (Beijing Xiangju New Energy Technology Co., Ltd.), farmers directly contracted with the Project and government agencies in the project site. Therefore, the information disclosure and communication objects of the Project mainly include the farmers involved in the Project and the government agencies where the Project is located.

(1) Information disclosure and communication to farmers involved in the Project

Prepare unified publicity and explanation materials, distribute them to all farmers involved in the Project and carry out publicity and explanation. The key points of the publicity and answer materials include the necessity of project construction, construction scheme, construction progress, control scheme of environmental impact factors such as noise and light and shadow during project construction and operation, and traffic organization scheme during construction.

The project construction communication and coordination meeting shall be held at the right time before the Project starts, during the project construction and during the project operation. In addition to individual answers for the masses during the handling of letters, visits and other complaint work, it is suggested to hold a mass communication and coordination promotion meeting for project construction before some important nodes such as project scheme publicity and project construction, so as to focus on publicizing and explaining various questions concerned by the masses, and timely study and answer unexpected questions raised by residents.

(2) Information disclosure and communication to local government agencies

Strengthen the communication with the local government of the city, town, subdistrict and village where the project is located, try to avoid disputes, and invite governments at all levels and relevant departments to guide and participate in the social

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risk prevention and resolution of the Project, further rely on local grassroots organizations along the line, and do a good job in risk resolution patiently, carefully and persistently. For example, the petitioning departments at all levels respond to and guide the petitioners who have opinions, coordinate and implement the emergency handling plan for social risks, and publicize and educate the grassroots. Including strengthening project management and safety control to avoid disputes such as wage arrears. Regularly visit the municipal, township, subdistrict and village local governments where the Project is located, and timely obtain the suggestions of the local governments on the Project as an important decision-making basis to guide the construction and operation of the Project.

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## 8.5 Environmental Protection Measures during Construction Period

### (1) Ambient air protection measures

① Reasonable management shall be carried out on the construction site, equipment and installation materials shall be stacked in a unified manner, covered with tarpaulin, and handling links shall be minimized.

② The transport vehicles shall be in good condition and in strict accordance with the relevant regulations of muck management. The transport vehicles shall not be overloaded. During the construction process, the pavement on which the vehicles are running shall be sprayed with water to suppress dust. Materials prone to dust shall be covered with tarpaulin during transportation, the tires shall be washed, and water shall be sprayed regularly to reduce dust during transportation. At the same time, special personnel shall be assigned to carry out road cleaning and HSE-compliant construction inspection in the construction area every day.

③ When the wind is too strong, the construction operation shall be stopped, and covering measures shall be taken for building materials such as stacking materials that are easy to generate dust.

④ The welding work during the construction of the Project may be carried out outdoors, and the fumes generated by welding may be directly discharged into the atmosphere, but the welding amount is small and the surrounding diffusion conditions are good. The welding fumes have little impact on the surrounding atmospheric environment.

### (2) Water environment protection measures

The construction content of the Project is relatively small. No construction living area will be set up during the construction period. The domestic wastewater generated by the workers will be solved by relying on the original wastewater treatment system of the surrounding villages. The office area relies on the original permanent office building of the Project, and the domestic sewage is incorporated into the municipal pipe network for treatment.

Since there is basically no production wastewater during the construction of

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distributed PV projects, only a small amount of construction vehicle washing wastewater is generated, and the main pollutant in the wastewater is only a small amount of SS. Vehicle washing tanks and sedimentation tanks shall be set up in the main construction area of the Project to wash the vehicles entering and leaving the construction site, so as to prevent the vehicles from bringing dust into the social roads. After sedimentation, the wastewater from vehicle washing can be reused as construction water or for spraying for dust suppression. The sediment shall be dried in a certain area on the construction area, and then transported to the designated place for soil covering. In addition, commercial concrete is adopted during the construction period of the Project, and no large-scale concrete mixing is carried out on site.

(3) Acoustic environmental protection measures

The Project sponsor shall strictly implement the Noise Emission Standard for Construction Field Boundary (GB12523-2011) during the construction process, and take effective noise reduction measures as far as possible to avoid the concentrated use of a large number of power mechanical equipment at the same time. The construction equipment shall be arranged as far away from sensitive points as possible, and the control of construction noise shall be strengthened to minimize the impact of construction on the surrounding environment and sensitive targets. Protection measures against noise during construction;

① During the construction process, the Construction Contractor shall strictly implement the relevant provisions of the Noise Emission Standard for Construction Field Boundary (GB12523-2011) to avoid construction disturbances.

② Reasonable layout of construction site: Arranging a large number of power mechanical equipment at the same location shall be prevented to avoid excessive local sound level.

③ Reasonable arrangement of construction time: The Construction Contractor shall reasonably arrange the construction time to avoid night construction, so as not to affect the rest of nearby residents.

④ Low-noise equipment shall be selected for selection of construction machinery, and enclosed operation sheds shall be set up for high-noise machinery to reduce noise

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diffusion.

⑤ The noise generated by construction machinery is often sudden, irregular, discontinuous and highly intense. The Construction Contractor shall adopt the method of reasonably arranging the operation time of construction machinery to mitigate it, reduce the number of high-noise construction machinery operating at the same time, and minimize the superimposed impact of sound sources.

⑥ For noise sources such as material transportation, knocking and human shouting during the construction period, the Construction Contractor is required to carry out HSE-compliant construction and strengthen effective management to mitigate its impact.

⑦ The Owner is required to indicate the complaint number on the construction site. Once receiving the complaint, the Owner shall contact the local environmental protection department in time to deal with the environmental dispute in time.

⑧ The height of the fencing in the construction area is determined according to the height of the surrounding sensitive targets.

After the above measures are taken, the construction noise of the Project will have little impact on the surrounding sensitive points.

(4) Prevention measures for solid waste

① Waste parts generated during installation mainly include waste such as residual materials of cables and leftover materials of section steel brackets. Classify, collect, and recycle in a timely manner.

② During the construction, a relatively fixed garbage collection point shall be selected at a reasonable position, and a small amount of domestic garbage shall be collected through the sanitation facilities of nearby villages or cooperative enterprises, and transported and treated by the sanitation department in a unified manner.

## 8.6 Environmental Protection Measures during Operation

(1) Protective measures for water environment

No domestic sewage will be generated during the operation period of the Project; the cleaning water of PV modules can be collected and treated through local rainwater

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ditches.

(2) Acoustic environmental protection measures

When ordering the equipment, put forward the noise limit requirements for the equipment, and set up sound insulation measures for inverters and other equipment to make their noise meet the relevant requirements.

(3) Solid waste protection measures

During the operation period of the Project, no domestic waste will be generated. Waste PV modules will be temporarily stored in the courtyards of farmers and regularly recycled by equipment manufacturers. The components and parts (such as inverters) replaced during the maintenance during the operation period shall be recycled by the maintenance team.

