

Gold standard for the global goals Monitoring report



June 2017, version 1

Title of the project	Hunan Guanbaodu-Liangjiangkou Small-scale Hydropower Bundle Project
Gold Standard project id	835
Version number of the monitoring report	3.0
Completion date of the monitoring report	16/06/2020
Date of project design certification	31/12/2010
Start date of crediting period	01/01/2009
Duration of this monitoring period	(01/01/2019) to (31/12/2019)
Duration of previous monitoring period	(01/01/2018) to (31/12/2018)
Project representative(s)	Climate Bridge Ltd.
Host Country	P. R. China
Certification pathway (activity certification/impact certification)	Impact certification
SDG Contributions targeted (as per approved PDD)	SDG 5 Impacts SDG 7 Impacts SDG 8 Impacts Certified SDG 13 Impacts – Emission reductions
Gold Standard statement/product certification sought (GSVER/ADALYs/RECs etc.)	GS VER
Selected methodology(ies)	CDM Methodology ACM0002 (Version 16.0)
Estimated amount of annual average certified SDG impact (as per approved PDD)	SDG 5 Impacts: Women employees: 4 SDG 7 Impacts: Renewable power generation: 21,612 MWh/year SDG 8 Impacts: SDG 8.3.1 for job positions and training opportunities: 23 SDG 8.5.1 for salary level: 1,100-3,773 RMB/month SDG 13 Impacts: 12,930 t GSVERs/year
Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period	SDG 5 Impacts: Women employees: 2 SDG 7 Impacts: Renewable power generation: 23,763.19 MWh/year SDG 8 Impacts: SDG 8.3.1 for job positions and training opportunities: 21 SDG 8.5.1 for salary level: 3,015 RMB/month SDG 13 Impacts: 14,216 t GSVERs

SECTION A. Description of project

A.1. Purpose and general description of project

>> *(Provide a brief summary of the detailed description given in section B.1 including purpose of the project, brief description of the installed technology and equipment and relevant dates for the project (e.g. construction start/end, commissioning, continued operation periods, etc.)*

The total installed capacity of the bundled Project is 5.89MW, with an estimated annual net electricity generation of 21,612 MWh which will be delivered into CCPG. The bundled project started operation since January 2008 and have been implemented continuously during this monitoring period (01/01/2019 - 31/12/2019).

The bundled project uses run-of-the-river hydropower technology to generate electricity. The water from the river is diverted through the diversion dam and the water diversion system to the power house, fueling the turbines for electricity generation.

The bundled project was registered as a Gold Standard project on 31/12/2010 and the start date of the first crediting period of the bundled project is defined as 01/01/2009. The chosen crediting period is 7 years and the second crediting period is from 01/01/2016 to 31/12/2022. This monitoring period (01/01/2019~31/12/2019) is the eighth monitoring period, and the net electricity generated during this monitoring period is 23,763.19 MWh, the total emission reduction being claimed in this monitoring period is 14,216 tCO₂e.

The bundled project contributes to sustainable development through the reduction of GHG emissions and other pollutants associated with the standard practice of fossil fuel fired power plants in the region. It also contributes to ensuring the local power supply by generating reliable hydropower, promoting the local economy development and improvement of livelihoods by creating job opportunities, and construct power transmission lines.

A.2. Location of project

>> *(Provide host country, state/province, city/town details along with GPS co-ordinates.)*

Guanbaodu is located on the lower reach of Qushui River in Guanbaodu Village, Taiyangping Town, Jingzhou Miao & Dong Autonomous County, Huaihua City, Hunan Province of China, and the project is 16 km from Jingzhou County and the geographical coordinates are east longitude 109°44'09" and north latitude 26°40'38".

Liangjiangkou is located on the Tongdao River in Liangjiangkou Village, Shuangjiang Town, Tongdao Dong Autonomous County, Huaihua City, Hunan Province of China, and the project is 8.5 km away from Tongdao County and the geographical coordinates are east longitude 109°47'45" and north latitude 26°13'11".

A.3. Reference of applied methodology

>> *(Indicate title and version number of the methodology.)*

Methodology ACM0002 (Version 16.0): "Grid-connected electricity generation from renewable sources"

A.4. Crediting period of project

>> *(Provide start date and length of the crediting period as given in approved PDD.)*

The second renewable crediting period of the bundled project is: 01/01/2016~31/12/2022.

SECTION B. Implementation of project

B.1. Description of implemented project

>> *(Provide information on the implementation status of the project during this monitoring period. Specify any deviations / delays compared to information in approved project.)*

The Hunan Guanbaodu-Liangjiangkou Small-scale Hydropower Bundle Project (hereafter referred to as “the bundled project”) consists of two hydropower projects in Huaihua City, Hunan Province, P.R. China. The total installed capacity of the bundle project is 5.89 MW, and the electricity will be transferred to Central China Power Grid (CCPG). The construction of Guanbaodu Hydropower Station (hereafter referred to as “Guanbaodu”) commenced in August 2005 with an installed capacity of 4 MW, and its operation started in January 2008; and the construction of Liangjiangkou Hydropower Station (hereafter referred to as “Liangjiangkou”) commenced in August 2006 with an installed capacity of 1.89 MW, and its operation started in January 2008. The bundled project was registered under GS Version 1.0 (GS ID 835) on 31/12/2010 and has completed the transition to GS4GG on 29/10/2019 with a renewable crediting period of 3*7 years. The first crediting period is from 01/01/2009 to 31/12/2015 and the second crediting period is from 01/01/2016 to 31/12/2022. During this monitoring period from 01/01/2019 to 31/12/2019, the net electricity generated of Guanbaodu and Liangjiangkou is 15,642.32 and 8,120.87 MWh, respectively. The total net electricity generated is 23,763.19 MWh, and the total emission reduction is 14,216 tCO_{2e}.

No events or deviations that may impact the GHG emission reductions or removals and monitoring occurred.

