



**Verified Carbon
Standard**

GANSU HUANGHE CHAIJIAXIA HYDROPOWER STATION PROJECT



Document Prepared by Gansu Carbon Checking Consulting Pty Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Gansu Huanghe Chaijiaxia Hydropower Station Project involves the construction of a run-of-river hydropower station at the main stream of the Yellow River in Xigu District, Lanzhou City, Gansu Province, China.

The main objective of the project is to generate power from clean renewable hydropower in Gansu Province and contribute to the sustainability of power generation in the Northwest China Grid.

The primary construction activities of this project started on 23/11/2004, while the first set of turbine generator was put into commercial operation on 09/01/2008. In addition, the project activity has been fully put into operation since 09/12/2008, and four turbine generators has been put into operation successively on 09/01/2008, 23/04/2008, 18/10/2008 and 09/12/2008.

There are four bulb-propeller turbine/generator sets installed at the hydropower station with a total installed capacity of 96 MW. Moreover, the project adopts a run-of-river design to utilize the natural water flow of the river and low head of 6.8 meters. The construction of the integrated dam/powerhouse type hydropower station is involved in the project, which consists of a water retaining section, five flood gates and a water intake/powerhouse section. The water flows to the turbine firstly from the water intake and then returns to the river.

The designed water flow capacity of this project is 1,608 m³/s. The expected annual operating hours (corrected for full load operation) are 5,115 and the expected annual net power supply to the grid is 451,720 MWh.

Moreover, the project has operated without any accidental or emergency events that might affect the accuracy and/or implementation of the monitoring activities. The net electricity supplied to the grid by the project during this monitoring period (30/05/2012-08/01/2018) is 2,883,006.737 MWh, as well as the total GHG emission reductions claimed in this monitoring period are 2,424,578 tCO₂e.

1.2 Sectoral Scope and Project Type

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

Project Type: Hydropower project

The project is not a grouped project.

1.3 Project Proponent

Organization name	Gansu Chaiji Xia Hydropower Co., Ltd.
Contact person	Du Jianzhou
Title	Director of Planning Department
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1.4 Other Entities Involved in the Project

Organization name	Gansu Carbon Checking Consulting Pty Ltd.
Role in the Project	Consultant
Contact person	Fan Chaoyi
Title	General manager
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1.5 Project Start Date

The project start date was 09/01/2008 on which the first set of turbine generator of the project started operation and began reducing GHG emissions.

1.6 Project Crediting Period

The first VCS crediting period is 09/01/2008-08/01/2018 which covers 10 years.

There is a deviation on the project crediting period. For the first monitoring period under the VCS program, the requested project crediting period was 09/01/2008 to 19/02/2009. However, since the project was registered as a VCS project under VCS 2007.1, and completed validation before 19/03/2020, thus it remains eligible to apply the crediting period requirements under VCS Version 3, according to which the crediting period is

applicable to a maximum of 10 years which may be renewed at most two times. So, the first renewable crediting period shall be updated from 09/01/2008-19/02/2009 to 09/01/2008-08/01/2018 which covers 10 years. Since the project crediting period was not renewed within the 2 years after the end of the first 10 years, the total VCS crediting period of the project ends on 08/01/2018.

1.7 Project Location

The project is located at the main stream of the Yellow River near Liangjiawan Village of Dongchuan Town, Xigu District, Lanzhou City, Gansu Province, P.R.China and the geographical coordinates are: 103°32'08"E, 36°07'11"N. Figure 1.1 below shows the location of the project activity.

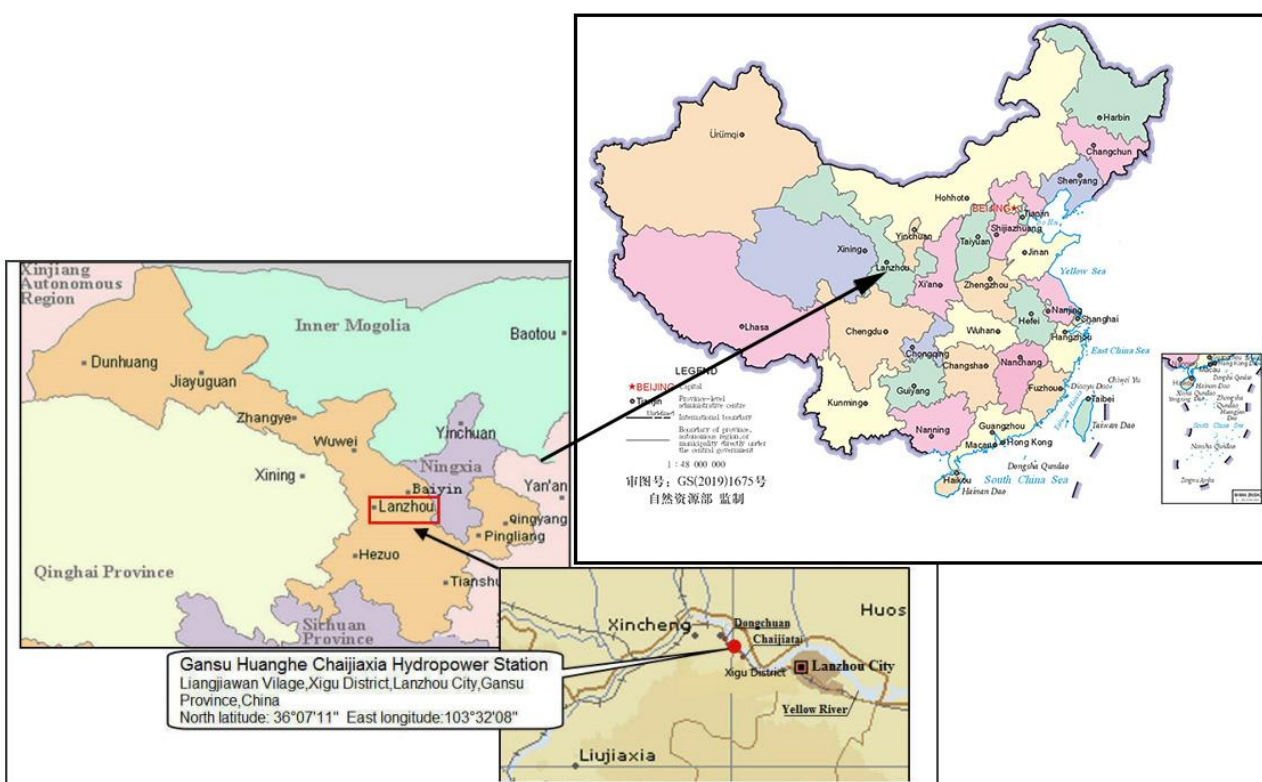


Figure 1.1 The location of the Project

1.8 Title and Reference of Methodology

The applied methodology:

ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (version 06)

<https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>

The applied tools:

“Tool for the Demonstration and Assessment of Additionality” (Version 04)

<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-01-v4.pdf>

1.9 Participation under other GHG Programs

The project was registered as a UNFCCC CDM project on 20/02/2009 (Reference number: 2103), with a 7*3 renewable crediting period starting on 20/02/2009. A total number of 1,301,279 CERs have been issued under the CDM program during four monitoring periods from 20/02/2009 to 29/05/2012.

The project was also registered as a VCS project in 2010 (ID: 435). The project crediting period is 10 years from 09/01/2008 to 08/01/2018. 291,486 tCO₂e of GHG emission reductions have been issued as VCUs under the VCS program during the monitoring period 09/01/2008 to 19/02/2009.

All emission reductions during this monitoring period have not and will not seek issuance under other kind of GHG programs. Emission reductions during this monitoring period will only seek issuance under VCS program.

1.10 Other Forms of Credit

- Emission Trading Programs and Other Binding Limits

The GHG emission reductions generated from the project activity are not included in an emission trading program or any other mechanism that includes GHG allowance trading.

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 tons of CO₂e/year, not including renewable project.

The project proponent: Gansu Chaiji Xia Hydropower Co., Ltd., as an enterprise for renewable energy investment, is not included in the compliance entity list by China national Emission Trading Scheme (ETS). Moreover, the project has not been registered as a CCER (Chinese Certified Emission Reductions) project in China, thus it is not eligible for emission reductions transaction under the China's ETS. Moreover, the project has not been registered as a CCER (Chinese Certified Emission Reductions) project in China, thus it is not eligible for emission reductions transaction under the China's ETS.

Therefore, 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. The net GHG emission reductions generated during this monitoring period have not been used for compliance under such programs or mechanisms.