## 9. Environmental and Social Monitoring Plan

### 9.1 Environmental Protection Management Plan

Including environmental management system and environmental supervision system.

(1) Environmental management and supervision during construction

According to the Environmental Protection Law of the People's Republic of China and the Measures for the Administration of Environmental Protection in the Power Industry and relevant regulations, the environmental management and environmental monitoring plan of the Project is formulated, and the measures during the construction period are as follows:

① The Construction Contractor of the Project shall formulate the environmental management and supervision measures to be taken according to the requirements of the Project sponsor;

② The engineering management department of the Project shall assign special personnel for inspection.

(2) Environmental management and supervision during operation

According to the environmental characteristics of the project area, an environmental management department must be set up, equipped with at least 1

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corresponding professional management personnel (part-time). The functions of this department are:

① Formulate and implement various environmental supervision and management plans;

② Regularly check the operation of environmental protection treatment facilities and deal with the problems in time;

③ Coordinate and cooperate with the possible environmental investigation and other activities carried out by the superior competent department of ecological environment;

④ The environmental protection measures and facilities of the Project must be designed, constructed and put into operation simultaneously with the Project.

## 9.2 Environmental Monitoring Plan

In order to establish a file on the impact of the Project on the environment, the impact of project implementation on the surrounding environment shall be monitored or investigated. The monitoring content includes:

(1) Monitoring items: noise.

(2) Monitoring points: representative environmentally sensitive targets in the construction area of Dashiqiao City and Baodi District.

(3) Monitoring time: during completion acceptance and when there are complaints.

## 9.3 Social Monitoring Plan

During the construction and operation of the Project, the social impact of the Project shall be regularly monitored.

(1) Project grievance and feedback monitoring

The grievance channels of the Project mainly include the GRM team (Project Contractor, Construction Contractor and Supervisor), Beijing Xiangju New Energy Technology Co., Ltd. and the Bank. The project grievance team shall regularly report to Beijing Xiangju New Energy Technology Co., Ltd. and the Bank on the grievances from various channels, the handling of grievances, and the follow-up feedback on grievances.

(2) Monitoring of project rental income

The Project shall timely monitor the rental income brought to villagers during the project development and before the overall transfer, and track and monitor the social benefits of the Project. The main indicators to be monitored include: ① the number of farmers who receive benefits from the Project; ② the amount of annual rent per household from the Project; ③ the number of women who directly receive rent benefits from the Project.

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## 10. Analysis of Environmental, Social and Economic Gain and Loss

### 10.1 Analysis of Social, Economic and Environment Effects

As the world energy issues rank first among the top ten hot issues in the world, especially with the development of the world economy, the sharp increase in world population and the continuous improvement of people's living standards, the world energy demand continues to increase, followed by gradual depletion of global fossil energy, the aggravation of environmental pollution and other issues. Therefore, vigorously developing new and renewable energy technologies such as solar energy, wind energy, biomass energy, geothermal energy and ocean energy will become one of the important measures to reduce environmental pollution.

Our government has regarded the development of PV industry as an important aspect in the field of energy, and incorporated it into the basic policy of national energy development. The construction and use of PVPS will reduce the emission of certain greenhouse gases. Solar PV power generation will also not cause air and water pollution problems and waste residue stacking problems. It relieves the environmental pressure to a certain extent.

According to the feasibility study report of the Project, it is estimated that after the completion of Baodi 50MW Distributed PV Project, the annual average energy output will be 68,087,800 kWh, and about 20,800 tons of standard coal can be saved every year. Accordingly, about 55,400 tons of carbon dioxide (CO<sub>2</sub>), about 422.14 tons of sulfur dioxide (SO<sub>2</sub>), and about 142.98 tons of nitrogen oxides (NO<sub>x</sub>) can be reduced every year.

After the completion of Dashiqiao 50MW Distributed PV Project, it is estimated that the average annual energy output will be 65,898,000 kWh, and about 20776.325 tons of standard coal can be saved every year. Accordingly, about 55448.95 tons of carbon dioxide (CO<sub>2</sub>), 422.35 tons of sulfur dioxide (SO<sub>2</sub>) and 143.05 tons of nitrogen oxides (NO<sub>x</sub>) can be reduced every year.

The above data shows that distributed PV projects are helpful to improve the local atmospheric environment and promote energy conservation and emission reduction. In

addition, it can also save water and reduce the pollution of the water environment caused by hydraulic ash removal wastewater and warm drainage. Therefore, PVPS have good energy saving benefits, environmental benefits and social benefits.

## 10.2 Social and environmental protection investment

The static investment of PV power generation system of 50MW Distributed PV Power Generation Project in Baodi District is RMB 197.52 million, the dynamic investment is RMB 200.93 million, the static investment per kilowatt is RMB 3950/kW, and the dynamic investment per kilowatt is RMB 4018/kW. 25% of the Project is self-raised, and the rest is bank loans, with a loan interest rate of 4.6%. The environmental protection investment of the Project is about RMB 320,000, and the specific environmental protection investment estimation of the Project is shown in Table 9.2-1.

The static investment in the PV power generation system of Dashiqiao 50MW Distributed PV Power Generation Project is RMB 195 million, the dynamic investment is RMB 197.841 million, the static investment per kilowatt is RMB 3,900/kW, and the dynamic investment per kilowatt is RMB 3,956.8/kW. The source of funds is 25% self-raised and 75% loans. The environmental protection investment of the Project is about RMB 320,000, and the specific environmental protection investment estimation of the Project is shown in Table 9.2-2.

### List of Environmental Protection Investment Estimation for 50MW Distributed PV Power Generation Project in Baodi District

Table 9.2-1

S/N	Stage	Environmental protection investment item	Amount of investment (RMB 10,000)	Remarks
1	Construction period	Ambient air treatment	8	Set up fences, cover materials, clean the site, sprinkle water on the construction site to reduce dust, etc.
2		Water environment management	2	Including car washing tank and sedimentation tank
3		Control of noise	5	Measures such as setting up work sheds for high-noise machinery, strictly prohibiting

				high-noise equipment from operating during work and rest hours, and strengthening the management of transportation vehicles; sound insulation and noise reduction measures and equipment
4		Solid waste treatment	2	Temporary storage, removal and disposal of domestic waste
5		Ecological management	10	Greening of construction site
6	Operation period	Water environment management	0	Mainly cleaning wastewater during the operation period
7		Control of noise	3	Sound absorbers.
		Solid waste management	2	Recovery of PV modules and damaged components
Total (RMB 10,000)				32

List of Environmental Protection Investment Estimation for 50MW Distributed PV Power Generation Project in Dashiqiao City