The key technical parameters of the bundled project are listed in the table below:

Table B-1 Technical parameters of the bundled projects

Item	Unit	Parameter	
		Guanbaodu	Liangjiangkou
Turbine			
Quantity	/	4	3
Model	/	GD008-WZ-275	Z003-LH-160
Rated Power	kW	1,097	700
Rated water head	m	3.4	6.8
Rotate speed	r/min	133.3	250
Generator			
Quantity	/	4	3
Model	/	SFW1000-10/1430	SF630-24/1730
Rated Power	kW	1,000	630
Rated voltage	V	6,300	400
Rated current	A	114	113
Rated rotate speed	r/min	600	250
Power factor	/	0.8	0.8

B.2. Post-registration changes

B.2.1. Temporary deviations from Certified Key Project Information, Project Design Document, Monitoring & Reporting Plan, applied methodology or applied standardized baseline

>> (Indicate whether any temporary deviations have been applied during this monitoring period. If applied, provide a description of the deviation(s). Include the reasons for the deviation(s), how it deviates from the monitoring plan, applied methodology(ies) and/or applied approaches, the duration for which the deviation(s) is(are) applicable and justification on the conservativeness of the approach. Also indicate if prior approval from GS-TAC have been sought on the deviation.)

NA.

B.2.2. Corrections

>> (Indicate whether any corrections to project information or parameters fixed at validation have been applied.)

NA.

B.2.3. Changes to start date of crediting period

>> (Indicate whether any changes to the start date of the crediting period have been approved by Gold Standard that is relevant for this monitoring period.)

NA.

B.2.4. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

>> (Indicate whether any permanent changes from the approved monitoring plan, applied methodologies or applied approaches have been approved by GS-TAC that is relevant for this monitoring period.)

NA.

B.2.5. Changes to project design of approved project

>> (Indicate whether any changes to the design of the project have been approved by GS-TAC that is relevant for this monitoring period.)

The project used to consist of three hydropower projects, the Guanbaodu hydropower project (referred as 'Guanbaodu'), the Liangjiangkou hydropower project (referred as 'Liangjiangkou') and the Xinglong hydropower project (referred as 'Xinglong'). The total installed capacity of the bundle project was 7.65 MW with annual expected net electricity generation (electricity supplied to power grid) of 27,745MWh.

Upon a design change request on 08/08/2014, the project participants changed the design of the project by removing one of the hydropower projects (Xinglong) from the bundled project. The rest two projects were still bundled and nothing else changed. The design change has been approved by GS registry on 03/09/2014.

As a result, the changed project only consists of two hydropower projects (Guanbaodu and Liangjiangkou), and the installed capacity is 5.89 MW with annual expected net electricity generation of 21,612 MWh. Also, the project title has also been changed from 'Guanbaodu-Liangjiangkou-Xinglong Small-scale Hydropower Bundle Project' to 'Guanbaodu-Liangjiangkou Small-scale Hydropower Bundle Project'.

SECTION C. Description of monitoring system applied by the project

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1. Operational and management structure

The monitoring of the emissions reductions of all the bundled projects are basically the same as each other. The monitoring process will be carried out according to the operation and management structure shown in Figure C-1:

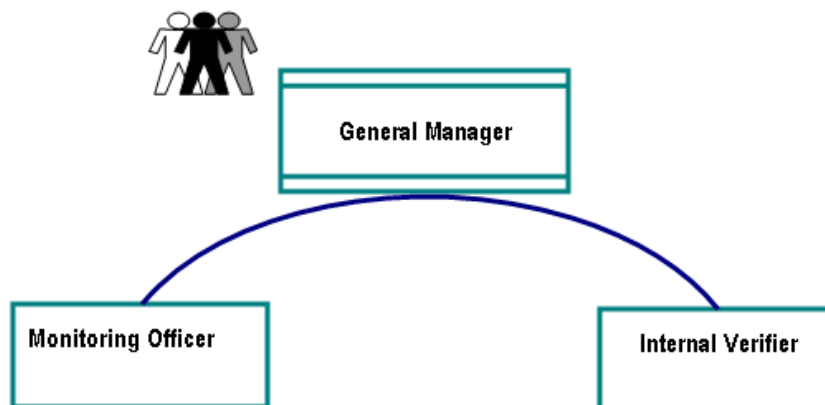


Figure C-1 Operations and Management Structure

1) The General Manager conducts the overall responsibility for the monitoring process.

2) Station staff serves as the monitoring officer to carry out the measurement of the exports and imports electricity recordings. A staff in monitoring officer carries out the measurement of technical training recordings and stakeholders' questionnaires about water quality, solid wastes and biodiversity.

3) An accountant worked as internal verifier is responsible for internal verification of the measurement, collection of electricity receipts and invoices, monthly payroll contains the information about employees' name, gender and salary, stakeholders' questionnaires, technical training recordings and the calculation of the emission reductions.

2. Monitoring data and procedures

The baseline and monitoring methodology applied for the project is methodology ACM0002 (Version 16.0): "Grid-connected electricity generation from renewable sources".

Guanbaodu:

The monitoring officer carries out technical training meetings and the stakeholders' questionnaires annually, and the accountant provides electricity receipts or invoices and monthly payroll which contain the information about employees' name, gender and salary every year. During this monitoring period, the technical trainings were provided and recorded on 08/03/2019 and 20/06/2019 separately, the stakeholder questionnaires contained water quality, solid wastes and biodiversity were distributed and collected on 15/04/2019.

As Figure C-2 the electricity connection diagram of Guanbaodu shown, the electricity generated from 4 generators were delivered into the main transformer through a 6.3 kV transmission line, and then transformed into 35 kV which were delivered into GanTang Substation and then connected to CCPG finally. The bidirectional gateway meter M2 (main meter) owned by local power company is installed at GanTang Substation to measure the electricity exported to the grid and imported from the grid, and the meter M1 (backup meter) owned by the Guanbaodu Hydropower Station is installed at the high voltage side of the main transformer in Guanbaodu Hydropower Station for crosscheck.

The readings of gateway meter (M2) were recorded on a monthly basis, and the Electricity Transaction Note (ETN) was served as additional check for quality control. The readings of M1 were recorded in daily log by the technical staff at the power station every day. All data will be archived for at least 2 years after the end of the last crediting period.

