



**Verified Carbon
Standard**

GROUPED CONNECT SOLAR PV POWER GENERATION PROJECT IN CHINA



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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Grouped Connect Solar PV Power Generation Project in China (hereafter referred to as “the grouped project”) is implemented by China Three Gorges Renewables (Group) Co., Ltd.¹(hereafter refer to as “the project owner”) and aims to generate electricity by using renewable solar PV energy to the grid.

The grouped project consists of solar PV Power Generation plants located in 30 provinces of China. The initial project activity instances under the grouped project are:

- **INSTANCE 01:** Yongchang County Dazhaitan 50MW Grid Connected Solar PV Power Generation Project (in the following also called “the Dazhaitan Project” or instance 01) located in Yongchang County, Jinchang City, Gansu Province of China, The Dazhaitan Project is developed, financed and managed by Three Gorges New Energy Jinchang Wind Power Co., Ltd. and will generate electricity by using renewable solar photovoltaic power. The installed capacity of the power plant is 50.112MWp, employing 172,800 pieces of 290Wp polycrystalline silicon solar cells. The annual utilization hours is estimated to be circa 1,409.85 hours. The electricity generated by the Dazhaitan Project will be connected to inverters first, then will go through a boost transformer and then will be transmitted to Northwest China Power Grid (NWPG). The expected annual net electricity delivered to the grid by the Dazhaitan Project is 70,650.48MWh.
- **INSTANCE 02:** Yongchang County Heqingtian Phase II 50MW Grid Connected Solar PV Power Generation Project (in the following also called “the Heqingtian Project” or instance 02) located in Yongchang County, Jinchang City, Gansu Province of China, The Heqingtian Project is developed, financed and managed by Three Gorges New Energy Jinchang Wind Power Co., Ltd. and will generate electricity by using renewable solar photovoltaic power. The installed capacity of the power plant is 50.9067MWp, employing 92,340 pieces of 300Wp and 78,660 pieces of 295Wp polycrystalline silicon solar cells. The annual utilization hours is estimated to be circa 1,429.91 hours. The electricity generated by the Heqingtian Project will be connected to inverters first, then will go through a boost transformer and then will be transmitted to Northwest China Power Grid (NWPG). The expected annual net electricity delivered to the grid by the Heqingtian Project is 72,791.95MWh.

¹ The change of Project Proponent’s name is due to the change of the English name. China Three Gorges New Energy Corp. and China Three Gorges Renewables (Group) Co., Ltd. are the same company.

- **INSTANCE 03:** Wulan 20MW Grid Connected Solar PV Power Generation Project (in the following also called “the Wulan Project” or instance 03) located in Wulan County, Qinghai Province of China. The Wulan Project is developed, financed and managed by the Wulan Jinfeng New Energy PV Power Co., Ltd. and will generate electricity by using renewable solar photovoltaic power. The installed capacity of the power plant is 20.139MWp, employing 82,200 pieces of 245Wp polycrystalline silicon solar cells. The annual utilization hours is estimated to be circa 1,555.57 hours. The electricity generated by the project will be connected to inverters first, then will go through a boost transformer and then will be transmitted to Northwest China Power Grid (NWPG). The expected annual net electricity delivered to the grid by the Wulan Project is 31,217.73MWh.
- **INSTANCE 04:** Three Gorges New Energy Hetian Pishan Phase II 20MW Grid Connected Solar PV Power Generation Project (in the following also called “the Pishan Project” or instance 04) located in Pishan County, Hetian City and Xinjiang Uygur Autonomous Region of China. The Pishan Project is developed, financed, and managed by the Three Gorges New Energy Pishan Power Generation Co., Ltd. and will generate electricity by using renewable solar photovoltaic power. The installed capacity of the power plant is 20.0MWp, employing 80,000 pieces of 250Wp polycrystalline silicon solar cells. The annual utilization hours are estimated to be circa 1,300 hours. The electricity generated by the Pishan Project will be connected to inverters first, then will go through a boost transformer and then will be transferred to Northwest China Power Grid (NWPG). The expected annual net electricity delivered to the grid by the Pishan Project is 26,003 MWh.
- **INSTANCE 05:** Three Gorges New Energy Hami 20MW Grid Connected PV Power Generation Project (in the following also called “the Hami Project” or instance 05) located in Hami City, Xinjiang Uygur Autonomous Region of China. The Hami Project is developed, financed and managed by the Three Gorges New Energy Hami Wind Power Co., Ltd. and will generate electricity by using renewable solar photovoltaic power. The installed capacity of the power plant is 20.4MWp, employing 81,600 pieces of 250Wp polycrystalline silicon solar cells. The annual utilization hours are estimated to be circa 1,516.45 hours. The electricity generated by the project will be connected to inverters first, then will go through a boost transformer and then will be transmitted to Northwest China Power Grid (NWPG). The expected annual net electricity delivered to the grid by the Hami project is 30,935.57MWh.
- **INSTANCE 06:** Suzhou Zhaoyang Dongdongtan Phase I 50MW Grid Connected Solar PV Power Generation Project (in the following also called “the Zhaoyang Project” or instance 06) located in Jiuquan City, Gansu Province of China. The Zhaoyang Project is developed, financed and managed by Jiuquan Zhaoyang New Energy Power Generation Co., Ltd. and will generate electricity by using renewable solar photovoltaic power. The installed capacity of the power plant is 50MWp, employing 200,000 pieces of 250Wp polycrystalline silicon solar cells. The annual utilization hours is estimated to be 1,504.70

hours. The electricity generated by the Zhaoyang Project will be connected to inverters and booster station first, then will go through a transformer substation and then will be transmitted to Northwest China Power Grid (NWPG). The expected annual net electricity delivered to the grid by the Zhaoyang Project is 75,235MWh.

- INSTANCE 07:** Suzhou Sanyang Dongdongtan Phase II 50MW Grid Connected Solar PV Power Generation Project (in the following also called “the Sanyang Project” or instance 07) located in Jiuquan City, Gansu Province of China. The Sanyang Project is developed, financed and managed by Jiuquan Sanyang New Energy Power Generation Co., Ltd. and will generate electricity by using renewable solar photovoltaic power. The installed capacity of the power plant is 50MWp, employing 200,000 pieces of 250Wp polycrystalline silicon solar cells. The annual utilization hours is estimated to be 1,540.74hours. The electricity generated by the Sanyang project will be connected to inverters and booster station first, then will go through a transformer substation and then will be transmitted to Northwest China Power Grid (NWPG). The expected annual net electricity delivered to the grid by the Sanyang Project is 77,037MWh.

GHG emission reductions will be generated through the implementation of the grouped project. Which aims to generate electricity by using renewable solar PV energy to the grid and replacing equivalent electricity generated by fossil fuel fired power plants connected to the State Grid or China Southern Power Grid. Prior to the grouped project implementation, equivalent amount of annual power output to the grouped project will be generated and supplied by the State Grid or China Southern Power Grid. This is also the baseline scenario of the grouped project.

The estimated annual average GHG emission reduction from the initial seven project activity instances is 302,268 tCO₂e and the total estimate GHG emissions reductions over the first crediting period is 3,026,288 tCO₂e.

- The construction date was different as per the different instance, the table below presents the instance construction time. The grouped project started operation on 23-Jan-2013. All project equipment and facilities as described in the registered VCS PD have been correctly installed and run continuously. Please refer to section 2.1 for details.

Instance ID	Construction date	Commission date
Instance 01 Dazhaitan	25-Aug-2012	06-Mar-2013
Instance 02 Heqingtian	01-Sep-2013	26-Dec-2013
Instance 03 Wulan	04-Nov-2012	23-Jan-2013
Instance 04 Pishan	10-Oct-2013	21-Dec-2013
Instance 05 Hami	10-Oct-2013	26-Dec-2013
Instance 06 Zhaoyang	30-Nov-2012	20-Jul-2013

Instance 07 Sanyang	30-Nov-2012	30-Jun-2013
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- This monitoring period covers the period from 23-Jan-2013 to 31-Dec-2018.
- The project operated in accordance with the registered VCS PD. Total GHG emission reduction achieved in this monitoring period is 1,265,672 tCO₂e.

1.2 Sectoral Scope and Project Type

The Project falls under UNFCCC CDM sectoral scope 01, “Energy Industries (renewable- /non-renewable resources)”.

The project is a grouped project.

1.3 Project Proponent

The Grouping Entity of the grouped project is China Three Gorges Renewables (Group) Co., Ltd. the contact information is:

Organization name	China Three Gorges Renewables (Group) Co., Ltd.
Contact person	Wang Hongye
Title	General Manager Assistant
Address	No. 12, Lane 2, Baiguang Road, Xicheng District, Beijing, China
Telephone	+86-2123019950
Email	3542346576@qq.com

1.4 Other Entities Involved in the Project

Organization name	Climate Bridge (Shanghai) Ltd.
Role in the Project	Consultant
Contact person	Zhiwen Gao
Title	General Manager
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1.5 Project Start Date

The following table showed the commission time of the initial seven project activity instances included in the grouped project, on which the project began generating GHG emission. The grouped project started on 23-Jan-2013, which is the earliest commission date of the initial seven project activity instances.

Instance	Commission time
Yongchang County Dazhaitan 50MW Grid Connected Solar PV Power Generation Project	06-Mar-2013
Yongchang County Heqingtian Phase II 50MW Grid Connected Solar PV Power Generation Project	26-Dec-2013
Wulan 20MW Grid Connected Solar PV Power Generation Project	23-Jan-2013
Three Gorges New Energy Hetian Pishan Phase II 20M Grid Connected Solar PV Power Generation Project	21-Dec-2013
Three Gorges New Energy Hami 20MW Grid Connected PV Power Generation Project	26-Dec-2013
Suzhou Zhaoyang Dongdongtan Phase I 50MW Grid Connected Solar PV Power Generation Project	20-Jul-2013
Suzhou Sanyang Dongdongtan Phase II 50MW Grid Connected Solar PV Power Generation Project	30-Jun-2013

1.6 Project Crediting Period

The first crediting period of the grouped project is 10 years, from 23-Jan-2013 to 22-Jan-2023.

