DATONG RIVER ZHUCHAXIA HYDROPOWER STATION

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Datong River Zhuchaxia Hydropower Station (hereafter referred to as the project) developed by GEPIC Darong Electric Power Company Ltd. (hereafter referred to as the project proponent) is a run-of-river hydropower project located in Tibetan Autonomous County of Tianzhu, Gansu Province, P.R. China. The total installed capacity of the project is 34 MW, consisting of two 13.5 MW and one 7 MW turbine generators.

The purpose of the project is to utilize the hydrological resources of the Datong River through the construction of a run-of-river hydro project to generate zero emissions electricity for the Gansu Power Grid, which is an integral part of the Northwest China Power Grid (NWCPG). The electricity currently generated by the NWCPG is relatively carbon intensive. The project is therefore expected to reduce GHG emissions by reducing the need of thermally generated power and reducing needed capacity expansion of fossil fuel-based generation of the NWCPG. The estimated annual net electricity exported to the grid of the project was 143,113 MWh and the estimated emission reductions of the project were 121,617 tCO_2e per year.

The project started construction on 13/04/2006, the first generator was put into operation on 24/03/2008, and all generators were put into operation on 02/06/2008. The estimated operation period of the project is 25 years, as stated in the registered CDM PDD (version 02).

The project was registered as a CDM project on 18/12/2009 with CDM reference 2845, and 680,271 tCO_2e of emission reductions have been issued as CERs for seven monitoring periods between 18/12/2009 and 29/12/2015. The project was also registered as a VCS project with VCS reference 817, and 180,792 tCO_2e of emission reductions have been issued as VCUs for the monitoring period 24/03/2008 to 17/12/2009.

The emission reduction achieved during this monitoring period (30/12/2015 to 23/03/2018) is 293,331 tCO_2e.

1.2 Sectoral Scope and Project Type

Sectoral Scope 1: energy industries (renewable sources)

Project Activity: Grid-connected renewable power generation.

The project is not a grouped project.

1.3 Project Proponent

Organization name	GEPIC Darong Electric Power Company Ltd.
Contact person	HU Bo
Title	Project Manager
Address	Gansu Investment Building, No. 69 Hedong Road, Chengguan District, Lanzhou City, Gansu Province, People's Republic of China
Telephone	+86 0931-8822631
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1.4 Other Entities Involved in the Project

Organization name	Gansu Heihe Electric Power Sales Co., Ltd.
Role in the Project	Consultant
Contact person	LIU Mengde
Title	General Manager
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1.5 Project Start Date

The project started on 24/03/2008, the commissioning date of the first generator.

1.6 Project Crediting Period

There is a deviation for the crediting period. For the first monitoring period under the VCS program, the crediting period requested was 24/03/2008 – 17/12/2009. However, as the project was registered as a VCS project under *VCS Standard version 3,* and completed validation before

19/03/2020, 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.

As per *VCS Standard v4.1*, projects registered under other GHG programs are not eligible for VCU issuance beyond the end of the total project crediting period under those programs. Since the project is also a registered CDM project and has a fixed ten-year crediting period of 18/12/2009 to 17/12/2019 under the CDM program, the total length of VCS crediting period should be no more than 10 years. Therefore, the crediting period of the project should be updated from 24/03/2008 – 17/12/2009 to 24/03/2008 – 23/03/2018.

1.7 Project Location

The project activity is located in Tibetan Autonomous County of Tianzhu, Gansu Province, P.R. China. The geographical coordinates of the dam are 102°35'32" E and 36°52'19" N, and the geographical coordinates of the powerhouse are 102°38'14" E and 36°51'12" N. **Figure 1.1** shows the location of the project.