Table 9.2-2

S/N	Stage	Environmental protection investment item	Amount of investment (RMB 10,000)	Remarks
1	Construction period	Ambient air treatment	8	Set up fences, cover materials, clean the site, sprinkle water on the construction site to reduce dust, etc.
2		Water environment management	2	Including car washing tank and sedimentation tank
3		Control of noise	5	Measures such as setting up work sheds for high-noise machinery, strictly prohibiting high-noise equipment from operating during work and rest hours, and strengthening the management of transportation vehicles; sound insulation and noise reduction measures and equipment
4		Solid waste treatment	2	Temporary storage, removal and disposal of domestic waste

5		Ecological management	10	Greening of construction site
6	Operation period	Water environment management	0	Mainly cleaning wastewater during the operation period
7		Control of noise	3	Sound absorbers.
8		Solid waste management	2	Recovery of PV modules and damaged components
Total (RMB 10,000)			32	

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## 11. Conclusions and Suggestions

### 11.1 Comprehensive Conclusions

#### (1) Main social impacts

The Baodi 50MW Distributed PV Project has been registered with the Administrative Examination and Approval Bureau of Baodi District, Tianjin for fixed-asset investment projects of domestic enterprises (see Annex 1), and the project code is 2112-120115-89-03-984322. The Dashiqiao 50MW Distributed PV Project has been registered with the Administrative Examination and Approval Bureau of Dashiqiao for fixed-asset investment projects of domestic enterprises (see Annex 2), and the construction of the Project is legal.

The Project is an encouraged project in the Guidance Catalogue for Industrial Structure Adjustment (2019 edition), which conforms to the national industrial policy.

All procedures in the early stage of the Project shall be handled in accordance with the requirements of relevant laws and regulations, and relevant units shall review and approve them according to the scope of authority stipulated by laws and regulations, and there shall be no contents and procedures that do not meet the requirements of laws and regulations.

A total of group questionnaires filled out by 11 towns and subdistricts and 151 individual questionnaires filled out by villagers in 17 towns and subdistricts were collected in Dashiqiao City. A total of group questionnaires filled out by 10 towns and subdistricts and 302 individual questionnaires filled out by villagers in 10 towns and subdistricts were collected in Baodi District. Among the questionnaires, the main concerns of the public include lease compensation, HSE-compliant construction and environmental protection. Finally, the public involved in the Project basically support the construction of the Project.

#### (2) Main environmental impact

##### ① Impact on ambient air

During the construction period of the Project, there are few factors affecting the atmospheric environment and the construction quantity is small. After effective

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prevention and control measures are taken, there will be no great impact on the surrounding environment and residents.

During the operation period, the Project generates clean energy, which can save the use of standard coal and reduce the emission of polluting gases such as carbon dioxide.

② Impact on the water environment

Since there is basically no production wastewater generated during the construction of distributed PV projects, only a small amount of construction vehicle washing wastewater is generated. After sedimentation, it can continue to be reused for construction water or sprayed to suppress dust, and it will not have a great impact on the surface water body.

During the operation of the Project, the water quality of PV panel cleaning water is basically the same as that of rainwater, and the main characteristic pollutant is SS, which enters the rainwater ditch through the local rainwater collection and drainage system and will not affect the water environment in the area.

③ Impact on acoustic environment

As the Project is installed and implemented on the roof or in the courtyard of each farmhouse, certain noise impacts may be generated during the construction process. However, the area of PV panels installed by each farmer is small, the construction time is short, and the impact on the farmer will disappear after the construction is completed.

The noise during the operating period of the Project mainly comes from the noise generated during the operation of the inverter. According to the feasibility study report of the Project, it is planned to use string inverters in the Project. This type of inverter has a fanless design and does not require a civil engineering room. It can achieve a low ambient noise of 33dB, and there is basically no noise impact.

④ Impact of solid wastes

During the construction period, the solid waste mainly includes a small number of waste parts generated from the installation of PV modules, mainly including residual materials of cables and leftover materials of section steel brackets, which shall be recycled and processed in a timely manner so that they will not be scattered in the

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construction site and will not have an impact on the environment.

During the operation of the Project, the waste accessories that may be generated due to damage or replacement after the service life expires will be uniformly recycled by the maintenance team, and no solid waste will be generated.

⑤ Impact on ecological environment

The project construction area does not involve environmentally sensitive areas and wild animals and plants requiring key protection. During the construction process of the Project, the comprehensive protection measures combining engineering measures, vegetation measures, temporary measures and management measures will have little impact on the ecological environment in the Project area.

(3) Stakeholder engagement and information disclosure

The stakeholders of the Project mainly include governments at all levels and relevant institutions in the project area, project implementation institutions and construction units, various groups served by the Project, households providing roof rental for the Project and groups affected by construction. The Project has basically won the approval of all stakeholders, which is conducive to the smooth development of the Project. The publicity of ESIA information of the Project shall be posted on site. As of June 22 (two weeks after the publicity was posted), the Project sponsor and the assessment unit have not received the opinions and demands of the affected people on the Project.

(4) Establishment and management of GRM

Beijing Xiangju New Energy Technology Co., Ltd. will take the lead to establish a GRM team at the level of the project company, including the Project Contractor, Construction Contractor and Supervisor. Clarify the main body and division of responsibility and cooperation department for grievance handling of the Project, and implement the responsibility for grievance handling to individuals. In the process of work promotion, the communication and coordination mechanism between government departments at all levels and village committees and villagers shall be established.

(5) Environmental and social management measures

Based on the overall risks, policy planning approval, project management, information disclosure, public opinion management, work safety and other factors, and

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considering the decision-making, preparation, implementation and operation stages of the Project, measures such as protecting the rights and interests of farmers, protecting the health of the population, HSE-compliant construction management, information disclosure and communication are taken to ensure that the construction and operation of the Project minimize adverse impacts on society and promote social harmony and stability.

The production wastewater during the construction period of the Project will be reused for construction water or sprayed for dust suppression after sedimentation. The domestic wastewater in the construction area will be solved by relying on the original wastewater treatment system of the village; protect ambient air quality through construction management methods such as construction fences; protect the quality of acoustic environment through reasonable arrangement of construction time and other construction management methods; construction wastes shall be collected and recycled in a timely manner, and domestic wastes shall be disposed by village sanitation facilities.

#### (6) Overall conclusions

On the premise of taking various environmental protection measures and social risk precautionary approach, the construction of the Project has little impact on the environment and society. The Project is a distributed PV project. The construction of the Project is conducive to promoting the development of new energy industry, rationally utilizing local abundant solar resources, promoting energy conservation and emission reduction and improving the ecological environment, and providing additional income for local farmers, improving the living standard of farmers and building a harmonious society.

Therefore, under the conditions of comprehensively strengthening supervision and management and strictly implementing environmental protection measures and social risk precautionary approaches, the construction of the Project is feasible and beneficial.