1.7 Project Location

The geographical boundary of the grouped project is that of the 30 provinces in China listed in Table 1-1, as shown in Figure 1-1.

Table 1-1 Geographical distribution of the grids controlled by State Grid or the Southern Power Grid.

Province	Sub-Total
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Liaoning Province, Jilin Province, Heilongjiang Province	3
Beijing Municipality, Tianjin Municipality, Hebei Province, Shanxi Province, Shandong Province, Inner Mongolia Autonomous Region	6
Shanghai Municipality, Jiangsu Province, Zhejiang Province, Anhui Province, Fujian Province	5
Henan Province, Hubei Province, Hunan Province, Jiangxi Province, Sichuan Province, Chongqing Municipality	6
Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region, Xinjiang Uygur Autonomous Region	5
Guangdong Province, Guangxi Zhuang Autonomous Region, Yunnan Province, Guizhou Province, Hainan Province	5

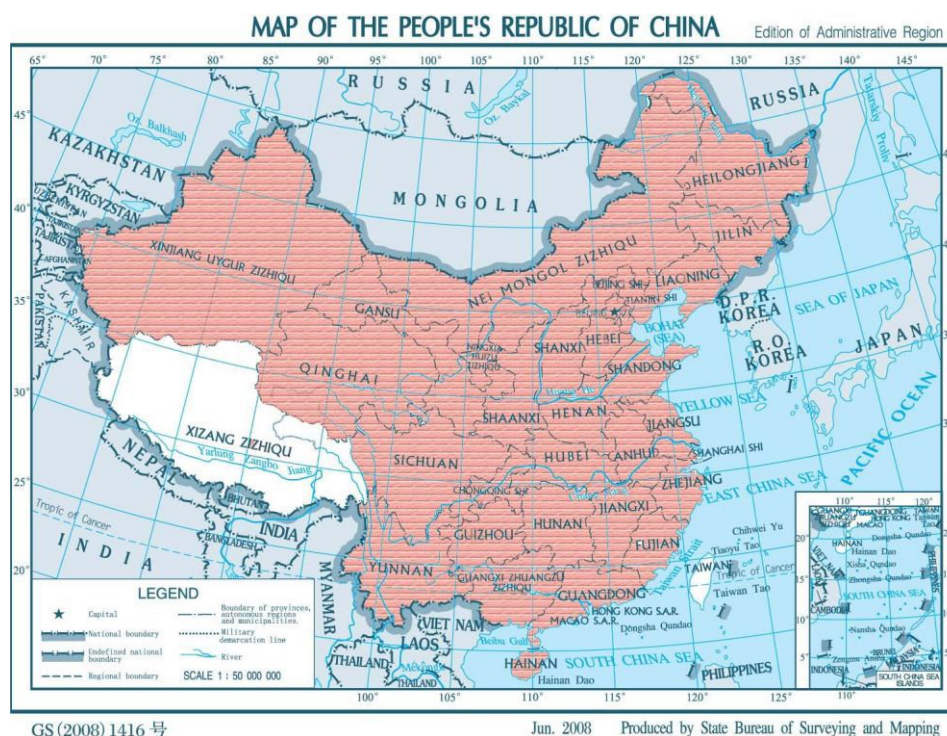


Figure 1-1 Geographical boundary of the grouped project

The Geographical location of the initial seven project activity instances are Gansu province, Qinghai province and Xinjiang Uygur Autonomous Region, as shown in Figure 1-2, The detailed geodetic coordinates are shown in Table 1-2 and Figure 1-3.

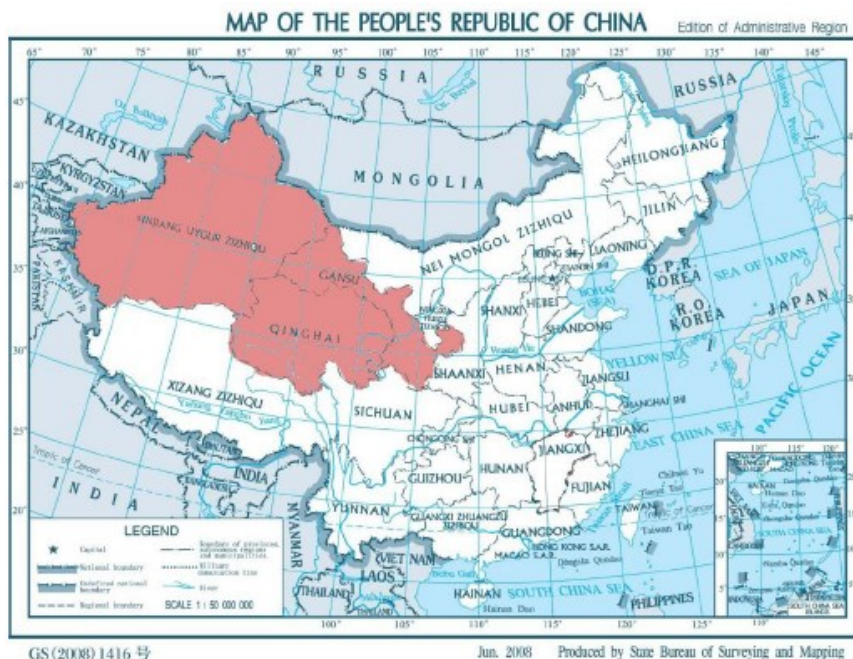


Figure 1-2 Geographical boundary of the initial seven project activity instances

Table 1-2 The Geographical coordinates of the initial seven project activity instances

No.	Geographical coordinates
Instance 01	102°17'49"E, 38°16'29"N
Instance 02	102°16'40"E, 38°16'58"N
Instance 03	98°23'50"E, 37°00'42"N
Instance 04	78°14'51"E, 37°32'21"N
Instance 05	93°37'07"E, 43°02'44"N
Instance 06	98°34'30"E, 39°35'06"N
Instance 07	98°34'20"E, 39°35'27"N



Figure 1-3 The location of the initial seven project activity instances

The grouped project activity is developed in accordance with the approved consolidated CDM baseline and monitoring methodology ACM002 (Version 16.0) “Grid-connected electricity generation from renewable sources”.

The methodology also refers to:

“Tool for the demonstration and assessment of additionality” (Version 7.0.0);

“Tool to calculate the emission factor for an electricity system” (Version 04.0).

More information concerning the above methodology and tools can be referred to:

<http://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83>

The Grouped Project has not been registered or is seeking registration under any other GHG programs.

The initial seven project instances are the CPA of the Grid Connect Solar PV Power Generation Plant Program (PoA 8868) under CDM, with a 7-year renewable crediting period started from 18-Dec-2012. By checking on the CDM website² and the other platforms, none of the GHG emission reduction has been issued during this monitoring period.

Emission Trading Programs and Other Binding Limits

China has a national emissions trading scheme only cover the high-emission industries, such as thermal power generation, petrochemical, chemical, building materials, iron and steel, non-ferrous, paper, aviation and other key emission industries that emitted at least 26,000

² https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/J7XM6V4NEI30WBO1GRYPT9HDKUA2ZL/view

tons of CO₂e/year, not including renewable project³. And the project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner according to the enforced company list⁴ in public information. Hence, it is confirmed that the emission reductions will not be double counted.

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

Other Forms of Environmental Credit

The project hasn't sought or received another form of environmental credits during this monitoring period.

1.11 Sustainable Development

The project promotes local sustainable development through the following aspects:

- Goal 1: No Poverty: The project will bring significant income to the local village by selling the emission reduction credit.
- Goal 7: Affordable and Clean Energy: The project activity will displace the power generation of fossil fuel power plants, reducing CO₂, SO_x and NO_x emissions significantly, thus mitigating the air pollution and its adverse.
- Goal 9: Industry, Innovation and Infrastructure: Promote application and diffusion of the innovative/creative solar PV technology in China through the demonstrative practice of the project activity.

2 SAFEGUARDS

2.1 No Net Harm

In this monitoring period, no negative environmental impact and social economic impact are expected to result from the project activity. In fact, the project as a clean renewable energy project aims at reducing greenhouse gas emissions and mitigating environmental pollution caused by fossil fuels consumption. Meanwhile, the implementation of the project will also facilitate local socio-economic development by creating more job opportunities and paying taxes.

³ Notice on strengthening the reporting and management of enterprise greenhouse gas emissions, by Ministry of Ecology and Environment of the People's Republic of China, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk05/202103/t20210330_826728.html

⁴ The more detail please refer to: <http://mee.gov.cn/xxgk2018/xxgk/xxgk03/202012/W020201230736907682380.pdf>

2.2 Local Stakeholder Consultation

Local Stakeholder Consultation during the project preparation stage:

The project owner designed a questionnaire to collect the comments of relevant stakeholders in October 2013. The one-page questionnaire was designed with the following sections:

- 1) Brief introduction of the project
- 2) Basic information of respondent
- 3) Major question issues
 - Whether the project will cause water pollution?
 - Whether the project will cause air pollution?
 - Whether the project will cause noise pollution?
 - Whether the project will impact on soil environment?
 - Whether the project will impact on the surrounding animals and plants?
 - Impact on the local resident's employment opportunities and income.
 - Impact on the local economic development.
 - Impact on the local power grid and NWPG.
 - Attitude on developing the project

210 questionnaires have been handed in total and all of them have been received successfully from the stakeholder representatives, respectively from the local government, and surrounding villages within the project boundary of these seven projects. The representatives covered different ages, different occupation, and different education levels. most of the stakeholders interviewed expressed the project will benefit the local environment, economy, and social development, some of them thought there is no significant impact on those, and no negative impact were raised by stakeholders.