M1 and M2 were installed and verified according to Technical Administrative Code of Electricity Energy Metering (DL/T448-2000) and the calibration of the meters was made once a year by the Measurement Institute of Jingzhou Power Co., Ltd. to secure the measurement accuracy.

If M2 is detected any failure but M1 operates normally, the emission reduction will be calculated by the readings of M1. The faulty meter will be repaired or replaced by the accredited equipment testing organization as soon as possible. If malfunction occurs for both M1 and M2, no emission reductions will be claimed until the malfunction is fixed.

No failure of the meters occurred during this monitoring period.

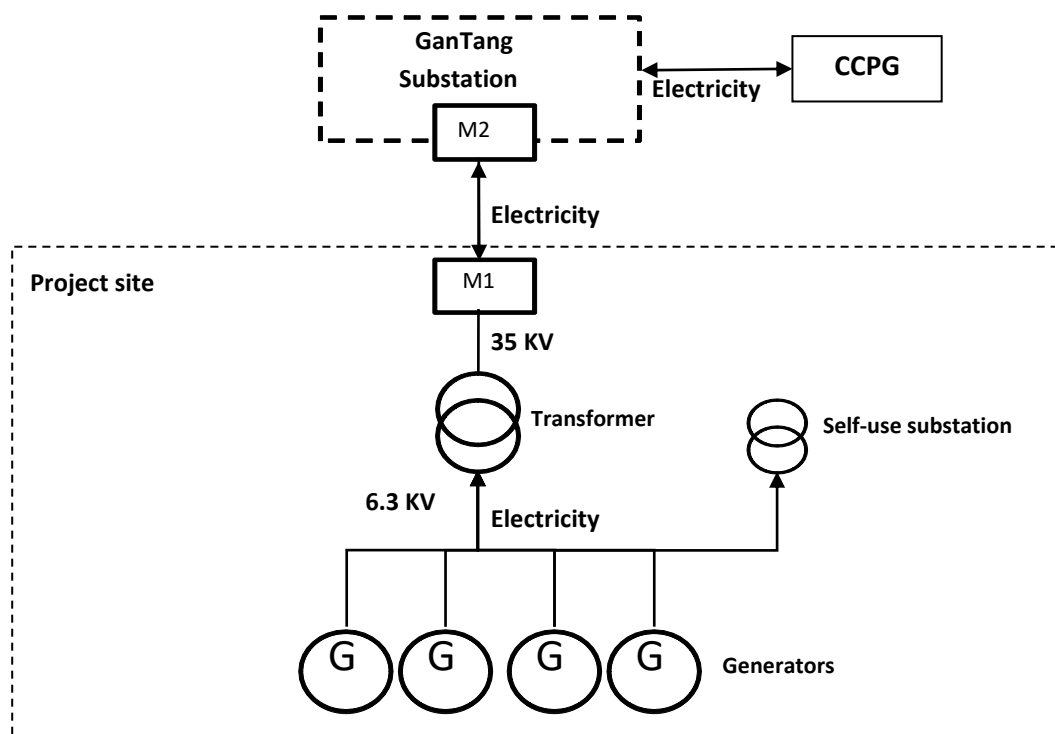


Figure C-2 Electricity connection diagram of Guanbaodu

Liangjiangkou:

The monitoring officer carries out technical training meetings and the stakeholders' questionnaires annually, and the accountant provides electricity receipts or invoices and monthly payroll which contain the information about employees' name, gender and salary every year. During this monitoring period, the technical training was provided and recorded on 03/05/2019, the stakeholder questionnaires contained water quality, solid wastes and biodiversity were distributed and collected on 15/04/2019.

As Figure C-3 the electricity connection diagram of Liangjiangkou shown, the electricity generated from 3 generators were delivered into the two main transformers through 2 separate transmission line of 6.3 kV and then transformed into 35 kV which were delivered into Shuangjiang Substation and connected to CCPG finally. The bidirectional gateway meter M1 owned by local power company is installed at Shuangjiang Substation and to measure and record the electricity exported to the grid and imported from the grid.

The readings of gateway meter (M1) were recorded on a monthly basis, and the Electricity Transaction Note (ETN) was served as additional check for quality control. All data will be archived for at least 2 years after the end of the last crediting period.

M1 was installed and verified according to Technical Administrative Code of Electricity Energy Metering (DL/T448-2000). The operation of M1 was checked periodically by the Tongdao Power Company and calibrated once every year.

If M1 is detected any failure, no emission reductions will be claimed until the malfunction is fixed.

No failure of the meter occurred during this monitoring period.