Furthermore, a statement on no double counting will be submitted to Verra to confirm the credits in this monitoring period has not been counted and will not be counted under emission trading programs and other binding limits.

- Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates

1.11 Sustainable Development Contributions

The main objective of the project is to generate power from clean renewable hydropower in Gansu Province and contribute to the sustainability of power generation of the Northwest China Grid.

- By connecting an on-site transformer station with the local grid, the project activity has generated and supplied 2,883,006.737 MWh renewable electricity to the power grid during this monitoring period which contributes to SDG7, corresponding to the target of increasing the share of clean energy consumption of China's "Action Plan for Carbon Dioxide Peaking Before 2030".
- The project has prevented the release of 2,424,578 tCO₂e into the atmosphere during the monitoring period which contributes to SDG13, corresponding to China's target of "Increase on labour force participation rate through implementation of the classification policy. Vigorously enforce the Law on Promotion of Employment".
- In addition, the project provides 86 to 92 long-term job opportunities from 2012-2018 during this monitoring period which contributes to SDG8, corresponding to China's stated sustainable development priorities "Actively adapt to climate change and strengthen resistance capacity to climate risks in agriculture, forestry, water resources and other key fields, as well as cities, coastal regions and ecologically vulnerable areas.

Table 1.2: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	Volumes of grid-connected electricity generated from renewable sources	Implemented activities to increase	Generated 2,883,006.737 MWh of grid-connected renewable energy during this monitoring period.	An accumulated 3,229,607.977 MWh of electricity from renewable sources has been supplied to the power grid by end of the reporting period
2)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By replacing fossil-fired power generation, the project has prevented the release of 2,424,578 tCO ₂ e into the atmosphere during the monitoring period	An accumulated 2,716,064 tCO ₂ e of GHG emission reduction have been achieved by the project by end of the reporting period
3)	8	Numbers of decent job opportunities provided by implementation of the project	Implemented activities to increase	The project provides 86 to 92 long-term job opportunities from 2012 to 2018 during this monitoring period which have an income rate higher than the local average level.	92 employees including 39 females have been employed by the project as long-term employee by end of the reporting period.

2 SAFEGUARDS

2.1 No Net Harm

The project did not and will not result in any significant environmental impacts or any negative socio-economic impacts.

Environmental Impacts

An Environmental Impact Assessment (EIA) was completed by the Northwest Hydro-electric Investigation & Design Institute of the State Power Company in May 2004 and was accepted by the Environmental Protection Department of Gansu province on 12th May 2004.

A summary of the main findings of the EIA is provided below:

The impacts of the project on the environment during construction mainly consist of the discharge of production sewage, domestic sewage, solid wastes, noises and water & soil losses.

The impacts of the project on the environment during operation mainly consists of the effects on terrestrial animals, surface water, and the production of domestic sewage. By taking the following protective measures, the above-mentioned negative impacts have been alleviated.

Domestic sewage

Domestic sewage during construction was solved through water supply zone disposal equipment and then discharged into a regulating pond for irrigation. Domestic sewage during the operation was resolved in accordance with the standards for biomass disposal and then discharged into a regulating pond for irrigation. The treated construction and domestic sewage does not cause the pollution in the water resources within the context of the project.

Surface water pollution

Water pollution during construction was mainly derived from sand and gravel material which was disposed through sediment disposal methods, and the water from this process was reused for irrigation. Water pollution during operation was addressed through measures in accordance with biomass disposal standards. After that, the water was discharged to a regulating pond for irrigation.

Solid waste

Solid wastes from construction were disposed at the project waste slag pit which was located in a valley near the project site with a total storage capacity of 800,000m³. Domestic waste was collected and sent to the disposal site at the No. 504 plant near the project. During the operation, floating materials and cadavers have been collected periodically, and sent to a landfill after disinfection.

Air pollution

Air pollution during construction mainly related to vehicle emissions from the transport of equipment and dust pollution from the transportation of construction materials. The following measures were applied to prevent and control air pollution: wet dust-removal method, operation of strict concrete loading and unloading procedures in covered areas, applying dust-removal equipment at concrete mixing equipment, covered transportation of waste materials. The construction vehicles and equipment will be chosen to fit with emission standards.

Noise pollution

The following measures were taken to minimize the negative impacts due to the noises such as applying low-noise equipment for construction, applying sound insulating operation rooms for equipment with noise louder than 100dB, installing KJ-2 and LZX style sound insulation equipment on an air compressor, limiting the driving speed and regulating site access with regard to time periods and routes.

Water & Soil conservation

After construction, temporary structures were removed and the land was leveled off and vegetation will be planted. The sand & gravel pit and processing sites were backfilled and leveled, and after that these sites were afforested. The land on either side of the construction access road was leveled off and afforested. The top of the waste slag pit was leveled off and a slag-resisting wall was erected.

Impact on the aquatic creatures

The project is a run-off river hydro-power station of which the reservoir has no regulating ability and does not change the variation trend of runoff, thus, there was no new impact caused by the project on the downstream. In addition, after the construction of the reservoir for the project, the transparency of the water has increased, so that the potential of phytoplankton for photosynthesis was improved, which provided a good condition for the growth and reproduction of aquatic creatures. Therefore, the project does not cause significant negative impact on the surrounding water environment and the aquatic creatures.

Water source protection

Prior to the filling of the reservoir, the reservoir area had been cleaned and disinfected. Trees, vegetation, houses, animal sheds, public toilets, and waste sites had been removed

before the reservoir was filled. The project proponent has removed suspended substance from the reservoir periodically and a water quality monitoring system has been established and the water quality during this monitoring period meets the requirement of national standard.

The environmental impacts of the project are not considered significant by the Chinese government and the project participants. The Environmental Impact Assessment Form (EIA) was accepted by the Gansu Environmental Protection Bureau.

Socio-economic impacts

The project did not and will not result in any significant environmental impacts or any negative socio-economic impacts. On the contrary, this project stimulated the local economy by providing 92 employment opportunities and reduced the dependence on exhaustible fossil fuels for power generation, reduced GHGs emissions by displacing coal-fired power plants with clean, renewable power.

In conclusion, no net harm on local environment and social community has been detected for the project.

2.2 Local Stakeholder Consultation

Local Stakeholder Consultation at the preparation stage

During the preparation of the project, the local authorities held several meetings to discuss impacts of the project on stakeholders and achieved agreement on the compensation. Local stakeholder consultation has been conducted during 09/06/2006 to 09/07/2006 consisted of establishment of a website and a stakeholder consultation meeting on 19/06/2006 held in Xigu district of Lanzhou city, Gansu Province. All comments received have been well addressed prior to the project implementation. Please refer to section E of the registered CDM-PDD of the project for detailed information. In conclusion, there was no significant negative comments received in the project preparation stage.

Local Stakeholder Consultation at the implementation stage

During this monitoring period, the project proponent carried out communication with local stakeholders in line with the mechanism. The designated contact person visited the villages annually to communicate with the local stakeholders to collect their comments or suggestions. The contact person visited the villages in Aug 2012, Sep 2013, Aug 2014, Sep 2015, Sep 2016 and Aug 2017 during this monitoring period to communicate with stakeholders. Meanwhile, the local authority has also conducted spot checks on the implementation of the project on a yearly basis. There is no negative comment nor grievance received from the project during this monitoring period. In line with VCS

requirements, all the procedures have been implemented to receive comments from local stakeholders through effective communication.