Local Stakeholder Consultation during the project implementation stage:

Communications with local stakeholders were carried out at periodic intervals. Key implementation schedules or changes of the project had been communicated to the local authority, who informed the neighborhood committee and the local residents, the comments and suggestions from residents would be collected by the local authority meanwhile. And the local government agencies and competent authorities conducted spot checks on the implementation of the project from time to time and gave some suggestions on the involved rectification problems.

During this monitoring period, two local stakeholder consultations were occurred on January 2015 and May 2017, the staff from the project owner carried out a survey of the local villagers and residents in the area. The one-page questionnaire was designed with the following sections:

- 1) Brief introduction of the project situation during the monitoring period
- 2) Basic information of respondent
- 3) Major question issues
 - Whether the project will cause water pollution?
 - Whether the project will cause air pollution?
 - Whether the project will cause noise pollution?
 - Whether the project will impact on soil environment?
 - Whether the project will impact on the surrounding animals and plants?
 - Impact on the local resident's employment opportunities and income.
 - Impact on the local economic development.
 - Impact on the local power grid and NWPG.
 - Attitude on developing the project

Following is a summary of the local survey. The survey forms are available from the project owner:

The questionnaires were sent to 70 households (10 people for 1 instance) during each consultation and the survey had a 100% response rate. The result of the survey indicated the support to the project.

The statistic of responders is shown in the table below:

Table 2-1 Statistic of responders during the two consultations

Statistic		Consultation 1 (January 2015)	Consultation 2 (May 2017)
Total		70	70
Gender	Male	45	42
	Female	25	28
Age	21~30	22	18

	31~40	36	38
	41~50	9	10
	51~60	3	4
Job	Famer	20	25
	Worker	42	38
	Other	8	7

It can be seen that respondents are representative of the public opinions in terms of their gender, age and educational levels. Therefore, it can be considered that responses to the survey have comprehensively reflected the attitudes towards the Project of the villagers possibly affected by the Project.

Table 2-2 Statistic of responses

Consultation 1 (January 2015)	Consultation 2 (May 2017)
100% of respondents agreed with the development of the Project.	100% of respondents agreed with the development of the Project.
98.6% respondents believed that the project will not do harm to the environment, 1.4% did not respond.	100% respondents believed that the project will not do harm to the environment
97.2% believed that the project will do no harm to the ecosystem, 2.8% did not respond.	95.8% believed that the project will do no harm to the ecosystem, 4.2% did not respond.
97.2% believed that the project will have no impact to the environment of living, studying, and working, 2.8% did not respond.	97.2% believed that the project will have no impact to the environment of living, studying, and working, 2.8% did not respond.
100% believed that the project will have positive impact on local economic development.	100% believed that the project will have positive impact on local economic development.
100% had no further suggestion.	100% had no further suggestion.

Conclusion from the survey:

There are no negative comments received for the project. In line with VCS requirements all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

2.3 AFOLU-Specific Safeguards

The project is a non-AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The grouped project started commissioning on 23-Jan-2013. The crediting period of the project is from 23-Jan-2013 to 22-Jan-2023, and the monitoring period of the project is from 23-Jan-2013 to 31-Dec-2018.

The project operated smoothly without any emergencies or special events that would impact the applicability of the applied methodology. No events that would impact the GHG emission reductions or removals and monitoring occurred during this monitoring period.

The project generated the electricity by using renewable solar photovoltaic (PV) power to the grid and replacing equivalent electricity generated by fossil fuel fired power plants connected to the grid. Main technology employed by the grouped project were listed below:

PV array

PV array cells are the most important equipment in solar PV plant. PV array cells are to collect solar energy and convert it into electricity. At present, the main types of PV array cells are monocrystalline silicon cells, polycrystalline silicon and others.

Inverters

Inverter is an electrical device that converts direct current (DC) to alternating current (AC).

The initial seven activities that are included in the grouped project have the following principal technical characteristics:

INSTANCE 01: Yongchang County Dazhaitan 50MW Grid Connected Solar PV Power Generation Project

The instance is using the solar to generate the electricity and transfer into the grid, the power connection diagram is shown as follows:

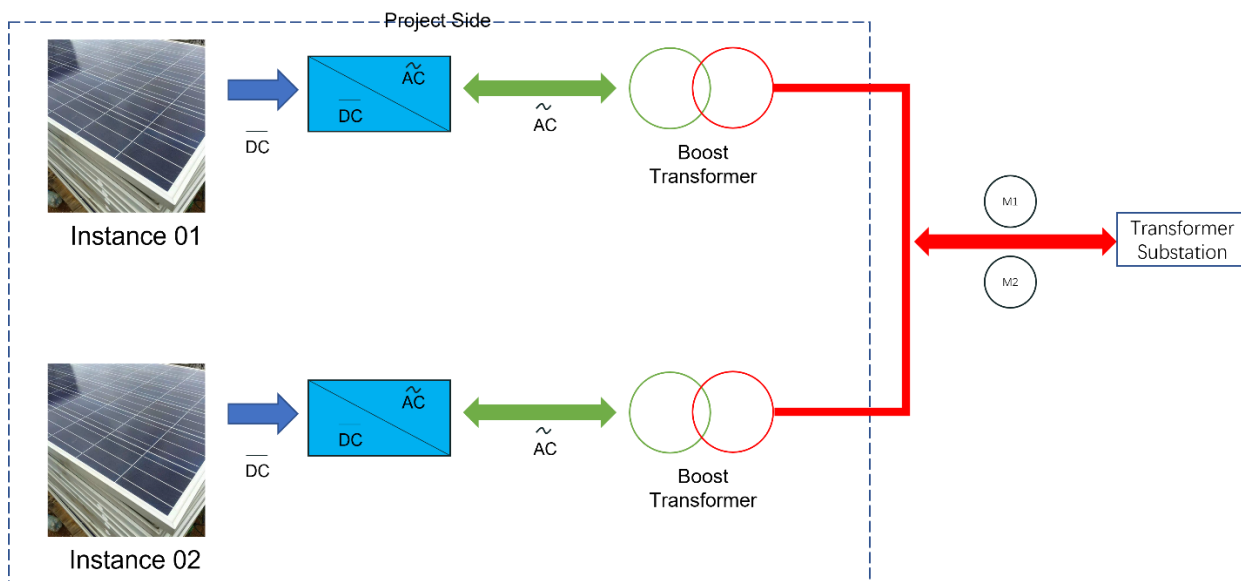


Figure 3-1 Power Connection Diagram of Instance 01

The key technology parameters of the instance 01 is as follows:

1. Modules

The project is a solar photovoltaic based power station with full capacity of 50.112MWp. Solar modules are the core component of the project, whose function is to convert solar energy into electricity energy through direct current (DC). The project consists of 172,800 pieces of 290Wp polycrystalline silicon solar cells, which are supplied with total 50.112MWp output power. The key technical parameters of polycrystalline silicon solar cells are listed in Table 3-1:

Table 、 3-1 The key technology parameters of 290MWp polycrystalline silicon solar cells

Parameters	Unit	Value	Data source
Model	-	JKM290P-72	Equipment purchases contract & nameplate of polycrystalline silicon solar cells
Number	-	172800	
Maximum power (Pmax)	Wp	290W±3%	
Maximum power current (Imp)	V	36.5	
Open-circuit voltage (Voc)	A	7.97	
Short-circuit current (Isc)	V	44.9	
Maximum system voltage	A	8.89	
Operation period	years	25	

Manufacturer		Jinko Solar Co.,Ltd.	
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2. Inverters

Inverter is an electrical device that converts direct current (DC) to alternating current (AC). 100 sets of inverters with capacity 500kW were installed in the project. The parameters of inverter are listed in Table 3-2:

Table 3-2 The key technology parameters of inverters

Parameters	Unit	Value	Value	Value	Data source
Model	-	SSL0500	KNGI900-500HEA	SG500KTL	Equipment purchase contract & nameplate of inverters
Rated Output Power	KW	500	500	500	
Maximum DC voltage	V	900	900	1000	
Maximum input Short-circuit current	A	/	/	1450	
MPPT Voltage Range	V	500-750	450-820	450-820	
Maximum Input current	A	1200	1168	1200	
Rated output voltage	V	400	270	270	
Rated frequency	Hz	50	50	50	
Maximum Output current	A	/	1188	1176	
Operation period	Year	25	25	25	
Manufacturer		Emerson Network Power Co., Ltd.	Beijing Kenuo Weiye Technology Co., Ltd.	Sungrow Power Supply Co., Ltd.	