## 11.2 Recommendations

(1) Improve, perfect, implement and maintain the safety control measures and facilities for the risk sources of the Project in the subsequent construction and operation

process in strict accordance with national, industrial and local laws and regulations and relevant standards and specifications;

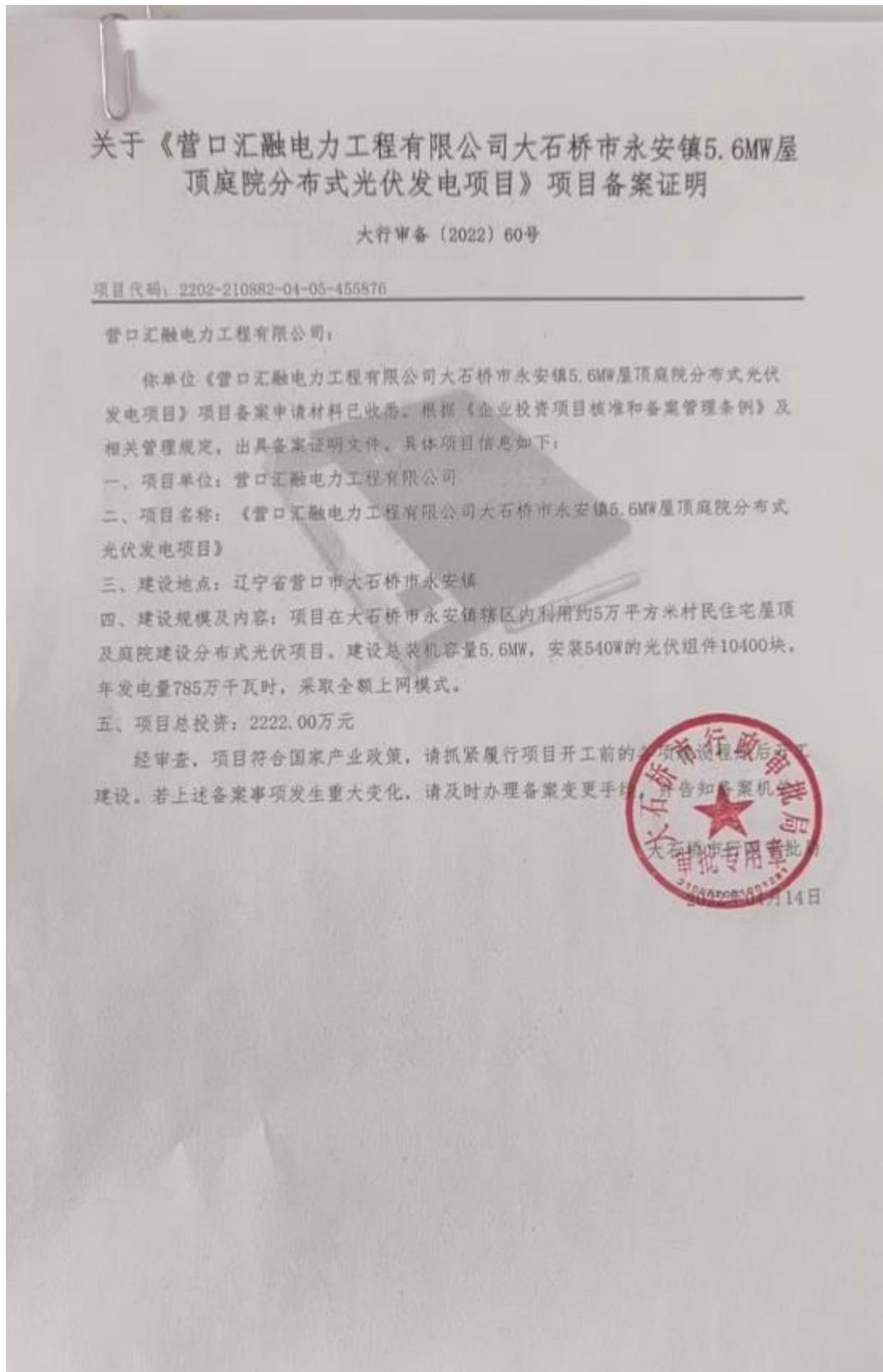
(2) After the completion of the Project, it is necessary to strengthen management, take scientific and effective measures, formulate emergency plans for accident prevention, strengthen safety education, improve the safety awareness of operators, strictly implement operating procedures, and prevent environmental risk accidents.

## Annex 1: Registration Form for Fixed Assets Investment Projects of Domestic-funded Enterprises in Tianjin

### 天津市内资企业固定资产投资备案登记表

单位名称	天津安居鑫益新能源科技有限公司			
项目名称	新建50MW屋顶分布式光伏发电项目			
项目代码	Z1122120115-89-03-984322			
建设地址	天津市宝坻区海滨、宝平、钰华、潮阳、朝霞、周良、大白、口东街道；大口屯镇、王卜庄镇、方家庄镇、林辛口镇、八门城镇、大钟庄镇、新安镇、源各庄镇、新开口镇、大唐庄镇、牛道口镇、史各庄镇、郝各庄镇牛家营镇尔王庄镇黄庄镇			
行业类别 (小类)	电力、热力、燃气及水生产和供应业	行业代码 (小类)	0_4416	建设性质 新建
产业目录				
主要建设内容及建设规模	新建50MW屋顶分布式光伏发电项目购置相关设备一台(套)			
总投资(万元)	20000	总投资按资金来源分列(万元)	资本金	4000
			国内银行贷款	16000
			其他资金	0
房屋建筑面积(平方米)			项目占地面积	
拟开工时间	2022年01月		拟竣工时间	2022年12月

## Annex 2: Filing Certificate of Roof and Courtyard Distributed PV Power Generation Project of Yingkou Huirong Power Engineering Co., Ltd.



# 关于《营口汇融电力工程有限公司大石桥市汤池镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)54号

项目代码: 2202-210882-04-05-532982

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市汤池镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件,具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市汤池镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市汤池镇
- 四、建设规模及内容: 项目在大石桥市汤池镇辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查,项目符合国家产业政策,请抓紧履行项目开工前的各项手续,尽快开工建设。若上述备案事项发生重大变化,请及时办理备案变更手续,并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市水源镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)56号

项目代码: 2202-210882-04-05-721691

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市水源镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市水源镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市水源镇
- 四、建设规模及内容: 项目在大石桥市水源镇辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查,项目符合国家产业政策,请抓紧履行项目开工前的各项建设程序后开工建设。若上述备案事项发生重大变化,请及时办理备案变更手续,并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市石佛镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)59号

项目代码: 2202-210852-04-05-555886

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市石佛镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市石佛镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市石佛镇
- 四、建设规模及内容: 项目在大石桥市石佛镇辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项建设程序开工建设。若上述备案事项发生重大变化, 请及时办理备案变更手续。