2.3 AFOLU-Specific Safeguards

The project is not an AFOLU project. This section is not applicable.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

There are four bulb-propeller turbine/generator sets (24WM each) installed at the hydropower station with a total installed capacity of 96 MW, which is the same as that described in the project PD. The surface area at full reservoir level is measured to be 2,353,158m² and in addition, the designed operation period of the project is 30 years and the key technical parameters of the equipment installed in the project are shown in Table 3.1 as below:

Table 3.1 Key technical parameters of the equipment installed in the project

Turbine	Type	Nominal flow rate	Capacity	Type number
Unit 1	Bulb-type propeller	402m ³ /s	24,670 kW	GZ995-WP-720
Unit 2	Bulb-type propeller	402m ³ /s	24,670 kW	GZ995-WP-720
Unit 3	Bulb-type propeller	402m ³ /s	24,670 kW	GZ995-WP-720
Unit 4	Bulb-type propeller	402m ³ /s	24,670 kW	GZ995-WP-720

Generator	Type	Nominal revolutions	Capacity	Type number
Unit 1	Integrated in bulb turbine	68.18 rpm	24 MW	SFWG24-88/7820
Unit 2	Integrated in bulb turbine	68.18 rpm	24 MW	SFWG24-88/7820
Unit 3	Integrated in bulb turbine	68.18 rpm	24 MW	SFWG24-88/7820
Unit 4	Integrated in bulb turbine	68.18 rpm	24 MW	SFWG24-88/7820

The technical process diagram is as below:

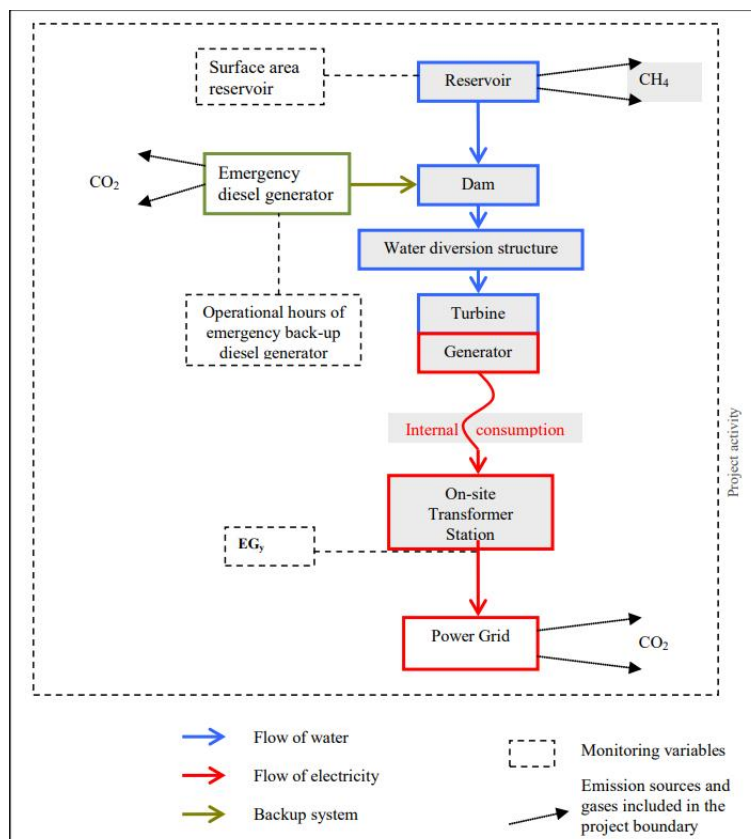


Figure 3.1 The technical process diagram

The main construction activities of this project started on 23/11/2004. The first set of turbine generator of the project was put into commercial operation on 09/01/2008 and it has been fully put into operation since 09/12/2008. Four turbine generators have been put into operational successively on 09/01/2008, 23/04/2008, 18/10/2008, and 09/12/2008.

According to the regulations of the grid company, the previously used grid side meter on main line M3a (SN:36125630) and M3b (SN:36125632) were replaced by the currently used meter M3a (41501820) and M3b (41501860) on 18/07/2015 and 28/07/2015 respectively and the new meters' accuracy is 0.2S which is the same as the old meters.

The project has an emergency back-up diesel generator on site with capacity of 250kW which is for back emergency use. However, during this period, no emergency happened and the diesel generator was only used for regular test operation.

In conclusion, the project was in normal operation during the indicated monitoring period, and no event or situation may affect the applicability of the methodology occurred during the period.

3.2 Deviations

3.2.1 Methodology Deviations

There are no methodology deviations applied during this monitoring period.

3.2.2 Project Description Deviations

There is a deviation in the project crediting period. For the first monitoring period under the VCS program, the requested project crediting period was 09/01/2008 to 19/02/2009. However, since the project registered as a VCS project under VCS 2007.1, and completed validation before 19/03/2020, thus it remains eligible to apply the crediting period requirements under VCS Standard Version 3, according to which the crediting period is applicable to a maximum of 10 years which may be renewed at most two times. Thus, the first crediting period shall be updated from 09/01/2008-19/02/2009 to 09/01/2008-08/01/2018 which covers 10 years.

This deviation of crediting period has no impact on the applicability of the methodology or the appropriateness of the baseline scenario and the project still meets all appropriate rules and requirements of the VCS standard. There is no other project description deviation occurred.

3.3 Grouped Projects

The project is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _y
Data unit	tCO ₂ e/ MWh
Description	Combined margin baseline emission factor
Source of data	The registered PD
Value applied	0.841
Justification of choice of data or description of measurement methods and procedures applied	The parameter is ex-ante calculated and fixed for the first crediting period.
Purpose of Data	Calculation of baseline emissions
Comments	Other parameters fixed ex-ante (i.e. Power generation by source, Internal power consumption of power plants, Primary fuel input for thermal power supply, Efficiency of advanced thermal power plant additions, Capacity by power generation source, Oxidation Factor, Fuel Emission Coefficients, Electricity imports from connected grids, Net Calorific Value) were used to calculate the combined margin baseline emission factor (EF _y) during the validation stage.

4.2 Data and Parameters Monitored

Data / Parameter	EG _y
Data unit	MWh
Description	Net electricity supplied to the grid by the project
Source of data	Reading records from on-site electricity meters
Description of measurement methods and procedures to be applied	The electricity supplied to and received from the grid through the two main lines (Line 1 and Line 2) is continuously measured by the project proponent with two bidirectional meters M2a and M2b (both with accuracy level of 0.2S) installed at the project site. They are also measured by grid company with two bidirectional meters M3a and M3b (both with accuracy level of 0.2S) installed at the Lanxi 110/330kV

	Transformer Station. Besides, the electricity received from the grid is also imported from a back-up line (Line 504), which is continuously measured by the project proponent with the meter M4 (accuracy level of 0.5S) installed at the project site and by the grid company with the meter M5 (accuracy level of 0.5S) installed at 504 Factory Transformer Station.
Frequency of monitoring/recording	Continuous measured, daily recorded and monthly aggregated
Value monitored	2,883,006.737
Monitoring equipment	Please refer to table 4.1 of Section 4.3 for details.
QA/QC procedures to be applied	These data were directly used for the calculation of emission reductions. The values on sales receipts were used for the double check purpose. Electricity meters were calibrated at least once a year according to national standard. All data and records will be archived at least 2 years after the end of the final crediting period.
Purpose of the data	Calculation of baseline emissions
Calculation method	$EG_y = ES_y - ED_y$ ES_y : electricity supplied to the grid through the main lines; ED_y : electricity received from the grid through main lines and back-up line.
Comments	N/A

Data / Parameter	Surface area reservoir
Data unit	m ²
Description	Surface area at full reservoir level
Source of data	Measured
Description of measurement methods and procedures to be applied	Survey report on the surface area of the reservoir
Frequency of	Once at the start of the project when the reservoir reaches full

monitoring/recording	capacity.
Value monitored	2,353,158
Monitoring equipment	It was measured by Gansu Provincial Investigation Design & Research Institute of Water Conservancy & Hydropower. The qualification certificate was issued by National Surveying and Mapping Bureau
QA/QC procedures to be applied	The power density of the project is well above 10 W/m ² , so substantial deviations from the calculated design surface area have not affected the calculation of emission reductions by the project. No further QA/QC procedures will be applied.
Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	Operational hours of emergency back-up diesel generator
Data unit	Hours/year
Description	Annual hours that the emergency back-up diesel generator is running either for the purpose of commissioning/maintenance or actual emergencies.
Source of data	Measured
Description of measurement methods and procedures to be applied	Log books
Frequency of monitoring/recording	Recorded and monitored once started
Value monitored	41
Monitoring equipment	Monitored manually
QA/QC procedures to be applied	The actual annual emissions associated with the operation of the emergency back-up diesel generator amount to about 0.001% of total emission reductions and were deducted.

	Further QA/QC procedures are therefore not considered necessary.
Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

4.3 Monitoring Plan

Monitoring system and data collection

Monitoring of electricity data

The project is connected to the grid through an on-site booster transformer station that increases the voltage to 110 kV. The project is then connected through two main power lines to the Lanxi 110/330 kV transformer station which functions as a switching station to connect the project to the grid.

The electricity supplied to and received from the grid through the two main lines (Line 1 and Line 2) is continuously measured by the project proponent with two bidirectional meters M2a and M2b (both with accuracy of 0.2S) installed at the project site. They are also measured by grid company with two bidirectional meters M3a and M3b (both with accuracy of 0.2S) installed at the Lanxi 110/330kV Transformer Station. Besides, the electricity received from the grid is also imported from a back-up line (Line 504), which is continuously measured by the project proponent with the meter M4 (accuracy level of 0.5S) installed at the project site and by the grid company with the meter M5 (accuracy level of 0.5S) installed at 504 Factory Transformer Station.