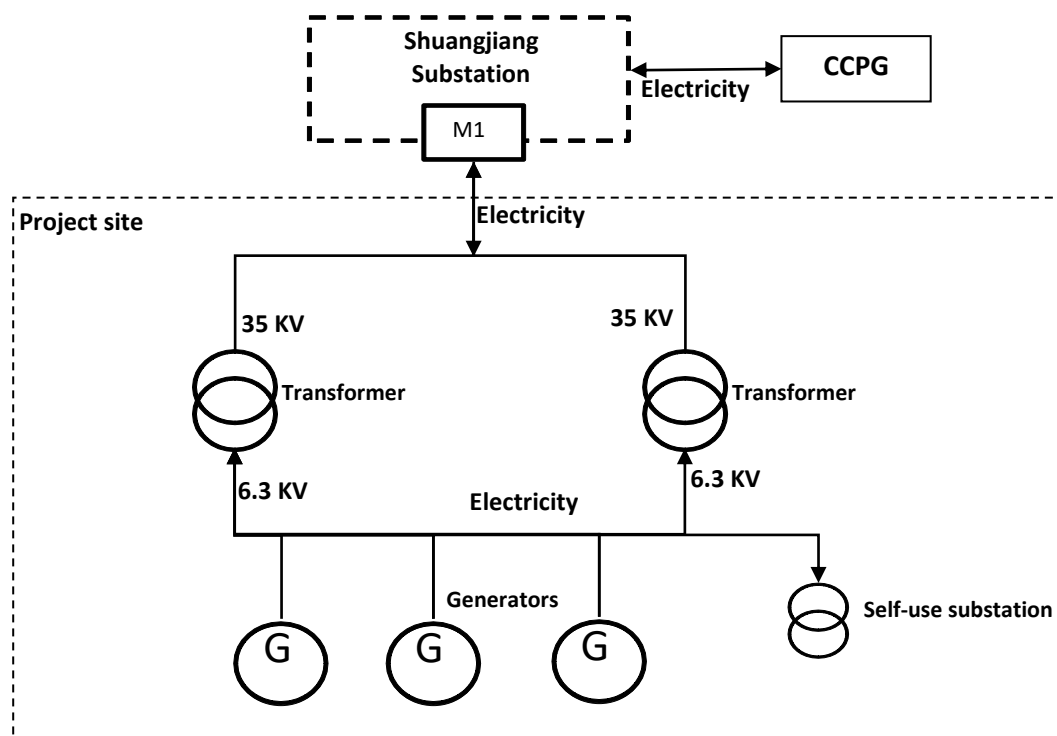


Figure C-3 Electricity connection diagram of Liangjiangkou

3. Quality control (QC) and quality assurance (QA)

Besides data management procedure described above, the project owner also takes the following procedures to ensure the operation and accuracy:

- 1) All meters are installed in accordance with the national Chinese standard Technical Administrative Code of Electricity Energy Metering (DL/T448-2000).
- 2) All relevant staff receives training periodically to improve their know-how and performance.
- 3) A monitoring and management manual identifying detailed duties and responsibilities of the relevant parties has been developed by Climate Bridge Ltd., and will be served as a basis of the project monitoring.
- 4) All data will be archived for at least 2 years after the end of the last crediting period.

4. Emergency procedure:

For Guanbaodu: If the readings of gateway meter M2 are not within the acceptable precision level at any month or the meter works abnormally, the readings of the backup meter M1 will be used for ER calculation with deduction of the transmission loss., In the case that the readings of both meters are not within the acceptable precision level, the net electricity supplied to grid will be confirmed based on the conventional process accepted by project owner and Grid Company. If such happens, relevant proof will be achieved by both parties and submitted for verification.

For Liangjiangkou: If the readings of gateway meter M1 are not within the acceptable precision level at any month or the meter works abnormally, the net electricity supplied to grid will be confirmed based on the conventional process accepted by project owner and Grid Company. If such happens, relevant proof will be achieved by both parties and submitted for verification.

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter)

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter:	$EF_{grid,OM,y}$
Unit	tCO ₂ e/MWh
Description	Operating margin emission factor for Central China Power Grid
Source of data	The weighted average emission factors of year 2010-2012 China DNA
Value(s) applied	0.9724
Choice of data or measurement methods and procedures	Calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" (version 05.0) by China DNA
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comments	Calculated ex ante and fixed for the second crediting period

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter:	$EF_{grid,BM,y}$
Unit	tCO ₂ e/MWh
Description	Build margin emission factor for Central China Power Grid
Source of data	Calculation after considering the installed capacity and shut down unit capacity
Value(s) applied	0.4737
Choice of data or measurement methods and procedures	Calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" (version 05.0) by China DNA
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comments	Calculated ex ante and fixed for the second crediting period

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter:	ω_{OM}
Unit	-
Description	Weighting of operating margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system" (version 05.0)
Value(s) applied	0.25
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comments	Calculated ex ante and fixed for the second crediting period

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter:	OBM
Unit	-
Description	Weighting of build margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system" (version 02.0)
Value(s) applied)	0.75
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comments	Calculated ex ante and fixed for the second crediting period

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter:	$EF_{grid,CM,y}$
Unit	tCO _{2e} /MWh
Description	Baseline emission factor for Central China Power Grid
Source of data	"2010-2012 Baseline Emission Factors for Regional Power Grids in China" published by China DNA
Value(s) applied)	0.5983
Choice of data or measurement methods and procedures	Calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" (version 05.0) by China DNA
Purpose of data	Baseline emission calculation
Additional comments	Calculated ex ante and fixed for the second crediting period

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter)

Relevant SDG Indicator	Safeguarding Principles 4.2: Water
Data/parameter:	Water quality
Unit	Level of management
Description	The impact of waste water on local water body the operation period
Measured/calculated/default	Measured
Source of data	12 pieces of Stakeholders' questionnaires replies for Guanbaodu and Liangjiangkou were received on 15/04/2019, respectively. Stakeholders' questionnaires contained some questions as follows: 1. Do you think that the waste water produced from the project has unfriendly influence on water quality? 2. Do you think that the solid waste produced from the project has unfriendly influence on local environment? 3. Do you think that the project operation has unfriendly influence on local biodiversity?
Value(s) of monitored parameter	No negative impact
Monitoring equipment	/
Measuring/reading/recording frequency:	Yearly during the operation period

Calculation method (if applicable):	/
QA/QC procedures:	/
Purpose of data:	Assessment of Safeguarding Principles
Additional comments:	This parameter can be used to demonstrate SDG 13: Climate and action and Safeguarding Principles 4.2: Water.

Relevant SDG Indicator	Safeguarding Principles 4.3: Environment, ecology and land use
Data/parameter:	Solid wastes
Unit	Level of management
Description	Management of the domestic rubbish during the operation period
Measured/calculated/default	Measured
Source of data	12 pieces of Stakeholders' questionnaires replies for Guanbaodu and Liangjiangkou were received on 15/04/2019, respectively. Stakeholders' questionnaires contained some questions as follows: 1. Do you think that the waste water produced from the project has unfriendly influence on water quality? 2. Do you think that the solid waste produced from the project has unfriendly influence on local environment? 3. Do you think that the project operation has unfriendly influence on local biodiversity?
Value(s) of monitored parameter	No negative impacts
Monitoring equipment	/
Measuring/reading/recording frequency:	Yearly during operation period
Calculation method (if applicable):	/
QA/QC procedures:	/
Purpose of data:	Assessment of Safeguarding Principles
Additional comments:	This parameter can be used to demonstrate SDG 13: Climate and action and Safeguarding Principles 4.3: Environment, ecology and land use.