# 关于《营口汇融电力工程有限公司大石桥市旗口镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)62号

项目代码: 2202-210882-04-05-408449

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市旗口镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市旗口镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市旗口镇
- 四、建设规模及内容: 项目在大石桥市旗口镇辖区内利用约5万平方米房屋顶及庭院位置建设分布式光伏项目。以能源合作管理模式,建设总装机容量5.6MW,安装540W的光伏组件10400块,年发电量785万千瓦时,采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查,项目符合国家产业政策,请抓紧履行项目开工前的各项建设程序开工建设。若上述备案事项发生重大变化,请及时办理备案变更手续,并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市镁都街道5.6MW 屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)65号

项目代码: 2202-210882-04-05-188068

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市镁都街道5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市镁都街道5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市镁都街道
- 四、建设规模及内容: 项目在大石桥市镁都街道辖区内利用约5万平方米房屋顶及庭院位置建设分布式光伏项目。以能源合作管理模式,建设总装机容量5.6MW,安装540W的光伏组件10400块,年发电量785万千瓦时,采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查,项目符合国家产业政策,请抓紧履行项目开工前的各项手续,开工建设。若上述备案事项发生重大变化,请及时办理备案变更手续,并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市金桥街道5.6MW 屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)53号

项目代码: 2202-210882-04-05-850657

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市金桥街道5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市金桥街道5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市金桥街道
- 四、建设规模及内容: 项目在大石桥市金桥街道辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项建设程序, 开工建设。若上述备案事项发生重大变化, 请及时办理备案变更手续, 并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市建一镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备〔2022〕63号

项目代码：2202-210882-04-05-515153

营口汇融电力工程有限公司：

你单位《营口汇融电力工程有限公司大石桥市建一镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定，出具备案证明文件。具体项目信息如下：

- 一、项目单位：营口汇融电力工程有限公司
- 二、项目名称：《营口汇融电力工程有限公司大石桥市建一镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点：辽宁省营口市大石桥市建一镇
- 四、建设规模及内容：项目在大石桥市建一镇辖区内利用约5万平方米房屋顶及庭院位置建设分布式光伏项目。以能源合作管理模式，建设总装机容量5.6MW，安装540W的光伏组件10400块，年发电量785万千瓦时，采取全额上网模式。
- 五、项目总投资：2222.00万元

经审查，项目符合国家产业政策，请抓紧履行项目开工前手续，开工建设。若上述备案事项发生重大变化，请及时办理备案变更手续，并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市黄土岭镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)64号

项目代码: 2202-210882-04-05-147045

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市黄土岭镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

一、项目单位: 营口汇融电力工程有限公司

二、项目名称: 《营口汇融电力工程有限公司大石桥市黄土岭镇5.6MW屋顶庭院分布式光伏发电项目》

三、建设地点: 辽宁省营口市大石桥市黄土岭镇

四、建设规模及内容: 项目在大石桥市黄土岭镇辖区内利用约5万平方米房屋顶及庭院位置建设分布式光伏项目。以能源合作管理模式,建设总装机容量5.6MW,安装540W的光伏组件10400块,年发电量785万千瓦时,采取全额上网模式。

五、项目总投资: 2222.00万元

经审查,项目符合国家产业政策,请抓紧履行项目开工前的各项建设。若上述备案事项发生重大变化,请及时办理备案变更手续。



# 关于《营口汇融电力工程有限公司大石桥市虎庄镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)26号

项目代码: 2201-210882-04-05-265005

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市虎庄镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市虎庄镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市虎庄镇
- 四、建设规模及内容: 项目在大石桥市虎庄镇辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。该项目应在符合相关用地政策的基础上, 方可实施。
- 五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项手续, 并告知备案机关。建设。若上述备案事项发生重大变化, 请及时办理备案变更手续。



# 关于《营口汇融电力工程有限公司大石桥市沟沿镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)58号

项目代码: 2202-210882-04-05-555992

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市沟沿镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

一、项目单位: 营口汇融电力工程有限公司

二、项目名称: 《营口汇融电力工程有限公司大石桥市沟沿镇5.6MW屋顶庭院分布式光伏发电项目》

三、建设地点: 辽宁省营口市大石桥市沟沿镇

四、建设规模及内容: 项目在大石桥市沟沿镇辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。

五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项建设程序, 开工建设。若上述备案事项发生重大变化, 请及时办理备案变更手续, 并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市高坎镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)57号

项目代码: 2202-210882-04-05-682295

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市高坎镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市高坎镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市高坎镇
- 四、建设规模及内容: 项目在大石桥市高坎镇辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项建设程序, 开工建设。若上述备案事项发生重大变化, 请及时办理备案变更手续, 并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市钢都街道5.6MW 屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)52号

项目代码: 2202-210882-04-05-129121

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市钢都街道5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

一、项目单位: 营口汇融电力工程有限公司

二、项目名称: 《营口汇融电力工程有限公司大石桥市钢都街道5.6MW屋顶庭院分布式光伏发电项目》

三、建设地点: 辽宁省营口市大石桥市钢都街道

四、建设规模及内容: 项目在大石桥市钢都街道辖区内利用约5万平方米居民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。

五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项建设条件, 开工建设。若上述备案事项发生重大变化, 请及时办理备案变更手续, 并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市博洛铺镇5.6MW 屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)61号

项目代码: 2202-210882-04-05-387249

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市博洛铺镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市博洛铺镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市博洛铺镇
- 四、建设规模及内容: 项目在大石桥市博洛铺镇辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项建设程序开工建设。若上述备案事项发生重大变化, 请及时办理备案变更手续。



# 关于《营口汇融电力工程有限公司大石桥市官屯镇5.6MW屋顶庭院闲置荒地分布式光伏发电项目》项目备案证明

大行审备(2022)06号

项目代码: 2202-210882-04-05-330454

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市官屯镇5.6MW屋顶庭院闲置荒地分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市官屯镇5.6MW屋顶庭院闲置荒地分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市官屯镇
- 四、建设规模及内容: 项目在大石桥市官屯镇辖区内利用约5万平方米村民住宅屋顶庭院及闲置荒地建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项建设手续。若上述备案事项发生重大变化, 请及时办理备案变更手续, 并告知备案机关。



# 关于《营口汇融电力工程有限公司大石桥市百寨街道5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备〔2022〕67号

项目代码：2202-210882-04-05-156058

营口汇融电力工程有限公司：

你单位《营口汇融电力工程有限公司大石桥市百寨街道5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定，出具备案证明文件。具体项目信息如下：

- 一、项目单位：营口汇融电力工程有限公司
- 二、项目名称：《营口汇融电力工程有限公司大石桥市百寨街道5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点：辽宁省营口市大石桥市百寨街道
- 四、建设规模及内容：项目在大石桥市百寨街道辖区内利用约5万平方米房屋顶及庭院位置建设分布式光伏项目。以能源合作管理模式，建设总装机容量5.6MW，安装540W的光伏组件10400块，年发电量785万千瓦时，采取全额上网模式。
- 五、项目总投资：2222.00万元