The meters' readings are daily recorded and monthly aggregated by project proponent based on the metering instruments M2a, M2b, and M4. Daily meter reading time starts at 0:00 and ends at 24:00, and monthly aggregating time i.e. the cut-off time is at 24:00 on the antepenultimate day of each month. The grid company issues sales receipts to the project proponent based on the readings on 24:00 of the antepenultimate day of each month metered by M3a, M3b, and M5. The sales receipts are collected as evidence of electricity supplied to the grid, electricity received from the grid through main lines, and electricity received from the grid through back-line, which is used for double check purposes. The location of the electricity meters installed is shown in the Figure 4.1 below.

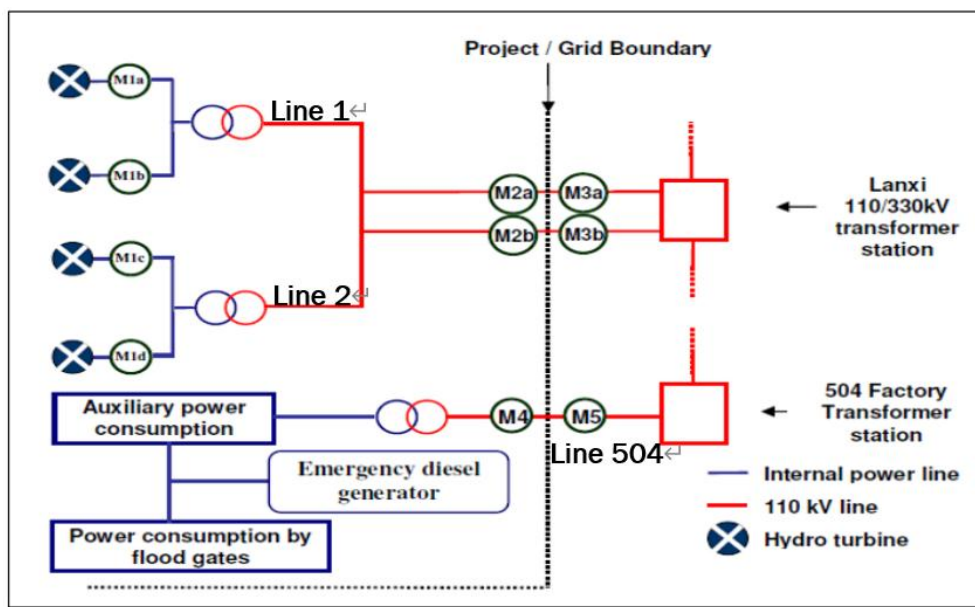


Figure 4.1 Indicative electric connection diagram of the project activity

All the meters were calibrated at least annually during this monitoring period to make sure the accuracy. The detailed information of the monitoring equipment is listed in Table 4.1 below:

Table 4.1 Monitoring equipment

Meter	Type	Accuracy class	Serial Number	Calibration Frequency	Date of calibration	Validity
M2a	SL7000	0.2S	36125639	At least annually	07/03/2012	06/03/2013
					06/03/2013	05/03/2014
					06/03/2014	05/03/2015
					12/01/2015	11/01/2016
M2b	SL7000	0.2S	36125640	At least annually	05/08/2015	04/08/2016
					28/10/2015	27/10/2016
					18/01/2016	17/01/2017
					06/06/2016	05/06/2017
M4	DSSD331	0.5S	20061136030005	At least annually	19/09/2016	18/09/2017
					22/12/2016	21/12/2017
					22/03/2017	21/03/2018
					19/04/2017	18/04/2018
M5	DTS256	0.5S	0901596187	At least annually	09/09/2017	08/09/2018
					07/11/2017	06/11/2018
					05/06/2018	04/06/2019

M3a (Previously used*)	SL7000	0.2S	36125630	At least annually	07/03/2012 06/03/2013 06/03/2014 12/01/2015	06/03/2013 05/03/2014 05/03/2015 11/01/2016
M3b (Previously used*)	SL7000	0.2S	36125632	At least annually	07/03/2012 06/03/2013 06/03/2014 12/01/2015	06/03/2013 05/03/2014 05/03/2015 11/01/2016
M3a (after being changed)	WU.TE43 2q	0.2S	41501820	At least annually	15/07/2015 05/08/2015 28/10/2015 18/01/2016 06/06/2016 19/09/2016 22/12/2016	14/07/2016 04/08/2016 27/10/2016 17/01/2017 05/06/2017 18/09/2017 21/12/2017
M3b (after being changed)	WU.TE43 2q	0.2S	41501860	At least annually	22/03/2017 19/04/2017 09/09/2017 07/11/2017 05/06/2018	21/03/2018 18/04/2018 08/09/2018 06/11/2018 04/06/2019

**According to the regulations of the grid company, the previously used grid side meter on main line M3a (SN:36125630) and M3b (SN:36125632) was replaced by the currently used meter M3a (SN:41501820) and M3b (SN:41501860) on 18/07/2015 and 28/07/2015 respectively.*

Determination of net power supply:

Net electricity supplied to the grid by the project (EG_y) is calculated on a monthly basis as:

$$EG_y = ES_y - ED_y$$

With:

ES_y = electricity supplied to the grid through the main lines;

ED_y = electricity received from the grid through the main lines and back-up line.

Monitoring of Surface area reservoir

The surface area of the reservoir was measured once at the start of the project when the reservoir reaches full capacity by Gansu Provincial Investigation Design & Research Institute of Water Conservancy & Hydropower, who has an authorization from the National Surveying and Mapping Bureau. The measurement report has been provided to VVB for verification.

Monitoring of operational hours of back up emergency diesel generator

The emergency back-up diesel generator on site has a capacity of 250kW which is for back emergency use. However, during this period, the diesel generator was only used for regular test operation, of which the operational hours was also monitored and manually logged by the project proponent.

Reporting, archiving and preparation for periodic verification

The project proponent in principle reports the monitoring data annually but may deviate from reporting at intervals corresponding to agreed verification periods and ensuring that these intervals are in accordance with VCS requirements. The project proponent ensures that all required documentation is made available to VVBs. Data records will be archived within 2 years after the crediting period to which the records pertain.

Operational and management structure for monitoring

The monitoring of the emission reductions is carried out according to the scheme shown in Figure 4.2. The Financial Supervisor of Chaiji Xia Hydropower Co., Ltd held the overall responsibility for the monitoring process, but as indicated below parts of the process are delegated. The first step was the measurement of the electricity supplied to the grid and reporting of daily operations, which were carried out by the plant manager. A monitoring officer was appointed and was responsible for verification of the measurement, collection of sales receipts, and the calculation of the emissions reductions.

The monitoring officer prepared operational reports of the project activity, recording the daily operation of the plant including operating periods, power generation, the power delivered to the grid, equipment defects, etc. Finally, the monitoring reports were reviewed by the Financial Supervisor of Gansu Chaiji Xia Hydropower Co., Ltd.

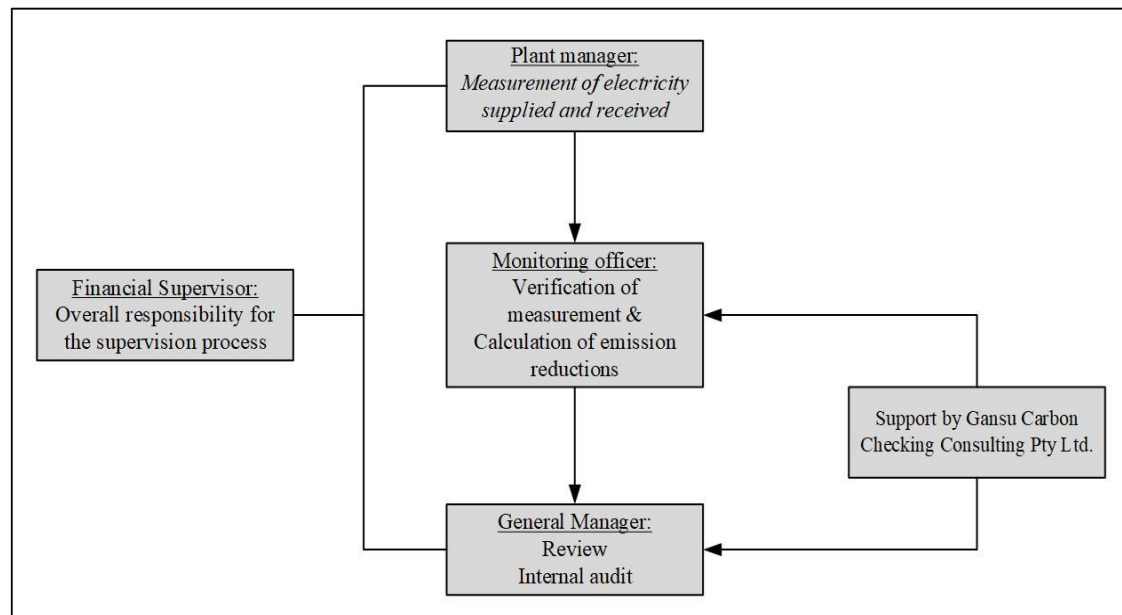


Figure 4.2 Management structure for monitoring

Internal audit procedures are formulated to assess the accuracy of the monitored parameters.