INSTANCE 02: Yongchang County Heqingtian Phase II 50MW Grid Connected Solar PV Power Generation Project

The instance is using the solar to generate the electricity and transfer into the grid, the power connection diagram is shown as follows:

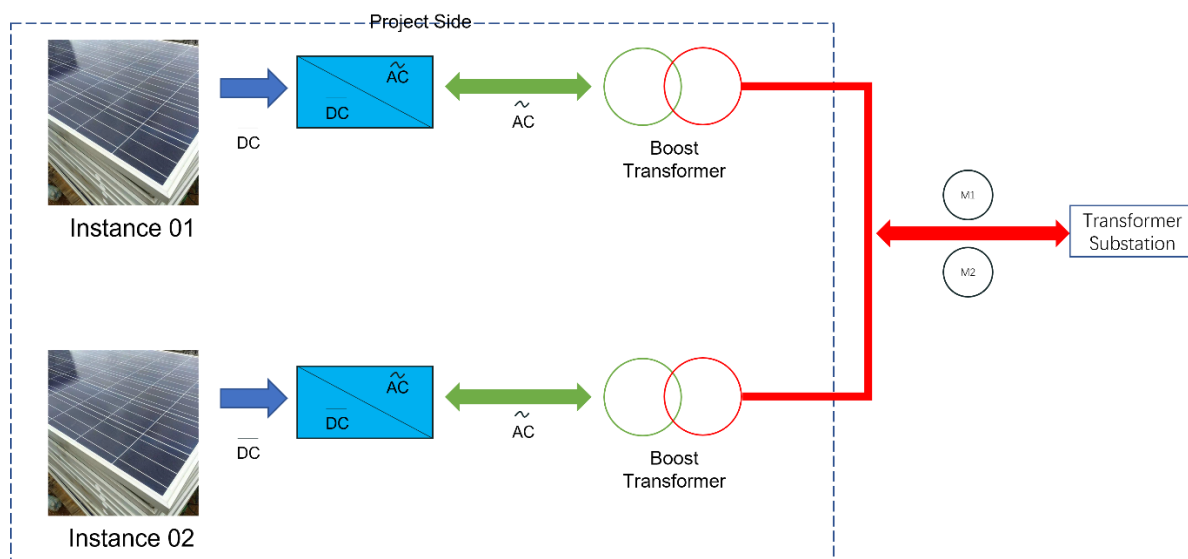


Figure 3-2 Power Connection Diagram of Instance 02

The key technology parameters of the instance 02 as follows:

1. Modules

The project is a solar photovoltaic based power station with full capacity of 50.9067MWp. Solar modules are the core component of the project, whose function is to convert solar energy into electricity energy through direct current (DC). The project consisted of 78,660 pieces of 295Wp and 92,340 pieces of 300Wp polycrystalline silicon solar cells, which were supplied with total 50.9067MWp output power. The key technical parameters of polycrystalline silicon solar cells are listed in Table 3-3:

Table 3-3 The key technology parameters of 295MWp and 300MWp polycrystalline silicon solar cells

Parameters	Unit	Value	Value	Value	Data source
Model	-	TSM-300PC14	TSM-295PC14	JC295M-24/Ab	Equipment purchase contract
Number	-	92,340	10,260	68,400	
Maximum power (Pmax)	Wp	300±3%	290W±3%	295W±5W	
Maximum power Voltage (Vmp)	V	36.9	36.6	36.3	
Maximum power current (Imp)	A	8.13	8.07	8.13	

Open-circuit voltage (Voc)	V	45.3	45.2	44.7	
Short-circuit current (Isc)	A	8.60	8.55	8.62	
Maximum system voltage	V	1000	1000	1000	
Operation period	years	25	25	25	
Manufacturer		Trina Solar Changzhou Co., Ltd.		Renesola Zhejiang Co., Ltd.	

2. Inverters

Inverter is an electrical device that converts direct current (DC) to alternating current (AC). 100 sets of inverters with capacity 500kW were installed in the project. The parameters of inverter are listed in Table 3-4:

Table 3-4 . The key technology parameters of inverters

Parameters	Unit	Value	Data source
Model	-	EP-0500-A	Equipment purchases contract & nameplate of inverters
Rated Output Power	KW	500	
Maximum DC voltage	V	1000	
Maximum input Short-circuit current	A	1327	
MPPT Voltage Range	V	500-820	
Maximum Input current	A	1128	
Rated output voltage	V	315	
Rated frequency	Hz	50	
Maximum Output current	A	1008	
Operation period	Year	25	
Manufacturer	Wuxi Shangneng new energy Co., Ltd.		

INSTANCE 03: Wulan 20MW Grid Connected Solar PV Power Generation Project

The instance is using the solar to generate the electricity and transfer into the grid, the power connection diagram is shown as follows:

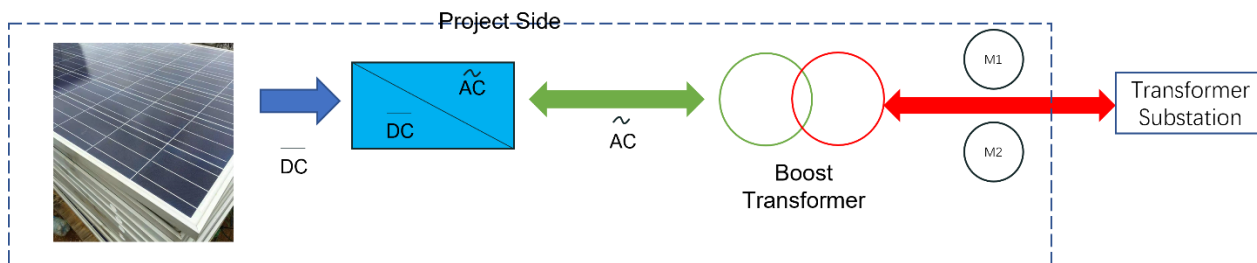


Figure 3-3 Power Connection Diagram of Instance 03

The key technology parameters of the instance 03 as follows:

1. Modules

The project is solar photovoltaic based power station with full capacity of 20.139MWp. The solar modules are the core component of the project, whose function is to convert solar energy into electricity energy through direct current (DC). The PROJECT employs 82,200 pieces of 245Wp polycrystalline silicon solar cells, which are supplied with total 20.139MWp output power. The key technical parameters of polycrystalline silicon solar cells are listed in Table 3-5:

Table 3-5 The key technical parameters of polycrystalline silicon solar cells

Parameters	Unit	Value	Data source
Model	-	YL245P-29b	Equipment purchases contract & nameplate of polycrystalline silicon solar cells
Number	-	82200	
Maximum power (Pmax)	Wp	245(0±3W)	
Rated Voltage	V	30.2	
Rated current	A	8.11	
Open-circuit voltage (Voc)	V	37.8	
Short-circuit current (Isc)	A	8.63	
Maximum system voltage	V	1000	
Operation period	years	25	
Manufacturer	Yingli Energy (China) Co., Ltd.		

2. Inverters

Inverter is an electrical device that converts direct current (DC) to alternating current (AC). 40 sets of inverters with capacity 500kW were installed in the project. The parameters of inverter are listed in Table 3-6:

Table 3-6 The key technology parameters of inverters

Parameters	Unit	Value	Data source
Model	-	DS500KTL	Equipment purchases contract & nameplate of inverters
Rated Output Power	KW	500	
Maximum DC voltage	V	1000	
MPPT Voltage Range	V	450-880	
Maximum Input current	A	1200	
Rated output voltage	V	270	
Rated frequency	Hz	50	
Maximum Output current	A	1070	
Operation period	Year	25	
Manufacturer	Anhui Jinfeng New Energy Co., Ltd.		

INSTANCE 04: Three Gorges New Energy Hetian Pishan Phase II 20MW Grid Connected Solar PV Power Generation Project

The instance is using the solar to generate the electricity and transfer into the grid, the power connection diagram is shown as follows:

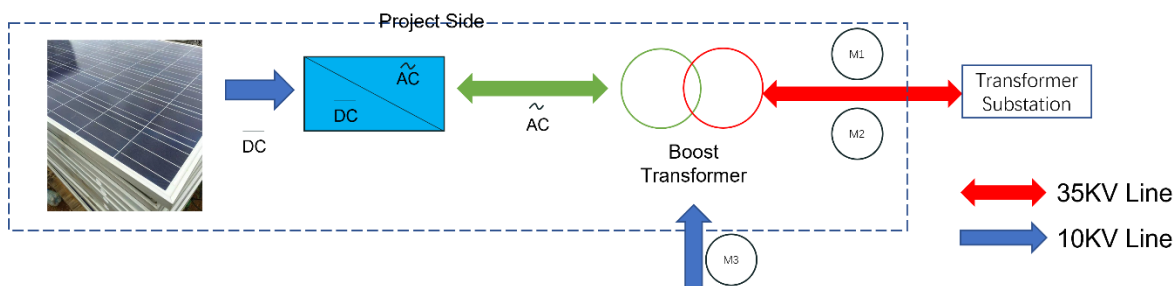


Figure 3-4 Power Connection Diagram of Instance 04

The key technology parameters of the instance 04 as follows:

1. Modules

The project is solar photovoltaic based power station with full capacity of 20MWp. The solar modules are the core component of the project, whose function is to convert solar energy into electricity energy through direct current (DC). The Project employed 80,000 pieces of 250Wp polycrystalline silicon solar cells, which are supplied with total 20MWp output power. The key technical parameters of polycrystalline silicon solar cells are listed in Table 3-7:

Table 3-7 Key technology parameters of 250MWp polycrystalline silicon solar cells

Parameters	Unit	Value	Data source
Model	-	EG250-P60-C	Technical Diagram
Maximum power (Pmax)	Wp	250(0±3%)	
Rated Voltage	V	30.20	
Rated current	A	8.28	
Open-circuit voltage (Voc)	V	37.72	
Short-circuit current (Isc)	A	8.81	
Maximum system voltage	V	1000	
Operation period	years	25	
Manufacturer	ChangZhou EGing Photovoltaic Technology Co.,Ltd		

2. Inverters

Inverter is an electrical device that converts direct current (DC) to alternating current (AC). 40 sets inverters with capacity 500kW were installed in the project. The parameters of inverter are listed in Table 3-8:

Table 3-8 The key technology parameters of inverters

Parameters	Unit	Value	Data source
Model	-	EP-0500-A	Technical Diagram
Rated Output Power	KW	500	
Maximum DC voltage	V	1000	
MPPT Voltage Range	V	420-850	

Maximum Input current	A	1128	
Rated output voltage	V	270	
Rated frequency	Hz	50	
Maximum Output current	A	1069	
Operation period	Year	25	
Manufacturer	Wuxi Shangneng New Energy Co., Ltd.		