经审查，项目符合国家产业政策，请抓紧履行项目开工前的各项建设程序开工建设。若上述备案事项发生重大变化，请及时办理备案变更手续。告知备案机关



# 关于《营口汇融电力工程有限公司大石桥市周家镇5.6MW屋顶庭院分布式光伏发电项目》项目备案证明

大行审备(2022)55号

项目代码: 2202-210882-04-05-321378

营口汇融电力工程有限公司:

你单位《营口汇融电力工程有限公司大石桥市周家镇5.6MW屋顶庭院分布式光伏发电项目》项目备案申请材料已收悉。根据《企业投资项目核准和备案管理条例》及相关管理规定,出具备案证明文件。具体项目信息如下:

- 一、项目单位: 营口汇融电力工程有限公司
- 二、项目名称: 《营口汇融电力工程有限公司大石桥市周家镇5.6MW屋顶庭院分布式光伏发电项目》
- 三、建设地点: 辽宁省营口市大石桥市周家镇
- 四、建设规模及内容: 项目在大石桥市周家镇辖区内利用约5万平方米村民住宅屋顶及庭院建设分布式光伏项目。建设总装机容量5.6MW, 安装540W的光伏组件10400块, 年发电量785万千瓦时, 采取全额上网模式。
- 五、项目总投资: 2222.00万元

经审查, 项目符合国家产业政策, 请抓紧履行项目开工前的各项建设程序开工建设。若上述备案事项发生重大变化, 请及时办理备案变更手续, 并告知备案机关。



## Annex 3: ESIA Information Publicity of Dashiqiao and Baodi Distributed PV Projects

### 屋顶项目环境社会影响评估信息公示

北京多源新能源科技有限公司拟在天津市大石岭100MW分布式光伏发电项目，项目环境社会影响评估与项目社会影响评估由北京多源新能源科技有限公司委托设计研究院有限公司进行。根据国家发改委等部门《关于印发分布式光伏发电项目管理暂行办法》、《中华人民共和国环境保护法》、《中华人民共和国环境影响评价法》、《国家发展和改革委员会关于印发分布式发电市场化竞价项目社会影响评估暂行办法的通知》及国家能源局2013年《分布式光伏发电项目管理暂行办法》有关规定，为开展本工程社会影响评估工作，现将本项目基本情况、项目建设的意义、项目主要建设内容、可能产生的环境影响的主要方面、征求公众意见的主要方面及征求公众意见的方式等相关内容公示如下。

#### 一、 建设项目基本情况

**工程名称：**天津市大石岭市100MW分布式光伏发电项目

**项目性质：**开发

**工程建设规模：**本次建设的大石岭市100MW分布式光伏发电项目为户用光伏发电，采用“全额上网”的并网方式，每户安装340Wp单晶硅太阳能电池组件30-60块，实际安装容量及装机容量的实际可安装面积确定，容量为10-300kW，根据实际安装容量配置光伏逆变器；户用逆变器接入用户低压配电箱，根据总装机容量、配电箱容量、系统效率及光伏组件规格确定逆变器，计算出的逆变器总装机容量4899.8万千瓦，年利用小时1320h，35年总发电量为144743.88万千瓦时。

(1) 户用工程：根据现有房屋面的结构分布，本工程采用340Wp单晶组件，本项目根据所铺设光伏的各类型光伏组件布置组件，以户为单位安装1套10-50kW单晶光伏逆变器，总装机容量为2000W-约2000户。

(2) 户用工程：项目光伏组件安装在原有建筑物的屋面或阳台上，其安装形式为户用的设计，适合安装光伏组件。

#### 二、 项目建设的意义

本工程所在区域太阳能资源丰富，气候交通便利，并依托华北，是建设光伏发电基地的理想地址。同时本工程的开发符合国家发展的能源结构调整战略部署，有利于缓解能源供应压力，加快北方经济转型发展发挥积极作用。

#### 三、 项目实施涉及的团体

工程建设主要涉及的团体为天津市大石岭市有关部门。

#### 四、 环境社会影响评估主要内容

为切实从源头上预防、减轻和消除工程建设可能对自然环境造成的影响，按照《环境影响评价法》有关规定，北京多源新能源科技有限公司组织实施了本工程环境社会影响评估。

#### 五、 征求公众意见的主要内容

主要内容包括工程环评公示内容，特别是与本工程有直接利益关系的群众和有关部门实施该工程的意见，项目可能存在的风险因素，对区域环境造成的不良影响等。

#### 六、 征求公众意见的主要方式

社会和企业通过网络公告以及书面调查、电子邮件、电话、传真等方式向有关单位和公众征求意见和反馈意见的方式如下：

**建设单位：**北京多源新能源科技有限公司

**联系地址：**北京市顺义区北大街113号南二层214室

**联系人：**李凯

**电话：**010-8828261

**电子邮件：**3543755@qq.com

**设计单位：**中国电建集团华东院设计研究院有限公司

**联系地址：**浙江省杭州市余杭区高教路101号；号楼

**联系人：**余工

**电话：**0571-26622000

**电子邮件：**gry@chinaec.com

#### 七、 征求公众意见起止时间

自公示之日起10个工作日内。

北京多源新能源科技有限公司

2022年6月8日



## Annex 4: Scanning Copy of Questionnaire for Dashiqiao and Baodi Distributed PV Projects (Partial)

天津市宝坻区 50MW 分布式光伏发电项目  
环境社会影响评估公众意见调查表 (团体)