Relevant SDG Indicator	Safeguarding Principles 4.3: Environment, ecology and land use
Data/parameter:	Biodiversity (species and habitat conservation)
Unit	Degree of Biodiversity
Description	The impacts of project activity on fish and organism species and habitats
Measured/calculated/default	Measured
Source of data	12 pieces of Stakeholders' questionnaires replies for Guanbaodu and Liangjiangkou were received on 15/04/2019, respectively. Stakeholders' questionnaires contained some questions as follows: 1. Do you think that the waste water produced from the project has unfriendly influence on water quality? 2. Do you think that the solid waste produced from the project has unfriendly influence on local environment? 3. Do you think that the project operation has unfriendly influence on local biodiversity?
Value(s) of monitored parameter	No negative impacts
Monitoring equipment	/
Measuring/reading/recording frequency:	Yearly during operation period
Calculation method (if applicable):	/

QA/QC procedures:	According to EIA, there will be no considerable effects on fish and organism species and habitats due to the project activity and no extinction of any animals will happen. The outcome of Report for the Examination and Acceptance of Completed Project has also concluded that the measures of ecological conservation have been well implemented.
Purpose of data:	Assessment of Safeguarding Principles
Additional comments:	This parameter can be used to demonstrate Safeguarding Principles 4.3: Environment, ecology and land use.

Relevant SDG Indicator	SDG Indicator 5.1.1: Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex
Data/parameter:	Women employees
Unit	Number
Description	The job positions for local women provided by the project.
Measured/calculated/default	Measured
Source of data	The monthly payroll contains the information about employees' name, gender and salary. Number of women employees are to be check.
Value(s) of monitored parameter	1 (Guanbaodu provides 14 job positions for local in total, including 1 job position for woman and 13 job positions for men) 1 (Liangjiangkou provides 7 job positions for local in total, including 1 job position for woman and 6 job positions for men)
Monitoring equipment	/
Measuring/reading/recording frequency:	Monthly
Calculation method (if applicable):	/
QA/QC procedures:	/
Purpose of data:	Assessment SDG target
Additional comments:	/

Relevant SDG Indicator	SDG Indicator 7.2.1: Renewable energy share in the total final energy consumption
Data/parameter:	Renewable power generation (Access to energy service)
Unit	MWh/y
Description	The amount of electricity the power plant supplies to the local which could release the local power shortage to a certain extent
Measured/calculated/default	Measured
Source of data	The monthly power sales receipt received from the local grid company
Value(s) of monitored parameter	15,642.32 (Guanbaodu) 8,120.87 (Liangjiangkou)
Monitoring equipment	Meter
Measuring/reading/recording frequency:	Monthly
Calculation method (if applicable):	/
QA/QC procedures:	/
Purpose of data:	Assessment of SDG target
Additional comments:	/

Relevant SDG Indicator	SDG Indicator 8.3.1: Proportion of informal employment in non-agriculture employment, by sex
Data/parameter:	Training opportunities (human and institutional capacity)
Unit	/
Description	Technical training provided by the project
Measured/calculated/default	Measured
Source of data	The training records and relevant technical certificates of the employees are to be check.
Value(s) of monitored parameter	14 (Guanbaodu) 7 (Liangjiangkou)
Monitoring equipment	/
Measuring/reading/recording frequency:	Monthly
Calculation method (if applicable):	/
QA/QC procedures:	/
Purpose of data:	Assessment of SDG target
Additional comments:	/

Relevant SDG Indicator	SDG Indicator 8.3.1: Proportion of informal employment in non-agriculture employment, by sex
Data/parameter:	Employment (including job quality, fulfillment of labor standards)
Unit	Number
Description	The numbers of employees of permanent jobs provided by the project
Measured/calculated/default	Measured
Source of data	The monthly payroll contains the information about employees' name, gender and salary. Number of employees are to be check.
Value(s) of monitored parameter	14 (Guanbaodu) 7 (Liangjiangkou)
Monitoring equipment	/
Measuring/reading/recording frequency:	Monthly
Calculation method (if applicable):	/
QA/QC procedures:	/
Purpose of data:	Assessment of SDG target
Additional comments:	/

Relevant SDG Indicator	SDG Indicator 8.5.1: Average hourly earnings of female and male employees, by occupation, age and persons with disabilities
Data/parameter:	Salary level (Livelihood of the poor)
Unit	RMB
Description	Salary of employees of the project
Measured/calculated/default	Measured
Source of data	The monthly payroll contains the information about employees' name, gender and salary. Number of employees are to be check.

Value(s) of monitored parameter	The salary of permanent employees is in the range from 2,751 to 4,167 RMB/month with an average of 3,658 RMB/month (Guanbaodu) The salary of permanent employees is in the range from 800 to 2,500 RMB/month with an average of 1,729 RMB/month (Liangjiangkou) The average salary level of the bundled project is 3,015 $((3,658 \times 14 + 1,729 \times 7) / 21 = 3,015)$ RMB/month, higher than the average level 1,220 RMB/month in of Hunan Province in 2019.
Monitoring equipment	/
Measuring/reading/recording frequency:	Monthly
Calculation method (if applicable):	/
QA/QC procedures:	/
Purpose of data:	Assessment of SDG target

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions					
Data/parameter:	Electricity export (EG _{export})					
Unit	MWh					
Description	Electricity delivered to the power grid generated by the project					
Measured/calculated/default	Measured					
Source of data	Meter readings					
Value(s) of monitored parameter	15,662.57 (Guanbaodu) 8,129.07 (Liangjiangkou)					
Monitoring equipment	Meter					
Measuring/reading/recording frequency:	Continuous measurement and monthly recording					
Calculation method (if applicable):	/					
QA/QC procedures:	Meter readings are cross-checked by Electricity Transaction Notes (ETN). Specifications of Meters for Guanbaodu are listed below:					
	Meter No.	Type	Serial No.	Accuracy	Date of Calibrations	Validity
	M1	DSSD25	0704575	0.5s	16/05/2018 05/04/2019	16/05/2018-15/05/2019 05/04/2019-04/04/2020
	M2	DSZ331	120100000049	0.5s	16/05/2018 05/04/2019	16/05/2018-15/05/2019 05/04/2019-04/04/2020
	Specifications of Meters for Liangjiangkou are listed below:					
	Meter No.	Type	Serial No.	Accuracy	Date of Calibration	Validity
M1	DSZ331	43480010003697381	0.5s	11/05/2018 11/05/2019	11/05/2018-10/05/2019 11/05/2019-10/05/2020	
Purpose of data:	Assessment of SDG target					
Additional comments:	/					