INSTANCE 05: Three Gorges New Energy Hami 20MW Grid Connected PV Power Generation Project

The instance is using the solar to generate the electricity and transfer into the grid, the power connection diagram is shown as follows:

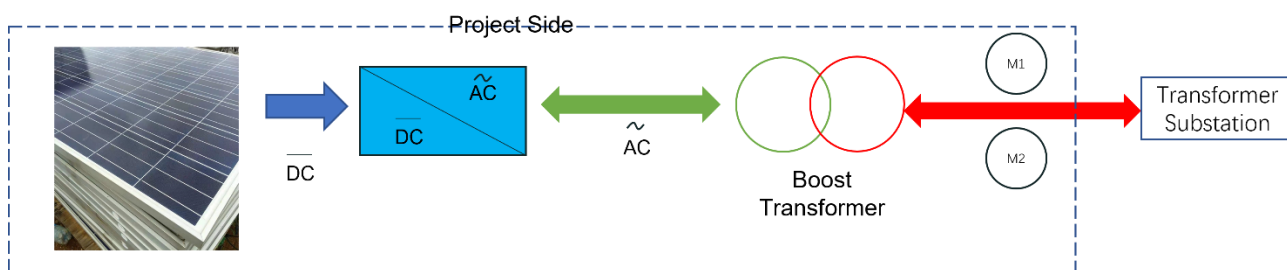


Figure 3-5 Power Connection Diagram of Instance 05

The key technology parameters of the instance 05 as follows as follows:

1. Modules

The project is solar photovoltaic based power station with full capacity of 20.4MWp. The solar modules are the core component of the project, whose function is to convert solar energy into electricity energy through direct current (DC). The PROJECT employs 81,600 pieces of 250Wp polycrystalline silicon solar cells, which are supplied with total 20.4MWp output power. The key technical parameters of polycrystalline silicon solar cells are listed in Table 3-9:

Table 3-9 The key technical parameters of polycrystalline silicon solar cells

Parameters	Unit	Value	Value	Data source
Model	-	JAP6-60-3BB-250	JC250M-24/Bb	Equipment purchases
Number	-	40800	40800	

Maximum power (Pmax)	Wp	250(0±5W)	250(>=0)	contract and nameplate
Maximum power Voltage (Vmp)	V	29.98	30.1	
Maximum power current (Imp)	A	8.34	8.31	
Open-circuit voltage (Voc)	V	37.54	37.4	
Short-circuit current (Isc)	A	8.84	8.83	
Maximum system voltage	V	1000	1000	
Operation period	years	25	25	
Manufacturer		Hefei JA Solar Technology Co., Ltd	Renesola Zhejiang Ltd	

2. Inverters

Inverter is an electrical device that converts direct current (DC) to alternating current (AC). 40 sets of inverters with capacity 500kW were installed in the project. The parameters of inverter are listed in Table 3-10:

Table 3-10 The key technology parameters of inverters

Parameters	Unit	Value	Data source
Model	-	YLSSL-500	Nameplate and Equipment purchase contract
Rated Output Power	KW	500	
Maximum DC voltage	V	1000	
MPPT Voltage Range	V	420-850	
Maximum Input current	A	1200	
Rated output voltage	V	270	
Rated frequency	Hz	50	
Maximum Output current	A	1069	
Operation period	Year	25	

Manufacturer	Shenzhen WinLine Technology Co., Ltd.	
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INSTANCE 06: Suzhou Zhaoyang Dongdongtan Phase I 50MW Grid Connected Solar PV Power Generation Project

The instance is using the solar to generate the electricity and transfer into the grid, the power connection diagram is shown as follows:

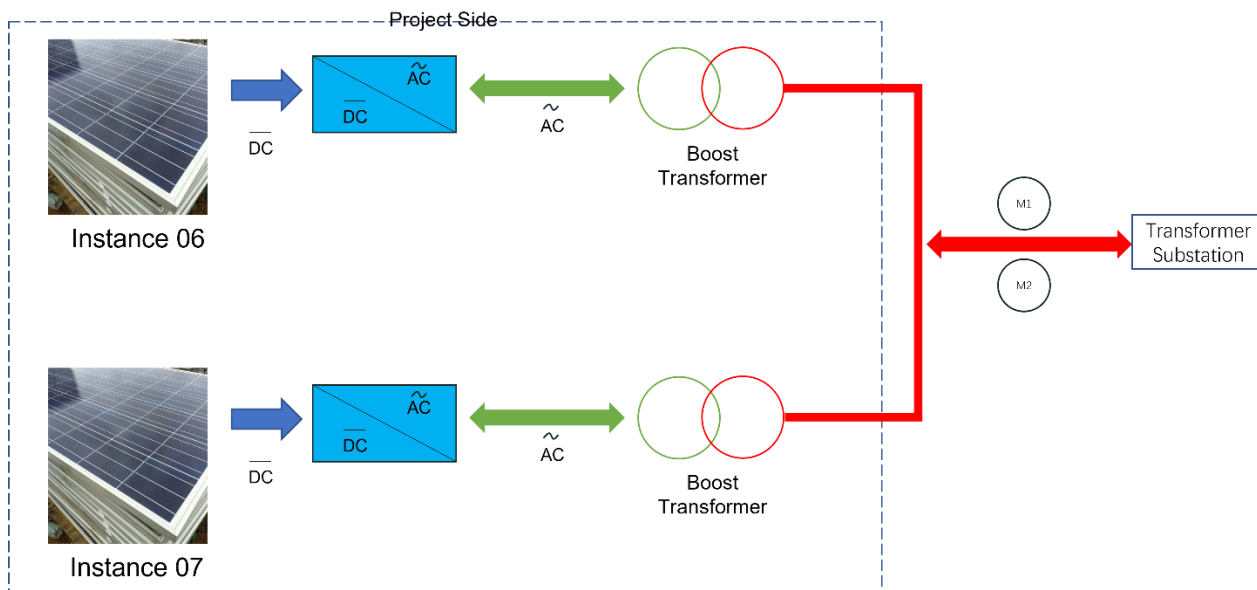


Figure 3-6 Power Connection Diagram of Instance 06

The key technology parameters of the Instance 06 as follows:

1. Modules

The project is a solar photovoltaic based power station with full capacity of 50MWp, consists of 200,000 pieces of 250Wp polycrystalline silicon solar cells. Solar modules are the core component of the project, whose function is to convert solar energy into electricity energy through direct current (DC). The key technical parameters of polycrystalline silicon solar cells are listed in Table 3-11:

Table 3-11 The key technology parameters of polycrystalline silicon solar cells

Parameters	Unit	Value	Value	Data source
Model	-	JAP6-60-3BB-250/3BB	JKM250P-60	Equipment purchases
Maximum power (Pmax)	Wp	250±3%	250±5%	

Maximum power Voltage (Vmp)	V	30.00	30.40	contract and nameplate
Maximum power current (Imp)	A	8.32	8.23	
Open-circuit voltage (Voc)	V	37.79	37.60	
Short-circuit current (Isc)	A	8.67	8.81	
Maximum system voltage	V	1000	1000	
Operation period	years	25	25	
Manufacturer		JA Solar	JINKO Solar	

2. Inverters

Inverter is an electrical device that converts direct current (DC) to alternating current (AC). 50 sets of 500kW inverters and 40 sets of 630 kW inverters were installed in the project. The parameters of inverter are listed in Table 3-12:

Table 3-12 Key technology parameters of inverters

Parameters	Unit	Value	Value	Data source
Model	-	SG500MX	SG630KTL	Nameplate and Equipment purchase contract
Rated Output Power	KW	500	630	
Maximum DC voltage	V	1000	1000	
MPPT Voltage Range	V	500-850	500-820	
Maximum Input current	A	1120	1400	
Rated output voltage	V	315	315	
Rated frequency	Hz	50	50	
Operation period	Year	25	25	
Manufacturer	SUNGROW POWER SUPPLY CO., LTD			

INSTANCE 07: Suzhou Sanyang Dongdongtan Phase II 50MW Grid Connected Solar PV Power Generation Project

The instance is using the solar to generate the electricity and transfer into the grid, the power connection diagram is shown as follows:

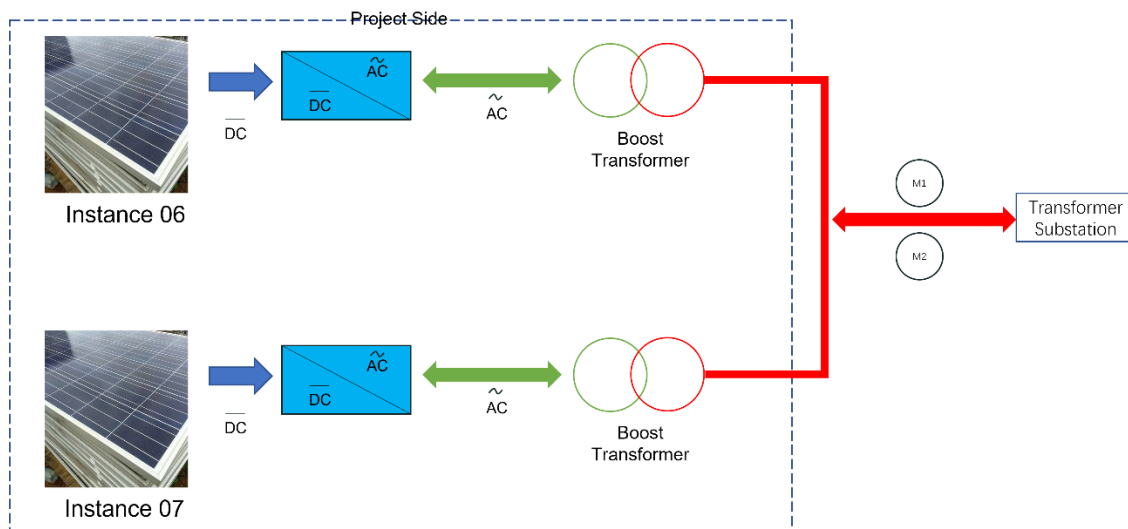


Figure 3-7 Power Connection Diagram of Instance 07

The key technology parameters of the Instance 07 as follows:

1. Modules

The project is a solar photovoltaic based power station with full capacity of 50MWp, consists of 200,000 pieces of 250Wp polycrystalline silicon solar cells. Solar modules are the core component of the project, whose function is to convert solar energy into electricity energy through direct current (DC). The key technical parameters of polycrystalline silicon solar cells are listed in Table 3-13:

Table 3-13 Key technology parameters of polycrystalline silicon solar cells

Parameters	Unit	Value	Value	Data source
Model	-	CS6P-250P	JKM250P-60	Equipment purchases contract and nameplate
Maximum power (Pmax)	Wp	250	250±5%	
Maximum power Voltage (Vmp)	V	30.10	30.40	
Maximum power current (Imp)	A	8.30	8.23	
Open-circuit voltage (Voc)	V	37.20	37.60	
Short-circuit current (Isc)	A	8.87	8.81	
Maximum system voltage	V	1000	1000	
Operation period	years	25	25	

Manufacturer		Canadian Solar	JINKO Solar	
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2. Inverters

Inverter is an electrical device that converts direct current (DC) to alternating current (AC). 50 sets of 500kW inverters and 40 sets of 630 kW inverters were installed in the project. The parameters of inverter are listed in Table 3-14:

Table 3-14 Key technology parameters of inverters

Parameters	Unit	Value	Value	Data source
Model	-	SG500MX	SG630KTL	Nameplate and Equipment purchase contract
Rated Output Power	KW	500	630	
Maximum DC voltage	V	1000	1000	
MPPT Voltage Range	V	500-850	500-820	
Maximum Input current	A	1120	1400	
Rated output voltage	V	315	315	
Rated frequency	Hz	50	50	
Operation period	Year	25	25	
Manufacturer	SUNGROW POWER SUPPLY CO., LTD			

3.2 Deviations

There is no deviation applied to this monitoring period.

2.3.1 Methodology Deviations

There is no methodology deviation applied to this monitoring period.

2.3.2 Project Description Deviations

There is no project deviation applied to this monitoring period.

3.3 Grouped Projects

During this monitoring period, all the seven instances involved in the project have been validated during project validation. No new instance is involved. All the seven instances are

in line with the eligibility criteria of grouped projects. Please refer to the registered PD (Version 02) for details.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

During this monitoring period, all the seven instances involved in the project have been validated during project validation. No new instance is involved. All the seven instances are in line with the eligibility criteria of grouped projects. Please refer to the registered PD (Version 02) for details.

The parameters (CO_2 emission factor of fossil fuel type i $\text{EF}_{\text{CO}_2,i,y}$, amount of fossil fuel type i consumed by the instance electricity system in year y $\text{FC}_{i,y}/\text{F}_{i,j,y}$, net calorific value of fossil fuel type i in year y $\text{NCV}_{i,y}$, net electricity generated by power plant $\text{EG}_{m,y}/\text{EG}_y$, installed capacity of source j in year y in the grid $\text{CAP}_{j,y}$, efficiency level of best technologies commercially available in China $\text{EF}_{\text{coal,adv,y}}$, $\text{EF}_{\text{oil,adv,y}}$, $\text{EF}_{\text{gas,adv,y}}$) used for calculation of the baseline grid emission factor available at validation in the registered PDD are replaced by the parameter of $\text{EF}_{\text{CM},y}$ directly here.

Data / Parameter	$\text{EF}_{\text{OM},y}$
Data unit	tCO ₂ e/MWh
Description	Operating margin emission factor of the grid connected by each instance
Source of data	"2014 Baseline Emission Factors for Regional Power Grids in China" issued by China's DNA in February. 4, 2015
Value applied	Northwest Power Grid: 0.9578
Justification of choice of data or description of measurement methods and procedures applied	China Official Data of <i>National Bureau of Statistics of China</i> and <i>National Development and Reform Commission</i>
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$\text{EF}_{\text{BM},y}$
Data unit	tCO ₂ e/MWh
Description	Build margin emission factor of the grid connected by each instance
Source of data	"2014 Baseline Emission Factors for Regional Power Grids in China" issued by China's DNA on February. 4, 2015

Value applied	Northwest Power Grid: 0.4512
Justification of choice of data or description of measurement methods and procedures applied	China Official Data of <i>National Bureau of Statistics of China and National Development and Reform Commission</i>
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{grid, CM, y}$
Data unit	tCO ₂ e/MWh
Description	Combined margin CO ₂ emission factor for grid connected by each instance
Source of data	The calculation is conducted based on data calculated by the Office of <i>National Coordination Committee on Climate Change</i> .
Value applied	Northwest Power Grid: 0.83115
Justification of choice of data or description of measurement methods and procedures applied	China Official Data of <i>National Bureau of Statistics of China and National Development and Reform Commission</i>
Purpose of Data	Calculation of baseline emissions
Comments	The calculation was conducted based on data calculated by the Office of National Coordination Committee on Climate Change.

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility, y}$
Data unit	MWh
Description	Net quantity of electricity delivered to the grid by a typical instance in year y
Source of data	Meter(s) installed at the Project site of each instance
Description of measurement methods and procedures to be applied	The meters are two-way and monitor the input electricity and output electricity simultaneously, they are calibrated annually and checked for accuracy by a qualified third party in accordance with industry standards. The measurement precision of the meters employed by each instance is at least 0.5s.

	The net electricity supplied to the Grid by the Project is calculated through electricity supplied by the Project to the grid ($EG_{output,y}$) minus electricity purchased from the Grid ($EG_{input,y}$).
Frequency of monitoring/recording	Continuously monitored and monthly recorded.
Value monitored	1,522,819.617
Monitoring equipment	Calculated
QA/QC procedures to be applied	The meter(s) is periodically checked and maintained. And receipt(s) is used for crosscheck.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$EG_{output,y}$
Data unit	MWh
Description	Electricity delivered by a typical instance to the grid in year y
Source of data	Actual data is obtained through on-site measurement with meter(s).
Description of measurement methods and procedures to be applied	The meters are two-way and monitor the input electricity and output electricity simultaneously, they are calibrated annually and checked for accuracy by a qualified third party in accordance with industry standards. The measurement precision of the meters employed by each instance is at least 0.5s.
Frequency of monitoring/recording	Continuously monitored and monthly recorded.
Value monitored	1,563,384.329
Monitoring equipment	Electric meters (please see the Section 4.3 for the details of meter and calibration)
QA/QC procedures to be applied	The meter(s) is periodically checked and maintained. And receipt(s) is used for crosscheck.
Purpose of the data	Calculation of baseline emissions
Calculation method	-

Comments	-
Data / Parameter	$EG_{input\ y}$
Data unit	MWh
Description	Electricity imported by a typical instance to the grid in year y
Source of data	Meter(s) installed at the Project site of each instance
Description of measurement methods and procedures to be applied	The meters are calibrated annually and checked for accuracy by a qualified third party in accordance with industry standards. The measurement precision of the meters employed by each instance are at least 0.5s.
Frequency of monitoring/recording	Continuously monitored and monthly recorded.
Value monitored	40,564.712
Monitoring equipment	Electric meters (please see the Section 4.3 for the details of meter and calibration)
QA/QC procedures to be applied	The meter(s) is periodically checked and maintained. And receipt(s) is used for crosscheck.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

4.3 Monitoring Plan

Monitoring Plan Objective and Organization

The project participant, as defined in each instance monitored the electricity delivered to the grid. The monitoring data and operation condition of each instance shall be reported to the grouping entity. The data were archived electronically and be stored for 2 years after the end of the crediting period of each instance.

The staffs would record the electricity in real time and submit the data to the data processing and reporting staff monthly.

The data processing and reporting staff and QA&QC staff are appointed by the project owner, who supervise and verify metering and recording, collect data (the data on the meter,

sales/purchasing invoice or the balance bill), calculate emission reductions and prepare monitoring report.

The project manager takes the responsibility for the monitoring plan implementation.

An emission team is established and consists of project manager, data processing and reporting staff, QA&QC staff, and staff. Organizing structure of the Emission team is shown as Figure 4-1.



Figure 4-1 The monitoring system of the instance in the grouped project

Monitoring data

Data to be monitored is the input and output electricity monthly in different instances, the monitoring points and methods may be different according to the real condition of the plant. All instances under the grouped project shall provide a monitoring point chart to demonstrate where the meters installed and how to monitor quantity of electricity delivered to the grid and electricity purchased from the grid, i.e. $EG_{input,y}$, $EG_{output,y}$.

Monitoring Equipment and program

The electric energy metering equipment were properly configured, and the metering equipment were checked by both the project owner and the grid company before the project starts operating according to relevant standard in China.

For the instance 01 ~07, they all installed main meter and backup meter, the main meter (M1) and backup meter (M2), which measure the electricity supplied to the grid and electricity supplied by the grid, are installed at the output of the on-site booster station of the project. For the instance 04 Pishan, the meter M3 measures the electricity use of power plant supplied by the grid, is installed at 10kV backup line. The meters' location and diagrams have been illustrated in Section 3.1, Figure 3-1 ~ Figure 3-7.

Precision of Meter(s)

The meter(s) of the Project will be equipped in line with Technical Administrative Code of Electric Energy Metering (DL/T 448-2000 and DL/T 448-2016). The measurement precision of the meter(s) employed by the instance were at least 0.5s.