单位名称	曹庄镇四村村委会	单位性质	
单位地址	四村村委会	联系方式	18322012586
填表人	孙书记	职务	支部书记
与本工程的位置关系	<input checked="" type="checkbox"/> 工程影响区内	<input type="checkbox"/> 工程影响区外	<input type="checkbox"/> 搬迁单位团体 <input type="checkbox"/> 其他单位团体
<p>本次拟建的宝坻区50MW分布式光伏发电项目为户用光伏电站,采用“全额上网”的并网方式,每户安装540Wp单晶硅太阳能电池组件28块,实际安装容量为14.98kWp,安装10kW光伏逆变器1台。逆变器出线接入居民低压配电箱。共计安装50MW。根据总装机容量、倾斜面辐照量、系统效率以及光伏组件标称效率衰减等,计算出光伏电站年均发电量为6808.78万千瓦时,年均利用小时1361.68h,25年总发电量为170219.50万千瓦时。</p> <p>根据国家相关法律法规,在验收调查过程中应充分考虑公众意见,因此特向贵单位发放本调查表,征求工程建设期间对周边环境带来的影响,谢谢贵单位的合作!</p>			
一、问卷选择 (在口内打√)			
1、您和本工程的位置关系:			
<input checked="" type="checkbox"/> 可能涉及房屋被长期租赁 <input type="checkbox"/> 可能涉及房屋被临时租赁 <input type="checkbox"/> 不涉及租赁房屋 居住地距离本工程: <input checked="" type="checkbox"/> 100m 范围内 <input type="checkbox"/> 100~500m 范围内 <input type="checkbox"/> 500m 范围外			
2、您认为本工程建设可能给贵单位带来:			
<input checked="" type="checkbox"/> 有利影响 <input type="checkbox"/> 不利影响 <input type="checkbox"/> 无影响 <input type="checkbox"/> 有不利影响但可接受			
3、若工程建设租赁贵单位土地,贵单位希望的租赁补偿方式是:			
<input checked="" type="checkbox"/> 租金补偿 <input type="checkbox"/> 其它_____			
4、工程施工阶段,贵单位最关注的问题是 (可多选):			
<input type="checkbox"/> 租赁补偿 <input type="checkbox"/> 交通影响 <input checked="" type="checkbox"/> 文明施工 <input type="checkbox"/> 生态破坏 <input type="checkbox"/> 环境影响 <input type="checkbox"/> 社会治安 <input type="checkbox"/> 其它_____			
5、工程运行阶段,贵单位最关注的问题是:			
<input checked="" type="checkbox"/> 工程安全运行 <input checked="" type="checkbox"/> 居民身体健康 <input type="checkbox"/> 环境影响 <input type="checkbox"/> 社会治安 <input type="checkbox"/> 其它_____			
6、贵单位认为可能工程可能受到公众关注或引起的社会风险因素有哪些 (可多选):			
<input checked="" type="checkbox"/> 民众不会反对 <input type="checkbox"/> 社会治安环境变差 <input type="checkbox"/> 造成环境污染 <input type="checkbox"/> 造成生态破坏 <input type="checkbox"/> 补偿金不合理 <input type="checkbox"/> 补偿金未及时足额发放 <input type="checkbox"/> 不文明施工 <input type="checkbox"/> 其它_____			
7、您认为本工程需加强哪些有关措施:			
<input checked="" type="checkbox"/> 加强环保和安保措施 <input type="checkbox"/> 制定相关处置预案 <input type="checkbox"/> 与利益相关方加强沟通 <input type="checkbox"/> 加强施工管理			
8、在上述预防措施得到落实后,贵单位对本工程所持态度:			
<input checked="" type="checkbox"/> 支持建设 <input type="checkbox"/> 反对建设 <input type="checkbox"/> 无所谓			
二、贵单位对本工程的其它意见或建议:			

**辽宁大石桥市 50MW 分布式光伏发电项目  
环境社会影响评估公众意见调查表 (团体)**

单位名称	汤池镇政府		单位性质	政府和村
单位地址	汤池镇		联系方式	13840704722
填表人	李天喜		职务	人大副主席
与本工程的位置关系	<input checked="" type="checkbox"/> 工程影响区内	<input type="checkbox"/> 工程影响区外	<input type="checkbox"/> 搬迁单位团体	<input type="checkbox"/> 其他单位团体
<p>本次拟建的大石桥市50MW分布式光伏发电项目为用户光伏电站，采用“全额上网”的并网方式，标准户安装540Wp单晶硅太阳能电池组件36块，实际安装容量为19.44kWp，安装20kW光伏逆变器1台。逆变器出线接入居民低压配电箱。共计安装50MW。根据总装机容量、倾斜面辐照量、系统效率以及光伏组件标称效率衰减等，计算出光伏电站年均发电量为6589.8万千瓦时，年均利用小时1329h，25年总发电量为164743.88万千瓦时。</p> <p>根据国家相关法律法规，在环社会影响评估调查过程中应充分考虑公众意见，因此特向贵单位发放本调查表，征求工程建设对周边环境带来的影响，谢谢贵单位的合作！</p>				
<b>一、问卷选择 (在□内打√)</b>				
1、贵单位和该工程的位置关系：				
<input checked="" type="checkbox"/> 可能涉及土地被长期租赁 <input type="checkbox"/> 可能涉及土地被临时租赁 <input type="checkbox"/> 不涉及租赁场地 距离本工程： <input checked="" type="checkbox"/> 100m 范围内 <input type="checkbox"/> 100~500m 范围内 <input type="checkbox"/> 500m 范围外				
2、您认为本工程建设可能给贵单位带来：				
<input checked="" type="checkbox"/> 有利影响 <input type="checkbox"/> 不利影响 <input type="checkbox"/> 无影响 <input type="checkbox"/> 有不利影响但可接受				
3、若工程建设租赁贵单位土地，贵单位希望的租赁补偿方式是：				
<input checked="" type="checkbox"/> 租赁补偿 <input type="checkbox"/> 其它_____				
4、工程施工阶段，贵单位最关注的问题是 (可多选)：				
<input checked="" type="checkbox"/> 租赁补偿 <input type="checkbox"/> 交通影响 <input checked="" type="checkbox"/> 文明施工 <input type="checkbox"/> 生态破坏 <input checked="" type="checkbox"/> 环境影响 <input type="checkbox"/> 社会治安 <input type="checkbox"/> 其它_____				
5、工程运行阶段，贵单位最关注的问题是：				
<input checked="" type="checkbox"/> 工程安全运行 <input type="checkbox"/> 居民身体健康 <input checked="" type="checkbox"/> 环境影响 <input type="checkbox"/> 社会治安 <input type="checkbox"/> 其它_____				
6、贵单位认为工程可能受到公众关注或引起的社会风险因素有哪些 (可多选)：				
<input type="checkbox"/> 民众会反对 <input type="checkbox"/> 社会治安环境变差 <input type="checkbox"/> 造成环境污染 <input type="checkbox"/> 造成生态破坏 <input checked="" type="checkbox"/> 补偿金不合理 <input type="checkbox"/> 补偿金未及时足额发放 <input type="checkbox"/> 不文明施工 <input type="checkbox"/> 其它_____				
7、您认为本工程需加强哪些有关措施：				
<input type="checkbox"/> 加强环保和安保措施 <input type="checkbox"/> 制定相关处置预案 <input checked="" type="checkbox"/> 与利益相关方加强沟通 <input checked="" type="checkbox"/> 加强施工管理				
8、在上述预防措施得到落实后，贵单位对本工程所持态度：				
<input checked="" type="checkbox"/> 支持建设 <input type="checkbox"/> 反对建设 <input type="checkbox"/> 无所谓				
<b>二、贵单位对本工程的其它意见或建议：</b>				