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions					
Data/parameter:	Electricity import (EG _{import})					
Unit	MWh					
Description	Electricity imported from the power grid by the project					
Measured/calculated/default	Measured					
Source of data	Meter readings					
Value(s) of monitored parameter	20.25 (Guanbaodu) 8.20 (Liangjiangkou)					
Monitoring equipment	Meter					
Measuring/reading/recording frequency:	Continuous measurement and monthly recording					
Calculation method (if applicable):	/					
QA/QC procedures:	Meter readings are cross checked by Electricity Transaction Notes (ETN). Specifications of Meters for Guanbaodu are listed below:					
	Meter No.	Type	Serial No.	Accuracy	Date of Calibrations	Validity
	M1	DSSD25	0704575	0.5s	16/05/2018 05/04/2019	16/05/2018-15/05/2019 05/04/2019-04/04/2020
	M2	DSZ331	120100000049	0.5s	16/05/2018 05/04/2019	16/05/2018-15/05/2019 05/04/2019-04/04/2020
	Specifications of Meters for Liangjiangkou are listed below:					
	Meter No.	Type	Serial No.	Accuracy	Date of Calibration	Validity
M1	DSZ331	43480010003697381	0.5s	11/05/2018 11/05/2019	11/05/2018-10/05/2019 11/05/2019-10/05/2020	
Purpose of data:	Assessment of SDG target					
Additional comments:	/					

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions					
Data/parameter:	Net Electricity supplied to the grid by the project (EG _{PJ,y})					
Unit	MWh					
Description	Net Electricity supplied to the grid by the project					
Measured/calculated/default	Calculated					
Source of data	Meter records					
Value(s) of monitored parameter	15,642.32 (Guanbaodu) 8,120.87 (Liangjiangkou)					

Monitoring equipment	/
Measuring/reading/recording frequency:	Continuous measurement and monthly recording
Calculation method (if applicable):	$EG_{PJ,y} = EG_{\text{export}} - EG_{\text{import}}$
QA/QC procedures:	Meter readings are cross checked by Electricity Transaction Notes (ETN).
Purpose of data:	Assessment of SDG target
Additional comments:	/

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter:	Installed capacity
Unit	MW
Description	Installed capacity of project
Measured/calculated/default	Default
Source of data	Readings of nameplate
Value(s) of monitored parameter	4 (Guanbaodu) 1.89 (Liangjiangkou)
Monitoring equipment	/
Measuring/reading/recording frequency:	Yearly
Calculation method (if applicable):	/
QA/QC procedures:	The installed capacity are checked the nameplates of all the generators installed in the project.
Purpose of data:	Assessment of SDG target
Additional comments:	/

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter:	Area of the reservoir
Unit	m ²
Description	Area of the reservoir
Measured/calculated/default	Measured
Source of data	The third party's report
Value(s) of monitored parameter	328,000 (Guanbaodu) 177,700 (Liangjiangkou)
Monitoring equipment	/
Measuring/reading/recording frequency:	Yearly
Calculation method (if applicable):	/
QA/QC procedures:	The area of the reservoir is measured by local River Management Station
Purpose of data:	Assessment of SDG target
Additional comments:	/

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter:	Power density
Unit	W/m ²
Description	Power density of project
Measured/calculated/default	Calculated
Source of data	/
Value(s) of monitored parameter	12.20 (Guanbaodu) 10.64 (Liangjiangkou)
Monitoring equipment	/
Measuring/reading/recording frequency:	Yearly
Calculation method (if applicable):	Power density= Installed capacity/Area of the reservoir
QA/QC procedures:	The results during the whole verification period are higher than 10W/m ² , therefore, no project emission needs to be taken into account.
Purpose of data:	Assessment of SDG target
Additional comments:	/

D.3. Implementation of sampling plan

>> (If data and parameters monitored described in section D.2 above are determined by a sampling approach, provide a description on how project participants implemented the sampling plan and surveys for those data and parameters according to the approved PDD.)

NA.

SECTION E. Calculation of SDG outcomes

E.1. Calculation of baseline value or estimation of baseline situation of each SDG outcome

>> (Provide details of equations and approaches used to calculate/estimate baseline values.)

SDG 5 Baseline value:

In baseline situation, the Guanbaodu and Liangjiangkou local women would not have obtained job opportunity and enjoyed the basic right and holiday if the bundled project hadn't been implemented. So SDG 5 (Gender and equality: Achieve gender equality and empower all women and girls) cannot be achieved in baseline situation. Therefore, SDG 5 baseline outcome benefit is zero.

SDG 7 Baseline value:

In baseline situation, generation electricity would be from CCPG used other fossil fuel sources to generate electricity in absence of the bundled project. The SDG 7 (Affordable and clean energy: Ensure access to affordable, reliable, sustainable and modern energy for all) cannot be achieved in baseline situation. Therefore, SDG 7 baseline outcome benefit is zero.

SDG 8 Baseline value:

In baseline situation, there is no good job opportunities and basic trainings for local people to improve living conditions and upgrade their skills in absence of the bundled project. The SDG 8 (Decent work and economic growth: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all) cannot be achieved in baseline situation. Therefore, SDG 8 baseline outcome benefit is zero.

SDG 13 Baseline value:

In baseline situation, there is no operation of renewable power generation, all the electricity demand would be supplied by CCPG as usual, and no GHG emission reduction would be achieved, therefore SDG 13 baseline outcome benefit is zero.

E.2. Calculation of project value or estimation of project situation of each SDG outcome

>> (Provide details of equations and approaches used to calculate/estimate project values.)

SDG 5 Project value:

According to SDG Indicator 5.1.1: Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex, Guanbaodu and Liangjiangou provided 1 job position for local women respectively in this monitoring period. Therefore, SDG 5 project outcome is 2.