Calibration of Meter(s)

The meter(s) of the Project was calibrated once per year. The details of each instance's meter are listed below:

Instance No.	Instance 01 Dazhaitan	
Meter name	M1	M2
Meter Type	WU.TE.432q	WU.TE.432q
Accuracy class	0.2S	0.2S
Serial No.	41600068	41600067
Calibration frequency	Annually	Annually
Calibration date	21-Apr-2018 22-Apr-2017 23-Apr-2016 24-Apr-2015 25-Apr-2014 26-Apr-2013 27-Apr-2012	21-Apr-2018 22-Apr-2017 23-Apr-2016 24-Apr-2015 25-Apr-2014 26-Apr-2013 27-Apr-2012
Validity	21-Apr-2018~20-Apr-2019 22-Apr-2017~21-Apr-2018 23-Apr-2016~22-Apr-2017 24-Apr-2015~23-Apr-2016 25-Apr-2014~24-Apr-2015 26-Apr-2013~25-Apr-2014 27-Apr-2012~26-Apr-2013	21-Apr-2018~20-Apr-2019 22-Apr-2017~21-Apr-2018 23-Apr-2016~22-Apr-2017 24-Apr-2015~23-Apr-2016 25-Apr-2014~24-Apr-2015 26-Apr-2013~25-Apr-2014 27-Apr-2012~26-Apr-2013

Instance No.	Instance 02 Heqingtian	
Meter name	M1	M2
Meter Type	WU.TE.432q	WU.TE.432q

Accuracy class	0.2S	0.2S
Serial No.	41600068	41600067
Calibration frequency	Annually	Annually
Calibration date	21-Apr-2018 22-Apr-2017 23-Apr-2016 24-Apr-2015 25-Apr-2014 26-Apr-2013 27-Apr-2012	21-Apr-2018 22-Apr-2017 23-Apr-2016 24-Apr-2015 25-Apr-2014 26-Apr-2013 27-Apr-2012
Validity	21-Apr-2018~20-Apr-2019 22-Apr-2017~21-Apr-2018 23-Apr-2016~22-Apr-2017 24-Apr-2015~23-Apr-2016 25-Apr-2014~24-Apr-2015 26-Apr-2013~25-Apr-2014 27-Apr-2012~26-Apr-2013	21-Apr-2018~20-Apr-2019 22-Apr-2017~21-Apr-2018 23-Apr-2016~22-Apr-2017 24-Apr-2015~23-Apr-2016 25-Apr-2014~24-Apr-2015 26-Apr-2013~25-Apr-2014 27-Apr-2012~26-Apr-2013

Instance No.	Instance 03 Wulan	
Meter name	M1	M2
Meter Type	DTSD341	DTSD341
Accuracy class	0.2S	0.2S
Serial No.	01200309	01200310
Calibration frequency	Annually	Annually
Calibration date	05-Dec-2012 04-Dec-2013 03-Dec-2014	05-Dec-2012 04-Dec-2013 03-Dec-2014

	02-Dec-2015 01-Dec-2016 30-Nov-2017 29-Nov-2018	02-Dec-2015 01-Dec-2016 30-Nov-2017 29-Nov-2018
Validity	05-Dec-2012~04-Dec-2013 04-Dec-2013~03-Dec-2014 03-Dec-2014~02-Dec-2015 02-Dec-2015~01-Dec-2016 01-Dec-2016~30-Nov-2017 30-Nov-2017~29-Nov-2018 29-Nov-2018~28-Nov-2019	05-Dec-2012~04-Dec-2013 04-Dec-2013~03-Dec-2014 03-Dec-2014~02-Dec-2015 02-Dec-2015~01-Dec-2016 01-Dec-2016~30-Nov-2017 30-Nov-2017~29-Nov-2018 29-Nov-2018~28-Nov-2019

Instance No.	Instance 04 Pishan		
Meter name	M1	M2	M3
Meter Type	DTSD341	DTSD341	DSZ311
Accuracy class	0.2S	0.2S	0.2S
Serial No.	7000018	7000017	3383644
Calibration frequency	Annually	Annually	Annually
Calibration date	15-Apr-2013 08-Apr-2014 07-Apr-2015 06-Apr-2016 05-Apr-2017 04-Apr-2018	15-Apr-2013 08-Apr-2014 07-Apr-2015 06-Apr-2016 05-Apr-2017 04-Apr-2018	15-Apr-2013 08-Apr-2014 07-Apr-2015 06-Apr-2016 05-Apr-2017 04-Apr-2018
Validity	15-Apr-2013~14-Apr-2014	15-Apr-2013~14-Apr-2014	15-Apr-2013~14-Apr-2014

	08-Apr-2014~07-Apr-2015	08-Apr-2014~07-Apr-2015	08-Apr-2014~07-Apr-2015
	07-Apr-2015~06-Apr-2016	07-Apr-2015~06-Apr-2016	07-Apr-2015~06-Apr-2016
	06-Apr-2016~05-Apr-2017	06-Apr-2016~05-Apr-2017	06-Apr-2016~05-Apr-2017
	05-Apr-2017~04-Apr-2018	05-Apr-2017~04-Apr-2018	05-Apr-2017~04-Apr-2018
	04-Apr-2018~03-Apr-2019	04-Apr-2018~03-Apr-2019	04-Apr-2018~03-Apr-2019

Instance No.	Instance 05 Hami	
Meter name	M1	M2
Meter Type	DTSD341	DTSD341
Accuracy class	0.2S	0.2S
Serial No.	9787408	9787409
Calibration frequency	Annually	Annually
Calibration date	17-Jan-2013 16-Jan-2014 15-Jan-2015 14-Jan-2016 13-Jan-2017 12-Jan-2018	17-Jan-2013 16-Jan-2014 15-Jan-2015 14-Jan-2016 13-Jan-2017 12-Jan-2018
Validity	17-Jan-2013~16-Jan-2014 16-Jan-2014~15-Jan-2015 15-Jan-2015~14-Jan-2016 14-Jan-2016~13-Jan-2017 13-Jan-2017~12-Jan-2018	17-Jan-2013~16-Jan-2014 16-Jan-2014~15-Jan-2015 15-Jan-2015~14-Jan-2016 14-Jan-2016~13-Jan-2017 13-Jan-2017~12-Jan-2018

	12-Jan-2018~11-Jan-2019	12-Jan-2018~11-Jan-2019
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Instance No.	Instance 06 Zhaoyang	
Meter name	M1	M2
Meter Type	MK6E	MK6E
Accuracy class	0.2S	0.2S
Serial No.	211650965	211650966
Calibration frequency	Annually	Annually
Calibration date	24-Mar-2012 23-Mar-2013 22-Mar-2014 21-Mar-2015 20-Mar-2016 19-Mar-2017 18-Mar-2018	24-Mar-2012 23-Mar-2013 22-Mar-2014 21-Mar-2015 20-Mar-2016 19-Mar-2017 18-Mar-2018
Validity	24-Mar-2012~23-Mar-2013 23-Mar-2013~22-Mar-2014 22-Mar-2014~21-Mar-2015 21-Mar-2015~20-Mar-2016 20-Mar-2016~19-Mar-2017 19-Mar-2017~18-Mar-2018 18-Mar-2018~17-Mar-2019	24-Mar-2012~23-Mar-2013 23-Mar-2013~22-Mar-2014 22-Mar-2014~21-Mar-2015 21-Mar-2015~20-Mar-2016 20-Mar-2016~19-Mar-2017 19-Mar-2017~18-Mar-2018 18-Mar-2018~17-Mar-2019

Instance No.	Instance 07 Sanyang	
Meter name	M1	M2
Meter Type	MK6E	MK6E
Accuracy class	0.2S	0.2S

Serial No.	211650965	211650966
Calibration frequency	Annually	Annually
Calibration date	24-Mar-2012 23-Mar-2013 22-Mar-2014 21-Mar-2015 20-Mar-2016 19-Mar-2017 18-Mar-2018	24-Mar-2012 23-Mar-2013 22-Mar-2014 21-Mar-2015 20-Mar-2016 19-Mar-2017 18-Mar-2018
Validity	24-Mar-2012~23-Mar-2013 23-Mar-2013~22-Mar-2014 22-Mar-2014~21-Mar-2015 21-Mar-2015~20-Mar-2016 20-Mar-2016~19-Mar-2017 19-Mar-2017~18-Mar-2018 18-Mar-2018~17-Mar-2019	24-Mar-2012~23-Mar-2013 23-Mar-2013~22-Mar-2014 22-Mar-2014~21-Mar-2015 21-Mar-2015~20-Mar-2016 20-Mar-2016~19-Mar-2017 19-Mar-2017~18-Mar-2018 18-Mar-2018~17-Mar-2019

Data Management System

- Particular staff were appointed by the instance implementer to take the overall responsibility for monitoring emission reductions and keeping all the data collected as part of monitoring archived electronically.
- Electronic data and documents were regularly copied and archived, and kept at least for two years after the end of the last crediting period or two years after the last issuance of VCUs, whichever is later.
- Written data and documents were copied and archived and kept for at least two years after the end of the last crediting period or two years after the last issuance of VCUs, whichever is later.

Quality Assurance and Quality Control Procedure

Particular QC staff were appointed by the Project Owner to take the overall responsibility of calibrating monitoring equipment, managing and processing the monitored data according

to QA/QC procedure provided in Section E.7.1. If something unusual, the Project Manager should be immediately reported.

Training

All staff involved in the instance received relevant training and ensure that only trained staffs are involved in the operation of the monitoring system.

Emergency

In case of emergencies, the instance operator didn't claim emission reductions due to the instance for the duration of the emergency. The instance operator would follow the procedure for declaring the emergency period to be over:

- 1) The instance operator ensured that all requirements for monitoring of emission reductions have been re-established.
- 2) The chief person who responsible for the plant and the operator both signed a statement to declare the emergency has been ended and normal operation has been resumed.

There was no emergency occurred during this monitoring period.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline Emissions (BE_y) is determined by multiplying the net quantity of electricity delivered to the grid by a typical instance ($EG_{\text{facility},y}$) during the monitoring period by Emission Factor ($EF_{\text{grid},\text{CM},y}$) of NWPG. As stated in Section 4.1, the grid emission factor $EF_{\text{grid},\text{CM},y}$ of the project during this monitoring period is 0.83115 tCO₂e/MWh

$$BE_y = EG_{\text{facility},y} * EF_{\text{grid},\text{CM},y} = 1,265,672 \text{tCO}_2$$

The yearly electricity data is listed in the table below.