**天津市宝坻区 50MW 分布式光伏发电项目  
环境保护验收公众意见调查表 (个人)**

姓名	李士志	性别	男	年龄	54	民族	汉
文化程度	中专	职业	农民				
身份证号	120224196806182816	联系方式	13821459077				
家庭地址:	宝坻市(区、县)中仓镇(乡、街道)曹各庄村(社区)曹各庄自然村(组)						
<p>本次拟建的宝坻区50MW分布式光伏发电项目为户用光伏电站,采用“全额上网”的并网方式。每户安装540Wp单晶硅太阳能电池组件28块,实际安装容量为14.95kWp,安装10kW光伏逆变器1台。逆变器出线接入居民低压配电箱,共计安装50MW。根据总装机容量、倾斜面辐照量、系统效率以及光伏组件标称效率衰减等,计算出光伏电站年均发电量为6808.78万千瓦时,年均利用小时1361.68h,25年总发电量为170219.50万千瓦时。</p> <p>根据国家相关法律法规,在验收调查过程中应充分考虑公众意见,因此特向贵单位发放本调查表,征求工程建设期间对周边环境带来的影响,谢谢贵单位的合作!</p>							
<b>一、问卷选择 (在□内打√)</b>							
1、您和本工程的位置关系:							
<input type="checkbox"/> 可能涉及土地被长期租赁 <input type="checkbox"/> 可能涉及土地被临时租赁 <input type="checkbox"/> 不涉及租赁场地 居住地距离本工程: <input checked="" type="checkbox"/> 100m 范围内 <input type="checkbox"/> 100~500m 范围内 <input type="checkbox"/> 500m 范围外							
2、您认为本工程建设可能给您家庭带来:							
<input checked="" type="checkbox"/> 有利影响 <input type="checkbox"/> 不利影响 <input type="checkbox"/> 无影响 <input type="checkbox"/> 有不利影响但可接受							
3、若工程建设租赁您家宅基地等,您希望的补偿方式是:							
<input checked="" type="checkbox"/> 租赁补偿 <input type="checkbox"/> 其它							
4、关于本工程建设,您最关注的问题是(可多选):							
<input checked="" type="checkbox"/> 租赁补偿 <input type="checkbox"/> 环境保护 <input type="checkbox"/> 居民身体健康 <input checked="" type="checkbox"/> 工程安全运行 <input type="checkbox"/> 文明施工 <input type="checkbox"/> 社会治安 <input type="checkbox"/> 其它							
5、项目建设会引起群众的关注,您认为可能的原因有哪些(可多选):							
<input type="checkbox"/> 民众不会反对 <input type="checkbox"/> 造成环境污染 <input type="checkbox"/> 不文明施工 <input type="checkbox"/> 影响居民生活 <input checked="" type="checkbox"/> 不合理赔偿 <input type="checkbox"/> 扰乱社会治安 <input type="checkbox"/> 其它							
6、您认为建设单位应该如何预防可能出现的社会风险问题(可多选):							
<input checked="" type="checkbox"/> 加强环境保护和安全措施 <input type="checkbox"/> 制定相关处置预案 <input checked="" type="checkbox"/> 与利益相关方加强沟通 <input type="checkbox"/> 按国家及地方政策合理进行征地补偿 <input type="checkbox"/> 加强施工管理 <input type="checkbox"/> 其它							
7、在上述预防措施得到落实后,您对本工程所持态度:							
<input checked="" type="checkbox"/> 支持建设 <input type="checkbox"/> 反对建设 <input type="checkbox"/> 无所谓							
<b>二、您对本工程的其他建议:</b>							

**辽宁大石桥市 50MW 分布式光伏发电项目  
环境社会影响评估公众意见调查表 (个人)**

姓名	盛天龙	性别	男	年龄	31	民族	汉
文化程度	初中			职业	工人		
身份证号	210882199105216111			联系方式	13124171300		
家庭地址: 大石桥市(区、县) 石寨镇(乡、街道) 西江村(社区) 8号6-11自然村(组)							
<p>本次拟建的大石桥市50MW分布式光伏发电项目为户用光伏电站,采用“全额上网”的并网方式,标准户安装540Wp单晶硅太阳能电池组件36块,实际安装容量为19.44kWp,安装20kW光伏逆变器1台,逆变器出线接入居民低压配电箱,共计安装50MW,根据总装机容量、倾斜面辐照量、系统效率以及光伏组件标称效率衰减等,计算出光伏电站年均发电量为6589.8万千瓦时,年均利用小时1329h,25年总发电量为164743.88万千瓦时。</p> <p>根据国家相关法律法规,在验收调查过程中充分考虑公众意见,因此特向贵单位发放本调查表,征求工程建设期间对周边环境带来的影响,感谢贵单位的合作!</p>							
<b>一、问卷选择 (在□内打√)</b>							
1、您和本工程的位置关系:							
<input checked="" type="checkbox"/> 可能涉及土地被长期租赁 <input type="checkbox"/> 可能涉及土地被临时租赁 <input type="checkbox"/> 不涉及租赁场地 居住地距离本工程: <input checked="" type="checkbox"/> 100m 范围内 <input type="checkbox"/> 100~500m 范围内 <input type="checkbox"/> 500m 范围外							
2、您认为本工程建设可能给您家庭带来:							
<input checked="" type="checkbox"/> 有利影响 <input type="checkbox"/> 不利影响 <input type="checkbox"/> 无影响 <input type="checkbox"/> 有不利影响但可接受							
3、若工程建设租赁您家宅基地等,您希望的补偿方式是:							
<input checked="" type="checkbox"/> 租赁补偿 <input type="checkbox"/> 其它							
4、关于本工程建设,您最关注的问题是(可多选):							
<input checked="" type="checkbox"/> 拆迁补偿 <input type="checkbox"/> 环境保护 <input checked="" type="checkbox"/> 居民身体健康 <input checked="" type="checkbox"/> 工程安全运行 <input type="checkbox"/> 文明施工 <input type="checkbox"/> 社会治安 <input type="checkbox"/> 其它							
5、项目建设会引起群众的关注,您认为可能的原因有哪些(可多选):							
<input checked="" type="checkbox"/> 民众不会反对 <input checked="" type="checkbox"/> 造成环境污染 <input checked="" type="checkbox"/> 不文明施工 <input checked="" type="checkbox"/> 影响居民生活 <input type="checkbox"/> 不合理赔偿 <input type="checkbox"/> 扰乱社会治安 <input type="checkbox"/> 其它							
6、您认为建设单位应该如何预防可能出现的社会风险问题(可多选):							
<input checked="" type="checkbox"/> 加强环境保护和安全措施 <input type="checkbox"/> 制定相关处置预案 <input checked="" type="checkbox"/> 与利益相关方加强沟通 <input checked="" type="checkbox"/> 按国家及地方政策合理进行征地补偿 <input type="checkbox"/> 加强施工管理 <input type="checkbox"/> 其它							
7、在上述预防措施得到落实后,您对本工程所持态度:							
<input type="checkbox"/> 支持建设 <input type="checkbox"/> 反对建设 <input checked="" type="checkbox"/> 无所谓							
二、您对本工程的其他建议:							
无							