SDG 7 Project value:

According to SDG Indicator 7.2.1: Renewable energy share in the total final energy consumption, in this monitoring period, net generation electricity of Guanbaodu delivered to the Jingzhou County Grid was 15,642.32 MWh, net generation electricity of Liangjiakou delivered to the Tongdao County Grid was 8,120.87 MWh, displacing electricity generation from fossil fuels and reducing GHG emissions. Therefore, SDG 7 project outcome is 23,763.19 MWh.

SDG 8 Project value:

According to SDG Indicator 8.3.1: Proportion of informal employment in non-agriculture employment, by sex, in this monitoring period, Guanbaodu provided 14 employment positions and carried out twice technical training meetings; Liangjiangkou provided 7 employment positions and carried out once technical training meetings. Therefore, SDG 8.3.1 project outcomes for employment positions and training opportunities provided by the bundled project are 21

According to SDG Indicator 8.5.1: Average hourly earnings of female and male employees, by occupation, age and persons with disabilities in this monitoring period, salary level of Guanbaodu for permanent employees was in the range from 2,751 to 4,167 RMB/month with average of 3,658 RMB/month and Liangjiangkou was in the range from 800 to 2,500 RMB/month with an average of 1,729 RMB/month.

The average salary level of the bundled project was 3,015 $((3,658 \times 14 + 1,729 \times 7) / 21 = 3,015)$ RMB/month. Therefore, SDG 8.3.1 project outcomes for salary level is 3,015 RMB/month

SDG 13 Project value:

According to the registered Transition Annex, Baseline Emissions under SDG 13 are calculated by multiplying the Baseline Emission factor by annual power generation as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad (1)$$

Where:

BE_y = Baseline emissions in year y (t CO₂/y).

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh), $EG_{PJ,y} = EG_{export,y} - EG_{import,y}$.

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system (tCO₂/MWh), the $EF_{grid,CM,y} = 0.5983$ tCO₂e/MW.

The $EF_{grid,CM}$ is equal to 0.5983 tCO₂/MWh, which has been calculated in the Project Design Document and is fixed during the second crediting period.

The monitored data based on meter readings and Electricity Transaction Notes (ETN) for the bundled project. And the $EG_{PJ,y}$, $EG_{export,y}$ and $EG_{import,y}$ for bundled project are shown as following:

Period	Project	$EG_{export,y}$ (Min(meter readings, EIn))	$EG_{import,y}$ (Max(meter readings, EIn))	$EG_{PJ,y} = EG_{export,y} - EG_{import,y}$
		MWh	MWh	MWh
		A	B	C=A-B
01/01/2019~31/12/2019	Guanbaodu	15,662.57	20.25	15,642.32
	Liangjiangkou	8,129.07	8.20	8,120.87
Total		23,791.64	28.45	23,763.19

The formula for calculating baseline emissions is:

$$\text{Guanbaodu: } BE_{Guanbaodu} = EG_{PJ,y} \times EF_{grid,CM,y} = 15,642.32 \times 0.5983 = 9,358 \text{ tCO}_2\text{e}$$

$$\text{Liangjiangkou: } BE_{Liangjiangkou} = EG_{PJ,y} \times EF_{grid,CM,y} = 8,120.87 \times 0.5983 = 4,858 \text{ tCO}_2\text{e}$$

$$BE_y = BE_{Guanbaodu} + BE_{Liangjiangkou} = 9,358 + 4,858 = 14,216 \text{ tCO}_2\text{e}$$

The baseline emissions are 14,216 tCO₂e.

The formula used for the determination of project emissions of SDG 13 is as follow,

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (2)$$

Where:

PE_y = Project emissions in year y (tCO₂e/yr)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO₂/yr)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO₂e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO₂e/yr)

According to ACM0002, for all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected, so $PE_{FF,y} = 0$. The project is not a geothermal power plant, thus $PE_{GP,y} = 0$.

Therefore, $PE_y = PE_{HP,y}$.

The project is a new hydropower project and results in a new reservoir, according to ACM0002 (Version 16.0), its power density of is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD = Power density of the project activity (W/m²)

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W).

For new hydro power plants, this value is zero

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A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)

A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

For Guanbaodu:

$Cap_{BL} = 0$, $A_{BL} = 0$, and as listed in section 4.1, $Cap_{PJ} = 4MW$, and the area of reservoir A_{PJ} in 2019 was 328,000 m^2 , so the power density PD in 2019 was 12.20 W/m^2 , which is greater than 10 W/m^2 ;

And for Liangjiangkou:

$Cap_{BL} = 0$, $A_{BL} = 0$, $Cap_{PJ} = 1.89MW$, and the area of reservoir A_{PJ} in 2019 was 177,700 m^2 , so the power density PD in 2019 was 10.64 W/m^2 , which is greater than 10 W/m^2 .

Therefore, according to ACM0002, the project emissions resulting from the project are zero. $PE_y = 0$ tCO₂e.

According to ACM0002, there is no leakage considered, i.e. $LE_y = 0$ tCO₂e.

The emission reductions (ER_y) of SDG 13 by the project during a given year y are the difference among baseline emissions (BE_y), project emissions (PE_y).

The final GHG emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (3)$$

Where:

ER_y = Emissions Reductions by the project in year y ; (tCO₂/yr).

BE_y = Baseline Emissions in year y ; (tCO₂/yr).

PE_y = Project Emissions in year y ; (tCO₂/yr).

According to the Section E.1 and E.2 above,

$$BE_y = 14,216 \text{ tCO}_2\text{e}$$

$$PE_y = 0 \text{ tCO}_2\text{e}$$

$$ER_y = BE_y - PE_y = 14,216 \text{ tCO}_2\text{e}$$

Therefore, SDG 13 project outcome of emission reduction is 14,216 tCO₂e.