Table 5-1 The yearly data of 7 instances

I01. Dazhaitan				
Period	$EG_{\text{output},y}$ (MWh)	$EG_{\text{input},y}$ (MWh)	$EG_{\text{facility},y}$ (MWh)	BE_y (tCO ₂ e)
23-Jan-2013~31-Dec-2013	59,038.803	491.040	58,547.763	48,661

01-Jan-2014~31-Dec-2014	39,352.160	701.360	38,650.800	32,124
01-Jan-2015~31-Dec-2015	60,854.172	830.720	60,023.452	49,888
01-Jan-2016~31-Dec-2016	50,678.074	1,724.800	48,953.274	40,687
01-Jan-2017~31-Dec-2017	48,533.860	1,619.200	46,914.660	38,993
01-Jan-2018~31-Dec-2018	63,226.013	1,452.000	61,774.013	51,343
Total (23-Jan-2013-31-Dec-2018)	321,683.082	6,819.120	314,863.962	261,696
I02. Heqingtian				
Period	EG _{output,y} (MWh)	EG _{input,y} (MWh)	EG _{facility,y} (MWh)	BE _y (tCO _{2e})
23-Jan-2013~31-Dec-2013	1.249	65.120	-63.871	-53
01-Jan-2014~31-Dec-2014	38,762.547	701.360	38,061.187	31,634
01-Jan-2015~31-Dec-2015	48,967.414	830.720	48,136.694	40,008
01-Jan-2016~31-Dec-2016	50,112.674	1,724.800	48,387.874	40,217
01-Jan-2017~31-Dec-2017	49,910.180	1,619.200	48,290.980	40,137
01-Jan-2018~31-Dec-2018	64,352.348	1,452.000	62,900.348	52,279
Total (23-Jan-2013-31-Dec-2018)	252,106.412	6,393.200	245,713.212	204,222
I03. Wulan				
Period	EG _{output,y} (MWh)	EG _{input,y} (MWh)	EG _{facility,y} (MWh)	BE _y (tCO _{2e})

23-Jan-2013~31-Dec-2013	19,913.930	0.000	19,913.930	16,551
01-Jan-2014~31-Dec-2014	34,787.060	877.235	33,909.825	28,184
01-Jan-2015~31-Dec-2015	32,435.210	660.889	31,774.321	26,409
01-Jan-2016~31-Dec-2016	28,465.370	695.971	27,769.399	23,080
01-Jan-2017~31-Dec-2017	29,750.070	720.942	29,029.128	24,127
01-Jan-2018~31-Dec-2018	27,934.630	797.718	27,136.912	22,554
Total (23-Jan-2013-31-Dec-2018)	173,286.270	3,752.755	169,533.515	140,905
I04. Pishan				
Period	EG _{output,y} (MWh)	EG _{input,y} (MWh)	EG _{facility,y} (MWh)	BE _y (tCO _{2e})
23-Jan-2013~31-Dec-2013	59.600	16.800	42.800	35
01-Jan-2014~31-Dec-2014	25,953.247	520.577	25,432.670	21,138
01-Jan-2015~31-Dec-2015	18,387.142	501.936	17,885.206	14,865
01-Jan-2016~31-Dec-2016	17,216.652	508.098	16,708.554	13,887
01-Jan-2017~31-Dec-2017	18,541.878	532.904	18,008.974	14,968
01-Jan-2018~31-Dec-2018	22,251.187	595.496	21,655.691	17,999
Total (23-Jan-2013-31-Dec-2018)	102,409.706	2,675.811	99,733.895	82,892

I05. Hami				
Period	EG _{output,y} (MWh)	EG _{input,y} (MWh)	EG _{facility,y} (MWh)	BE _y (tCO _{2e})
23-Jan-2013~31-Dec-2013	41.141	0.000	41.141	34
01-Jan-2014~31-Dec-2014	28,113.483	366.100	27,747.383	23,062
01-Jan-2015~31-Dec-2015	19,893.712	426.300	19,467.412	16,180
01-Jan-2016~31-Dec-2016	20,988.375	1,042.900	19,945.475	16,577
01-Jan-2017~31-Dec-2017	27,806.243	401.100	27,405.143	22,777
01-Jan-2018~31-Dec-2018	28,142.707	466.200	27,676.507	23,003
Total (23-Jan-2013-31-Dec-2018)	124,985.661	2,702.600	122,283.061	101,633
I06. Zhaoyang				
Period	EG _{output,y} (MWh)	EG _{input,y} (MWh)	EG _{facility,y} (MWh)	BE _y (tCO _{2e})
23-Jan-2013~31-Dec-2013	30,859.905	667.920	30,191.985	25,094
01-Jan-2014~31-Dec-2014	109,160.297	1,329.240	107,831.057	89,623
01-Jan-2015~31-Dec-2015	48,910.365	1,473.753	47,436.612	39,426
01-Jan-2016~31-Dec-2016	47,314.128	1,712.040	45,602.088	37,902
01-Jan-2017~31-Dec-2017	51,889.321	1,820.280	50,069.041	41,614
01-Jan-2018~31-Dec-2018	61,011.248	2,107.380	58,903.868	48,957

Total (23-Jan-2013-31-Dec-2018)	349,145.264	9,110.613	340,034.651	282,616
I07. Sanyang				
Period	EG _{output,y} (MWh)	EG _{input,y} (MWh)	EG _{facility,y} (MWh)	BE _y (tCO _{2e})
23-Jan-2013~31-Dec-2013	0.000	667.920	-668	-555
01-Jan-2014~31-Dec-2014	30,642.872	1,997.160	28,645.712	24,364
01-Jan-2015~31-Dec-2015	48,910.365	1,473.753	47,436.612	39,426
01-Jan-2016~31-Dec-2016	47,314.128	1,712.040	45,602.088	37,902
01-Jan-2017~31-Dec-2017	51,889.321	1,820.280	50,069.041	41,614
01-Jan-2018~31-Dec-2018	61,011.248	2,107.380	58,903.868	48,957
Total (23-Jan-2013-31-Dec-2018)	239,767.934	9,110.613	230,657.321	191,708
Period	EG _{output,y} (MWh)	EG _{input,y} (MWh)	EG _{facility,y} (MWh)	BE _y (tCO _{2e})
Total (23-Jan-2013-31-Dec-2018)	1,563,384.329	40,564.712	1,522,819.617	1,265,672

5.2 Project Emissions

The project is a renewable energy project, therefore, according to methodology ACM0002, there is no emission for the project, PE_y=0.

5.3 Leakage

According to methodology ACM0002, project leakage is not considered.

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
23-Jan-2013 ~31-Dec-2013	89,767	0	0	89,767
01-Jan-2014 ~31-Dec-2014	250,129	0	0	250,129
01-Jan-2015 ~31-Dec-2015	226,202	0	0	226,202
01-Jan-2016 ~31-Dec-2016	210,252	0	0	210,252
01-Jan-2017 ~31-Dec-2017	224,230	0	0	224,230
01-Jan-2018 ~31-Dec-2018	265,092	0	0	265,092
Total from 23-Jan-2013 to 31-Dec-2018	1,265,672	0	0	1,265,672

The total emission reduction during this monitoring period is 1,265,672 tCO₂e. According to the registered PDD, the expected annual emission reduction is 302,268 tCO₂e, then the expected emission reduction during this monitoring period (23-Jan-2013 to 31-Dec-2018) is 1,730,853 tCO₂e, calculated through the table below:

Period	Value estimated (tCO ₂ e)
23-Jan-2013~31-Dec-2013	135,593
2014	319,052
2015	319,052
2016	319,052
2017	319,052

2018	319,052
Total	1,730,853

The variation between the estimated value and actual value is -26.88%⁵. There are several raisons:

1. The commission dates of instance are different: the earliest commission date is Instance 03 Wulan Station, 23-Jan-2013, and the latest date is Instance 02 Heqingtian Station, 26-Dec-2013, there is a large gap between different instances start date, but the starting time of the grouped project is calculated from the earliest operation date of the instance, so it is normal to have an error between the actual power generation and the expected power generation. The Table 5-2 presents all the instances' commission date.

Table 5-2 Instance's commission date table

Instance	Commission date
Instance 01 Dazhaitan	06-Mar-2013
Instance 02 Heqingtian	26-Dec-2013
Instance 03 Wulan	23-Jan-2013
Instance 04 Pishan	21-Dec-2013
Instance 05 Hami	26-Dec-2013
Instance 06 Zhaoyang	20-Jul-2013
Instance 07 Sanyang	30-Jun-2013

2. Due to the supplied electricity ration and equipment maintenance, the illumination intensity in some months is insufficient, so this variation is within a reasonable range.

The comparison of the actual emission reduction and estimated value for different instances is provided in the Table 5-3:

Instance ID	Actual emission reduction during the monitoring period/ tCO ₂ e	Estimated emission reduction during the monitoring period/ tCO ₂ e	Variation between the actual value and estimated value
Instance 01 Dazhaitan	261,696	342,029	-23.49%
Instance 02 Heqingtian	204,222	303,499	-32.71%

⁵ -26.88%=(1,265,672 tCO₂e -1,730,853 tCO₂e)/1,730,853tCO₂e

Instance 03 Wulan	140,905	154,112	-8.57%
Instance 04 Pishan	82,892	108,711	-23.75%
Instance 05 Hami	101,633	128,982	-21.20%
Instance 06 Zhaoyang	282,616	340,922	-17.10%
Instance 07 Sanyang	191,708	352,598	-45.63%
Total	1,265,672	1,730,853	-26.88%