The periodical audits will cover:

- Monitored data collection and management procedures
- Quality of metering/calibration records
- Quality and accuracy of the monitored data

Monitored parameters were collected and recorded in a monthly log sheet. At the end of each month, the monitoring officer collected all daily logs and archived a copy of the logs with the VCS monitoring information.

Emergency procedures

A. Damages to metering equipment:

In case of metering equipment is damaged and no reliable readings can be recorded the project entity should estimate the net supply by the project activity according to the following procedure:

i In case of metering equipment operated by the project entity is damaged only:

The metering data logged by the grid company, evidenced by sales receipts should be used as a record of net power supplied to the grid for the days for which no record could be recorded.

ii In case both metering equipment operated by the project proponent and grid company is damaged:

The project proponent and the grid company should jointly calculate a conservative estimate of power supplied to the grid. A statement should be prepared to indicate

- the background to the damage to metering equipment;
- the assumptions used to estimate net electricity supply to the grid for the days for which no record could be recorded;
- the estimation of power supplied to the grid.

The statement should be signed by both a representative of the project proponent as well as a representative of the grid company.

B. Emergencies:

In case of emergencies, the project proponent should not claim emission reductions due to the project activity for the duration of the emergency. The project proponent should follow the following procedure for declaring the emergency period to be over:

- i) The project entity should ensure that all requirements for monitoring emission reductions have been re-established.
- ii) The monitoring officer and the head of operations should sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = EG_y \times EF_y = (ES_y - ED_y) \times EF_y$$

With:

BE_y = Baseline emissions in year y, tCO₂e;

EG_y = Net electricity supplied to the grid by the project, MWh

EF_y = Emission factor in year y, tCO₂e/MWh

ES_y = Electricity supplied to the grid through the main lines;

ED_y = Electricity received from the grid through main lines and back-up line.

The detailed monthly data and calculation of the baseline emissions is shown in the tables below:

Table 5.1 Electricity supplied to the grid through main lines and electricity received from the grid through main lines

Period	Electricity supplied to the grid through main lines (MWh)					Electricity received from the grid through main lines (MWh)				
	Readings from M2a	Readings from M2b	Readings of M2a+M2b	Sales receipts based on (M3a+M3b)	Conservative values	Readings from M2a	Readings from M2b	Readings of M2a+M2b	Sales receipts based on (M3a+M3b)	Conservative values
	A1	A2	B=(A1+A2)	C	D=Min(B,C)	E1	E2	F=(E1+E2)	G	H=Max(F, G)
30/05/2012-28/06/2012	31,705.080	31,806.060	63,511.140	62,987.760	62,987.760	0	0	0	0	0
29/06/2012-29/07/2012	30,590.340	30,681.420	61,271.760	60,800.080	60,800.080	1.980	1.980	3.960	3.960	3.960
30/07/2012-29/08/2012	14,301.540	14,316.720	28,618.260	28,501.440	28,501.440	0	0	0	0	0
30/08/2012-28/09/2012	29,139.660	29,222.160	58,361.820	57,927.760	57,927.760	0	0	0	0	0
29/09/2012-29/10/2012	31,998.120	32,097.120	64,095.240	63,580.000	63,580.000	0	0	0	0	0
30/10/2012-28/11/2012	22,332.420	27,178.140	49,510.560	49,186.720	49,186.720	0	0	0	0	0
29/11/2012-29/12/2012	20,677.800	16,874.880	37,552.680	37,369.200	37,369.200	0	0	0	0	0
30/12/2012-31/12/2012	1,224.300	1,225.620	2,449.920	-	0	0	0	0	0	0
Subtotal 2012	-	-	-	-	360,352.960	-	-	-	-	3.960
01/01/2013-29/01/2013	17,495.940	17,510.460	35,006.400	-	0	0	0	0	0	0
30/01/2013-26/02/2013	14,766.180	14,765.520	29,531.700	29,413.120	29,413.120	0	0	0	0	0
27/02/2013-29/03/2013	18,155.280	18,164.520	36,319.800	36,140.720	36,140.720	0	0	0	0	0
30/03/2013-28/04/2013	22,843.920	22,892.760	45,736.680	45,461.680	45,461.680	0	0	0	0	0
29/04/2013-29/05/2013	29,081.580	29,173.320	58,254.900	57,844.160	57,844.160	0	0	0	0	0
30/05/2013-28/06/2013	30,408.840	30,493.320	60,902.160	58,461.920	58,461.920	0	0	0	0	0
29/06/2013-29/07/2013	32,435.700	32,530.740	64,966.440	66,388.960	64,966.440	0	0	0	0	0
30/07/2013-29/08/2013	32,876.580	32,968.980	65,845.560	65,312.720	65,312.720	0	0	0	0	0
30/08/2013-28/09/2013	26,999.280	27,073.200	54,072.480	53,693.200	53,693.200	0	0	0	0	0
29/09/2013-29/10/2013	29,090.160	29,173.320	58,263.480	57,838.000	57,838.000	0	0	0	0	0
30/10/2013-28/11/2013	24,582.360	24,643.740	49,226.100	48,924.480	48,924.480	0	0	0	0	0
29/11/2013-29/12/2013	19,202.700	19,234.380	38,437.080	38,267.680	38,267.680	0	0	0	0	0
30/12/2013-31/12/2013	1,181.400	1,183.380	2,364.780	-	0	0	0	0	0	0
Subtotal 2013	-	-	-	-	556,324.120	-	-	-	-	0
01/01/2014-29/01/2014	17,606.820	16,190.460	33,797.280	-	0	0	0	0	0	0

30/01/2014-26/02/2014	13,434.960	13,429.680	26,864.640	26,715.040	26,715.040	0	0	0	0	0
27/02/2014-29/03/2014	14,290.980	14,203.200	28,494.180	28,380.880	28,380.880	0	0	0	0	0
30/03/2014-28/04/2014	20,848.740	20,875.140	41,723.880	41,494.640	41,494.640	0	0	0	0	0
29/04/2014-29/05/2014	28,469.100	28,530.480	56,999.580	56,589.280	56,589.280	0	0	0	0	0
30/05/2014-28/06/2014	28,386.600	28,450.620	56,837.220	56,398.320	56,398.320	0	0	0	0	0
29/06/2014-29/07/2014	30,831.240	30,911.100	61,742.340	61,269.120	61,269.120	0	0	0	0	0
30/07/2014-29/08/2014	30,078.180	30,152.100	60,230.280	59,806.560	59,806.560	0	0	0	0	0
30/08/2014-28/09/2014	29,254.500	29,343.600	58,598.100	58,126.640	58,126.640	0	0	0	0	0
29/09/2014-29/10/2014	29,741.580	29,834.640	59,576.220	59,136.880	59,136.880	0	0	0	0	0
30/10/2014-28/11/2014	26,417.160	26,495.700	52,912.860	52,584.400	52,584.400	0	0	0	0	0
29/11/2014-29/12/2014	18,412.680	20,196.000	38,608.680	38,413.760	38,413.760	0	0	0	0	0
30/12/2014-31/12/2014	1,192.620	1,194.600	2,387.220	-	0	0	0	0	0	0
Subtotal 2014	-	-	-	-	538,915.520	-	-	-	-	0
01/01/2015-29/01/2015	23,813.460	9,632.700	33,446.160	-	0	0	0	0	0	0
30/01/2015-26/02/2015	18,259.560	9,951.480	28,211.040	28,067.600	28,067.600	0	0	0	0	0
27/02/2015-29/03/2015	20,370.900	13,573.560	33,944.460	33,791.120	33,791.120	0	0	0	0	0
30/03/2015-28/04/2015	27,710.760	13,907.520	41,618.280	41,318.640	41,318.640	0	0	0	0	0
29/04/2015-29/05/2015	34,420.980	23,109.240	57,530.220	57,097.920	57,097.920	0	1.320	1.320	1.320	1.320
30/05/2015-28/06/2015	26,188.800	28,830.120	55,018.920	54,432.400	54,432.400	0	0	0	0	0
29/06/2015-29/07/2015	42,464.400	22,111.320	64,575.720	63,992.940	63,992.940	0	0	0	0	0
30/07/2015-29/08/2015	25,247.640	25,319.580	50,567.220	50,567.220	50,567.220	0	0	0	0	0
30/08/2015-28/09/2015	21,082.380	21,143.100	42,225.480	42,225.480	42,225.480	0	0	0	0	0
29/09/2015-29/10/2015	25,285.260	25,359.840	50,645.100	50,645.100	50,645.100	0	0	0	0	0
30/10/2015-28/11/2015	22,473.660	22,540.320	45,013.980	45,013.980	45,013.980	0	0	0	0	0
29/11/2015-29/12/2015	16,097.400	16,146.240	32,243.640	32,243.640	32,243.640	0	0	0	0	0
30/12/2015-31/12/2015	964.920	967.560	1,932.480	-	0	0	0	0	0	0
Subtotal 2015	-	-	-	-	499,396.040	-	-	-	-	1.320
01/01/2016-29/01/2016	13,168.320	13,207.260	26,375.580	-	0	0	0	0	0	0
30/01/2016-27/02/2016	12,303.720	12,340.020	24,643.740	24,643.740	24,643.740	0	0	0	0	0
28/02/2016-29/03/2016	15,208.380	12,629.760	27,838.140	27,838.140	27,838.140	0	0	0	0	0
30/03/2016-28/04/2016	18,798.780	18,732.780	37,531.560	37,531.560	37,531.560	0	0	0	0	0