E.3. Calculation of net benefits as difference of baseline and project values or direct calculation for each SDG outcome

>>

The final Net benefit SDG of the bundled project are calculated as follows:

Net benefit of SDG = Project outcome of SDG – Baseline outcome of SDG

According to the Section E.1 and E.2 above,

Net benefit of SDG 5 = 2 people – 0 = 2 people

Net benefit of SDG 7 = 23,763.19 MWh – 0 = 23,763.19 MWh

Net benefit of SDG 8.3.1 for employment positions and training opportunities = 21 – 0 = 21 people

Net benefit of SDG 8.5.1 for salary level = $(3,658 \text{ RMB/month} \times 14 + 1,729 \text{ RMB/month} \times 7) / 21 - 0 = 3,015 - 0 = 3,015 \text{ RMB/month}$

Net benefit of SDG 13 = $14,216 \text{ tCO}_2\text{e} - 0 = 14,216 \text{ tCO}_2\text{e}$

E.4. Summary of ex-post values of each SDG outcome for the current monitoring period

Period	Item		Baseline estimate	Project estimate	Net benefit
01/01/2019~ 31/12/2019	Guanbaodu	SDG 5	0	1	1
		SDG 7 (MWh)	0	15,642.32	15,642.32
		SDG 8.3.1 for job positions and training opportunities	0	14	14
		SDG8.5.1 for salary level (RMB/Month)	0	3,658	3,658
		SDG 13 (tCO ₂ e)	0	9,358	9,358
	Liangjiangkou	SDG 5	0	1	1
		SDG 7	0	8,120.87	8,120.87
		SDG 8.3.1 for job positions and training opportunities	0	7	7
		SDG8.5.1 for salary level(RMB/Month)	0	1,729	1,729
		SDG 13	0	4,858	4,858
	total	SDG 5	0	2	2
		SDG 7 (MWh)	0	23,763.19	23,763.19
		SDG 8.3.1 for job positions and training opportunities	0	21	21
		SDG8.5.1 for salary level (RMB/Month)	0	3,015	3,015
		SDG 13 (tCO ₂ e)	0	14,216	14,216

E.5. Comparison of actual value of outcomes with estimates in approved PDD

Period	Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
01/01/2019~31/12/2019	SDG 5	4	2
	SDG 7 (MWh)	21,612	23,763.19
	SDG 8.3.1 for job positions and training opportunities	23	21
	SDG8.5.1 for salary level (RMB/Month)	1,100-3,773	3,015
	SDG 13 (tCO ₂ e)	12,930	14,216

E.6. Remarks on difference from estimated value in approved PDD

>>

In this monitoring period, the bundled project provided 21 job positions for local people and which contained 2 employment opportunities for women, and relevant staff received three times training for improving their skills, and the average salary level of employees achieved 3,015 RMB/Month, which is within the range of 1,100-3,773 RMB/month in the registered PDD and Transition Annex. With the development of economy and society, the increasingly salary level of staff is considered to be reasonable. The employment opportunities for women are less two than estimated value in the registered PDD and Transition Annex due to normal personnel transfer and difficulty to recruit female staff. Thus, the Net benefit of SDG 5 and SDG 8 for the bundled project in this monitoring period is considered to be reasonable.

And the bundled project achieved 14,216 tCO₂ emission reductions and the total net electricity supplied to the grid is 23,763.19 MWh during this monitoring period. The actual emission reductions achieved are 9.95% higher than the estimated value (12,930 tCO₂) in the Transition Annex.

For Guanbaodu, the actual emission reductions achieved during the reported monitoring period are slightly higher (0.83%) than the arithmetic average value calculated based on that estimated in the registered PDD and Transition Annex, and so does net electricity supplied to the grid.

For Liangjiangkou, the actual emission reductions achieved during the reported monitoring period are 33.13% higher than the estimated value in the registered PDD and Transition Annex. It is because the average precipitation of Tongdao County in 2019 was 25.60% more than average level in historical year¹ (which was used to estimate the power generation and emission reduction in PDD and Transition Annex). And the accumulated net electricity supplied to the grid by the project from 2009 to 2019 is only slightly higher (4.84%) than the total estimated net electricity value in the registered PDD and Transition Annex from 2009 to 2019, details are summarized in the below table. Thus, the electricity generation and emission reductions in 2019 is considered to be reasonable.

The Net benefit of SDG 7 and SDG 13 for the bundled project in this monitoring period are considered to be reasonable.

¹ <http://www.hnsw.com.cn>

Year	Actual values achieved net electricity generation (MWh)			Values estimated net electricity generation in registered PDD (MWh)		
	Guanbaodu	Liangjiangkou	The bundled project	Guanbaodu	Liangjiangkou	The bundled project
2009	10,786.23	6,604.472	17,390.702	15,513	6,099	21,612
2010	7,974.1161	5,032.272	13,006.3881	15,513	6,099	21,612
2011	9,010.61	5,060.328	14,070.938	15,513	6,099	21,612
2012	13,133.63625	5,622.876	18,756.51225	15,513	6,099	21,612
2013	15,362.2	6,729.128	22,091.328	15,513	6,099	21,612
2014	13,639.15	6,317.612	19,956.762	15,513	6,099	21,612
2015	16,601.62	7,347.004	23,948.624	15,513	6,099	21,612
2016	14,986.86	6,434.96	21,421.82	15,513	6,099	21,612
2017	14,292.37	7,175	21,467.37	15,513	6,099	21,612
2018	11,294.28999	5,892.673	17,186.96299	15,513	6,099	21,612
2019	15,642.324	8,120.87	23,763.192	15,513	6,099	21,612
Total	142,723.4063	70,337.221	213,060.5993	170,643	67,089	237,732

SECTION F. Stakeholder inputs and legal disputes

F.1. List all inputs/grievances which have been received for the project during the monitoring period together with their respective answers/actions

>>

The monitoring office carry out questionnaires for local people to collect comments regularly and local people can raise any suggestion about negative impacts of the project operation to monitoring office at any time. Then the relevant staff will report the inputs/grievances to General Manager who is responsible to solve problem and improve situation. Finally, the inputs/grievances can be resolved until the complainant satisfies.

The bundled project has not received any inputs/grievances during this monitoring period.

F.2. List all inputs/grievances from previous monitoring period where follow up action is to be verified in this monitoring period

>>

The bundled project did not receive any inputs/grievances from previous monitoring period. Thus, there is no action to be verified in this monitoring period.

F.3. Provide details of any legal contest or dispute that has arisen with the project during the monitoring period

>>

There is no any legal contest or dispute during this monitoring period.