29/04/2016-29/05/2016	25,446.960	25,522.200	50,969.160	50,969.160	50,969.160	0	0	0	0	0
30/05/2016-28/06/2016	26,044.260	26,120.160	52,164.420	52,164.420	52,164.420	0	0	0	0	0
29/06/2016-29/07/2016	26,965.620	27,044.160	54,009.780	54,009.780	54,009.780	0	0	0	0	0
30/07/2016-29/08/2016	21,182.040	21,242.100	42,424.140	42,424.140	42,424.140	0	0	0	0	0
30/08/2016-28/09/2016	20,714.100	21,003.840	41,717.940	41,717.940	41,717.940	0	0	0	0	0
29/09/2016-29/10/2016	24,388.980	24,458.280	48,847.260	48,847.260	48,847.260	0	0	0	0	0
30/10/2016-28/11/2016	22,503.360	22,569.360	45,072.720	45,072.720	45,072.720	0	0	0	0	0
29/11/2016-29/12/2016	13,103.640	17,571.840	30,675.480	30,699.240	30,675.480	0	0	0	0	0
30/12/2016-31/12/2016	976.140	978.780	1,954.920	-	0	0	0	0	0	0
Subtotal 2016	-	-	-	-	455,894.340	-	-	-	-	0
01/01/2017-29/01/2017	12,839.640	12,881.220	25,720.860	-	0	0	0	0	0	0
30/01/2017-26/02/2017	11,273.460	11,309.100	22,582.560	22,578.600	22,578.600	0	0	0	0	0
27/02/2017-29/03/2017	13,867.920	11,746.020	25,613.940	25,619.220	25,613.940	0	0	0	0	0
30/03/2017-28/04/2017	17,299.260	17,350.080	34,649.340	34,678.380	34,649.340	0	0	0	0	0
29/04/2017-29/05/2017	30,269.580	22,065.120	52,334.700	52,325.460	52,325.460	0	0	0	0	0
30/05/2017-28/06/2017	24,757.260	24,837.120	49,594.380	49,604.940	49,594.380	0	0	0	0	0
29/06/2017-29/07/2017	30,146.820	24,735.480	54,882.300	54,892.860	54,882.300	0	0	0	0	0
30/07/2017-29/08/2017	30,375.180	15,015.000	45,390.180	45,383.580	45,383.580	0	0	0	0	0
30/08/2017-28/09/2017	22,062.480	22,131.780	44,194.260	44,202.180	44,194.260	0	0	0	0	0
29/09/2017-29/10/2017	28,320.600	28,406.400	56,727.000	56,725.680	56,725.680	0	0	0	0	0
30/10/2017-28/11/2017	26,051.520	26,135.340	52,186.860	52,147.920	52,147.920	0	0	0	0	0
29/11/2017-29/12/2017	17,168.580	17,228.640	34,397.220	34,401.840	34,397.220	0	0	0	0	0
30/12/2017-31/12/2017	1,050.060	1,054.020	2,104.080	-	0	0	0	0	0	0
Subtotal 2017	-	-	-	-	472,492.680	-	-	-	-	0
01/01/2018-08/01/2018	4,339.500	3,754.740	8,094.240	-	0	0	0	0	0	0
Subtotal 2018	-	-	-	-	0	-	-	-	-	0
Total (30/05/2012-08/01/2018)	-	-	-	-	2,883,375.660	-	-	-	-	5.280

Note:

1. The readings of electricity supplied to and received from the grid through main lines during 01-29 Jan. and 30-31 Dec. of each year are sourced from the daily reading records of meters M2a and M2b.

2. Since the cut-off time of electricity exports and imports is at 24:00 on the antepenultimate day of each month and the sales receipts are issued monthly, there are no separate sales receipts of electricity exports and imports for 01-29 Jan. and 30-31 Dec. of each year. To be conservative, the electricity exports for the period 01-29 Jan. and 30-31 Dec. of each year are considered as 0. And for the electricity imported from the grid during the period 01-29 Jan. and 30-31 Dec. of each year, the whole month's (30 Dec.- 29 Jan.) values from the sales receipts are applied for ER calculations.

Table 5.2 Electricity received from the grid through back-up line

Period	Electricity received from the grid through back-up power line (MWh)		
	Readings from M4	Values from Sales Receipts based on M5	Conservative values
	I	J	K=Max(I,J)
30/05/2012-28/06/2012	0	4.480	4.480
29/06/2012-29/07/2012	0	4.480	4.480
30/07/2012-29/08/2012	0	1.960	1.960
30/08/2012-28/09/2012	0	4.200	4.200
29/09/2012-29/10/2012	0	5.040	5.040
30/10/2012-28/11/2012	0	4.760	4.760
29/11/2012-29/12/2012	0	33.320	33.320
30/12/2012-31/12/2012	0	3.920	3.920
Subtotal 2012	-	-	62.160
01/01/2013-29/01/2013	0	3.920	3.920
30/01/2013-26/02/2013	0	4.760	4.760
27/02/2013-29/03/2013	0	3.920	3.920
30/03/2013-28/04/2013	0	4.480	4.480
29/04/2013-29/05/2013	0	3.920	3.920
30/05/2013-28/06/2013	0	4.480	4.480
29/06/2013-29/07/2013	0	4.480	4.480
30/07/2013-29/08/2013	0	4.200	4.200
30/08/2013-28/09/2013	0	0.000	0.000
29/09/2013-29/10/2013	0	3.360	3.360
30/10/2013-28/11/2013	0	4.760	4.760

29/11/2013-29/12/2013	0	6.440	6.440
30/12/2013-31/12/2013	0	34.440	34.440
Subtotal 2013	-	-	83.160
01/01/2014-29/01/2014	0.600	34.440	34.440
30/01/2014-26/02/2014	0	4.760	4.760
27/02/2014-29/03/2014	0	4.480	4.480
30/03/2014-28/04/2014	0	4.200	4.200
29/04/2014-29/05/2014	0	4.760	4.760
30/05/2014-28/06/2014	0	4.480	4.480
29/06/2014-29/07/2014	0	4.480	4.480
30/07/2014-29/08/2014	0	4.760	4.760
30/08/2014-28/09/2014	0	4.480	4.480
29/09/2014-29/10/2014	0	4.480	4.480
30/10/2014-28/11/2014	0	4.760	4.760
29/11/2014-29/12/2014	0	6.160	6.160
30/12/2014-31/12/2014	0	3.360	3.360
Subtotal 2014	-	-	89.600
01/01/2015-29/01/2015	0	3.360	3.360
30/01/2015-26/02/2015	0	41.720	41.720
27/02/2015-29/03/2015	0	4.480	4.480
30/03/2015-28/04/2015	0	3.920	3.920
29/04/2015-29/05/2015	0	4.760	4.760
30/05/2015-28/06/2015	0	1.960	1.960
29/06/2015-29/07/2015	0	3.920	3.920
30/07/2015-29/08/2015	0	5.320	5.320
30/08/2015-28/09/2015	0	2.520	2.520
29/09/2015-29/10/2015	0	0	0
30/10/2015-28/11/2015	0	0	0
29/11/2015-29/12/2015	0	0	0
30/12/2015-31/12/2015	0	0	0
Subtotal 2015	-	-	71.960

01/01/2016-29/01/2016	0	0	0
30/01/2016-27/02/2016	0	0	0
28/02/2016-29/03/2016	0	0	0
30/03/2016-28/04/2016	0	1.575	1.575
29/04/2016-29/05/2016	0	2.025	2.025
30/05/2016-28/06/2016	0	2.070	2.070
29/06/2016-29/07/2016	0	2.070	2.070
30/07/2016-29/08/2016	0	1.980	1.980
30/08/2016-28/09/2016	0	1.800	1.800
29/09/2016-29/10/2016	0	2.700	2.700
30/10/2016-28/11/2016	0	1.800	1.800
29/11/2016-29/12/2016	0	3.204	3.204
30/12/2016-31/12/2016	0	1.233	1.233
Subtotal 2016	-	-	20.457
01/01/2017-29/01/2017	0	1.233	1.233
30/01/2017-26/02/2017	0	0.963	0.963
27/02/2017-29/03/2017	0	8.055	8.055
30/03/2017-28/04/2017	0	4.500	4.500
29/04/2017-29/05/2017	1.5	4.050	4.050
30/05/2017-28/06/2017	0	3.393	3.393
29/06/2017-29/07/2017	0	2.088	2.088
30/07/2017-29/08/2017	0	2.448	2.448
30/08/2017-28/09/2017	0	2.106	2.106
29/09/2017-29/10/2017	0	2.250	2.250
30/10/2017-28/11/2017	0	2.250	2.250
29/11/2017-29/12/2017	0	2.970	2.970
30/12/2017-31/12/2017	0	0	0
Subtotal 2017	-	-	36.306
01/01/2018-08/01/2018	0	0	0
Subtotal 2018	-	-	0
Total (30/05/2012-08/01/2018)			363.643

Note:

1. Chaiji Xia Hydropower Station has almost no imported electricity through the back-up power line, so the meter readings from M4 at the project side are almost zero. However, the back-up power line is always in a live back-up status, so the values from sales receipts issued by the grid company are derived from the line loss between the project site and transformer station.
2. The readings of received from the grid through the backup power line during 01-29 Jan. and 30-31 Dec. of each year are sourced from the daily reading records of meter M4.
3. Since the cut-off time of electricity received from the grid through backup power line is at 24:00 on the antepenultimate day of each month and the sales receipts are issued monthly, there are no separate sales receipts for 01-29 Jan. and 30-31 Dec. of each year. To be conservative, for the period 01-29 Jan. and 30-31 Dec. of each year, the whole month's (30 Dec.- 29Jan.) values from the sales receipts are applied for ER calculations.

Table 5.3 Calculation of net electricity supplied to the grid

Period	Conservative values of electricity supplied to the grid through main lines (MWh)	Conservative values of electricity received from the grid through main lines and back-up power line (MWh)	Net electricity supplied to grid by the project (MWh)
	ES _y	ED _y	EG _y =ES _y -ED _y
	D	L=H+K	M=D-L
30/05/2012-31/12/2012	360,352.960	66.120	360,286.840
01/01/2013-31/12/2013	556,324.120	83.160	556,240.960
01/01/2014-31/12/2014	538,915.520	89.600	538,825.920
01/01/2015-31/12/2015	499,396.040	73.280	499,322.760
01/01/2016-31/12/2016	455,894.340	20.457	455,873.883
01/01/2017-31/12/2017	472,492.680	36.306	472,456.374
01/01/2018-08/01/2018	0	0	0
Total	2,883,375.660	368.923	2,883,006.737

Table 5.4 Calculation of baseline emissions

Period	Net electricity supplied to the grid by the project	Emission Factor	Baseline Emissions
	EG _y	EF _y	BE _y =EG _y *EF _y
	MWh	tCO ₂ e/MWh	tCO ₂ e
30/05/2012-31/12/2012	360,286.840	0.8410	303,001
01/01/2013-31/12/2013	556,240.960	0.8410	467,798
01/01/2014-31/12/2014	538,825.920	0.8410	453,152
01/01/2015-31/12/2015	499,322.760	0.8410	419,930
01/01/2016-31/12/2016	455,873.883	0.8410	383,389
01/01/2017-31/12/2017	472,456.374	0.8410	397,335
01/01/2018-08/01/2018	0	0.8410	0
Total	2,883,006.737	/	2,424,605

5.2 Project Emissions

Project emissions from the reservoir

The actual measured surface area at full reservoir level is 2,535,158m² and the installed capacity is 96 MW= 96,000,000W. Thus, the actual power density is calculated as $96,000,000W/2,535,158m^2=40.8W/m^2$ which leads to a power density sensibly higher than 10 W/m². Therefore, emissions from the reservoir do not have to be taken into account according to the methodology.

Project emissions due to the diesel generator

The emergency back-up diesel generator on site has a capacity of 250 kW and the operation hours during this monitoring period are recorded as 41 hours.

According to the PD, for the emission factor of the diesel generator, we refer to the AMS-I.D. (version 10) methodology, which provides emission factors for diesel generator systems. We apply the highest value listed in the methodology, i.e. 2.4 kg CO₂e/kWh (generators below 15 kW), which is conservative considering the size of the generator used on-site.

The detailed calculation of emissions from diesel generator is listed in Table 5.5 as below:

Table 5.5 Calculation of project emissions from diesel generator

Period	Installed Capacity of the Diesel Generator	Measured Operation Hours	Roundup Operation Hours	EF for the Diesel Generator	Emissions of the diesel generator
	A	B	B'=ROUNDUP (B,0)	C	D=ROUNDUP((A*B *C/1000),0)
	kW	hour	hour	kg CO ₂ e/kWh	tCO ₂ e
30/05/2012-31/12/2012	250	5.083	6	2.4	4
01/01/2013-31/12/2013		7.383	8		5
01/01/2014-31/12/2014		5.417	6		4
01/01/2015-31/12/2015		5.500	6		4
01/01/2016-31/12/2016		5.917	6		4
01/01/2017-31/12/2017		7.817	8		5
01/01/2018-08/01/2018		0.333	1		1
Total	/	37.450	41	/	27

5.3 Leakage

According to the baseline and monitoring methodology ACM0002 (Version 06), and the registered PD, the project does not involve leakage.

Thus, $L_y=0$ tCO₂e

5.4 Net GHG Emission Reductions and Removals

5.4.1 Calculation of emission reductions (ER_y)

The emission reductions (ER_y) are the deduction of the project emission (PE_y) and the leakage (L_y) from the baseline emission (BE_y) in year y, as follows:

$$ER_y = BE_y - PE_y - L_y$$

With:

ER_y = Emission reductions in year y, tCO₂e.

BE_y = Baseline emissions in year y, tCO₂e.

PE_y = Project emissions in year y, tCO₂e.

L_y = Leakage emissions in year y, tCO₂e, for the project, $L_y=0$.

The emission reductions of the project activity during the monitoring period (30/05/2012 - 08/01/2018) are summarized in the table below:

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)
2012 (30/05/2012-31/12/2012)	303,001	4	0	302,997
2013	467,798	5	0	467,793
2014	453,152	4	0	453,148
2015	419,930	4	0	419,926
2016	383,389	4	0	383,385
2017	397,335	5	0	397,330
2018 (01/01/2018-08/01/2018)	0	1	0	-1
Total	2,424,605	27	0	2,424,578

5.4.2 Remarks on difference between actual and estimated value in the VCS-PD

Table 5.6 Comparison of actual ERs and EG_y with the estimated value in the VCS-PD

Period	Actual ERs (tCO ₂ e)	Estimated ERs (379,896 tCO ₂ e per annum)	Discrepant proportion	Actual EG _y ¹ (MWh)	Estimated EG _y (451,720MWh per annum)	Discrepant proportion
	A	B=379,896/365*205 0	C=(A-B)/B*100%	D	E=451,720/365*2 050	F=(D-E)/E*100%
30/05/2012- 08/01/2018 (2050 days)	2,424,578	2,133,662	13.63%	3,058,640.657	2,537,057.534	20.56%

As shown in Table 5.6 above, the actual ERs during the current monitoring period (30/05/2012-08/01/2018) were 13.63% higher than the estimated value in the VCS-PD and the actual EG_y achieved during the current monitoring period was 20.56% higher than the estimated value.

The key parameter that affects the actual achieved ERs as well as the additionality of the project is the net electricity supply (EG_y), thus, the reason for the higher achieved EG_y is explained as follows:

During the current monitoring period, there was no low-water period, thus the water resources were relatively abundant. Meanwhile, with the increase of operating hours, sufficient training for the on-site staff and technicians and the enhancement of the overall management, the staff and technicians of Chaiji Xia Hydropower Station became familiar with the operating system and can perform the operation job with practiced skill, which led to the increase of the water utilization rate and therefore, the power generation of Chaiji Xia Hydropower Station increased correspondingly. A more intuitive statistical figure is shown below:

¹ The excess proportion of EG_y is higher than emission reductions due to that the principle of conservativeness has been followed in the calculation of emission reductions.

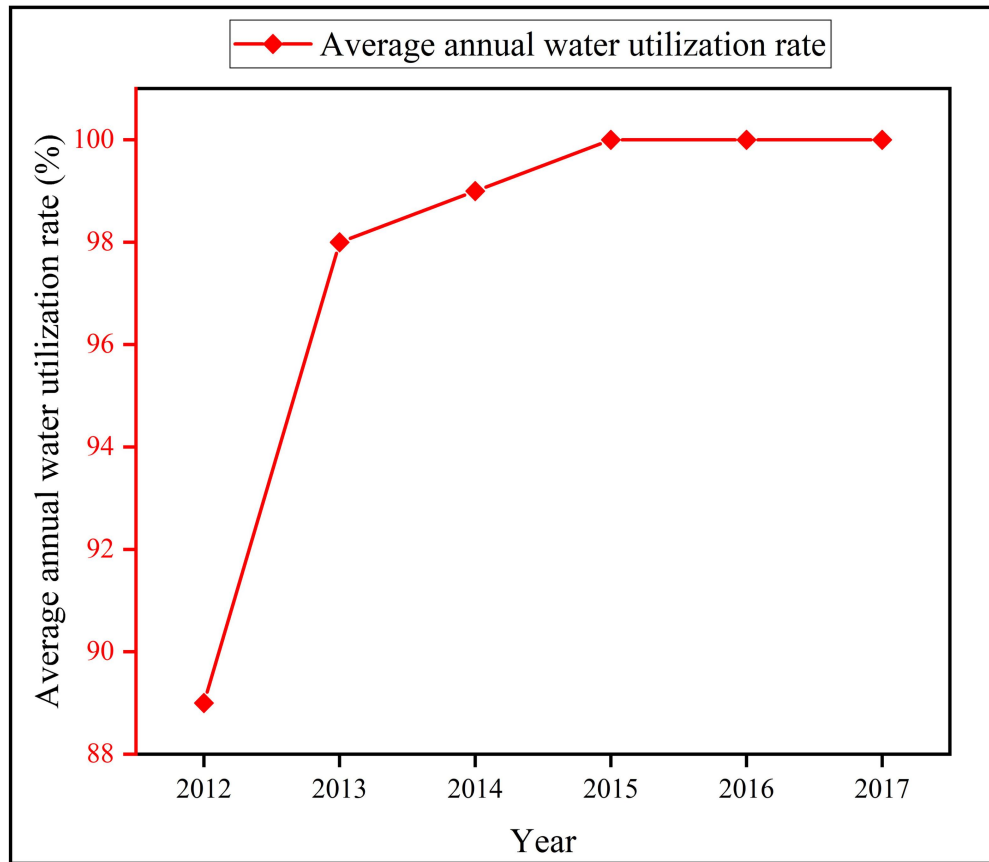


Figure 5.1 Average annual water utilization rate
(sourced from the monthly water utilization records)

According to the statistics, from 2015 to 2017, the average annual water utilization rate was almost 100%, followed by 99% in 2014, 98% in 2013, and 89% in 2012. And the average water utilization rate per month during the current monitoring period (30/05/2012-08/01/2018) was 97.66%. This led to higher power generation.

According to the registered PDD of Chaiji Xia Hydropower Station Project (UNFCCC reference NO.2103), which also serves as the VCS-PD of this project, 8% was selected as the Internal Rate of Return (IRR) benchmark to demonstrate the additionality of the project.

After calculation, it is found that, over the entire lifetime of the Chaiji Xia Hydropower Station (30 years), if the actual power supply increases by at least 22.4%, the IRR will reach the 8% benchmark.

As shown in Table 5.6 above, the actual EG_y during the current monitoring period was 20.56% higher than the estimated value, which did not exceed 22.4% in the IRR sensitivity analysis. Therefore, the additionality of the project is not affected by over generation during the monitoring period.

Furthermore, the comparison of actual ERs and EG_y with the estimated values during the whole crediting period (09/01/2008-08/01/2018) is shown in Table 5.7 below:

Table 5.7 Comparison of actual ERs and EG with the estimated values in the VCS-PD

Period	Number of Days	Actual ERs (tCO ₂ e)	Estimated ERs (379,896 tCO ₂ e per annum)	Discrepant proportion	Actual EG _y (MWh)	Estimated EG _y (451,720MWh per annum)	Discrepant proportion
	A	B	C=379,896 /365*A	D=(B-C)/C*100%	E	F=451,720/365*A	G=(E-F)/F*100%
09/01/2008-08/01/2018	3,653	4,017,343	3,802,082	5.66%	4,952,554.317	4,520,912.767	9.55%

Note: the above data are calculated based on the previously approved CDM MR and VCS MR as well as the MR for this monitoring period of the project

As shown in Table 5.7, during the whole crediting period (09/01/2008-08/01/2018), the actual emission reductions were 5.66% higher than the estimated in VCS-PD which was not a significant increase. The actual total EG_y was 9.55% more than the estimated in the VCS-PD. As stated above, if the actual power supply increases by at least 22.4%, the IRR will reach the 8% benchmark. 9.55% is far below 22.4%, which means the additionality of the project was not impacted by the higher EG_y achieved during the whole crediting period.

In conclusion, from the above analysis of actual ERs and EG_y in the current monitoring and the total crediting period, it can be concluded that the operation of the project was normal and its performance was reasonable. And accordingly, its additionality has not been affected by its higher emission reductions achieved during the current monitoring period than the estimated value in the VCS-PD.

APPENDIX 1 < SUPPORTING EVIDENCE >

Evidence for SDG8: The annual income and numbers of the employees are shown as below:

Figure 1 Total wages and per capita income from 2012 to 2018

Sheet of Total Wages and Per Capita Income from 2012 to 2018

Year	Total Wages(RMB)	Number	Per Capita Income(RMB)	Note
2012	6284457.96	86	73075.09	Male: 52 Female: 34
2013	6927923.14	91	76131.02	Male: 55 Female: 36
2014	8713940.64	91	95757.59	Male: 55 Female: 36
2015	9374934.13	91	103021.25	Male: 56 Female: 35
2016	10451720.74	92	113605.66	Male: 54 Female: 38
2017	10252514.09	92	111440.37	Male: 55 Female: 37
2018	10627812.27	92	115519.7	Male: 53 Female: 39

Evidence for SDG 7&13

As per MR template v4.1, “the cumulative impact should be calculated by summing the current project contributions with all impacts included in previously approved VCS monitoring reports or Sustainable Development Contribution Reports”, thus, from project operation date onwards, the net electricity supplied to the grid and corresponding emission reductions in every monitoring period under VCS scheme have been listed in the below table.

Monitoring Period under VCS		EG _y	ERs	Program
From	To	MWh	tCO ₂ e	
09/01/2008	19/02/2009*	346,601.24	291,486	VCS
30/05/2012	08/01/2018**	2,883,006.737	2,424,578	
Total		3,229,607.977	2,716,064	

*The net electricity supplied to the grid and the emission reductions generated during the first VCS monitoring period (09/01/2008-19/02/2009) have been verified by VVB and approved by Verra: <https://registry.verra.org/app/projectDetail/VCS/435>.

**The net electricity supplied to the grid is 2,883,006.737MWh and the emission reductions generated are 2,424,578 tCO₂e during this monitoring period (30/05/2012-08/01/2018) and the calculation process have been displayed in Section 5 of the MR.