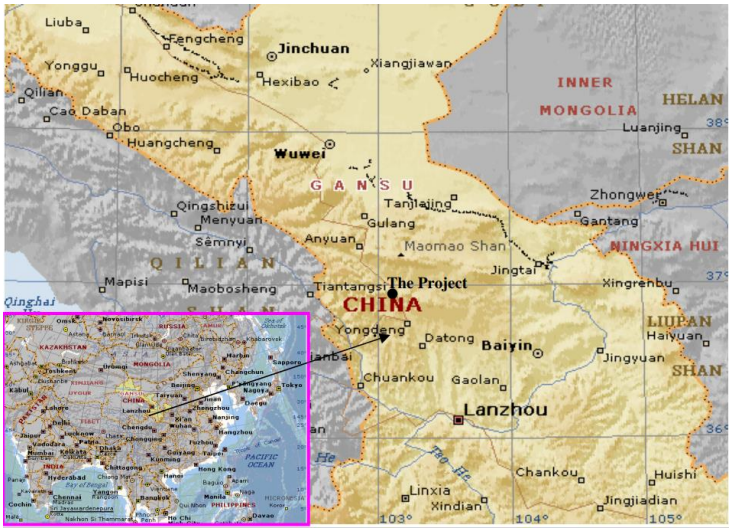

Figure 1.1 Location of the project

1.8 Title and Reference of Methodology

The applied methodology:

ACM0002 (Version 07) – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

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

The applied tools:

TOOL07 – "Tool to calculate the emission factor for an electricity system" (Version 01.1)

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf

TOOL03 – "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02)

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

TOOL01 – "Tool for the demonstration and assessment of additionality" (Version 05.2)

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

1.9 Participation under other GHG Programs

The project was registered as a UNFCCC CDM project on 18/12/2009 (UNFCCC reference: 2845), with a fixed ten-year period from 18/12/2009 to 17/12/2019.

The project has also been registered as a VCS project (VCS reference: 817).

A total number of 680,271 CERs, corresponding to GHG emission reductions of 680,271 tCO_2e, have been issued under the CDM program for seven monitoring periods between 18/12/2009 and 29/12/2015; 180,792 tCO_2e of GHG emission reductions have been issued as VCUs under the VCS program for the monitoring period 24/03/2008 to 17/12/2009, as is shown in **Table 1.1**.

Table 1.1 List of GHG emission reduction credits issued

Monitoring period	GHG emission reductions (tCO_2e)	Credit	Program
24/03/2008 – 17/12/2009	180,792	VCU	VCS
18/12/2009 – 05/29/2010	24,715	CER	CDM
30/01/2010 – 29/01/2011	89,053	CER	CDM
30/01/2011 – 28/11/2011	114,248	CER	CDM
29/11/2011 – 31/12/2012	123,388	CER	CDM
01/01/2013 – 28/11/2013	99,219	CER	CDM
29/11/2013 – 29/12/2014	113,672	CER	CDM
30/12/2014 – 29/12/2015	115,976	CER	CDM

Refer to the link below for more detailed information:
https://cdm.unfccc.int/Projects/DB/TUEV-SUED1249311745.95/view

1.10 Other Forms of Credit

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.

The emission reductions generated from the current monitoring period 30/12/2015 to 23/03/2018 have not been and will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions. The emission reductions achieved during this monitoring period will only be used for VCU issuance request under the VCS program.

The project has not sought and will not seek another form GHG-related environmental credit for this monitoring period.

1.11 Sustainable Development

The construction and operation of the project contributes to the sustainable development through the following aspects:

- Relieve the regional power shortage and facilitate the local economic development;
- Supply reliable and zero-emitting renewable energy to the provincial grid, reduce other pollutants resulting from the power generation industry, protect the environment;
- Increase local people's income, create new job opportunities for local people, and improve the quality of life;
- Improve the infrastructure that will enhance the transport for local goods and people.

2 SAFEGUARDS

2.1 No Net Harm

The construction and operation of this project did not and will not result in any significant environmental impacts or any negative socio-economic impact.

Environmental impacts

The project proponent entrusted a third party, Environmental Assessment Research Center of Lanzhou University, to conduct the environmental impact assessment (EIA) on the project and obtained the approval from Environmental Protection Bureau of Gansu Province on 04/07/2006 (Ganhuanzifa [2006] 21).

Construction phase

During the construction phase, the negative environmental issues mainly include: dust and air pollution due to the transport of construction materials, noise from construction machinery, as well as an increased amount of construction and domestic waste.

Operation phase

No household resettlement occurs due to the project. The negative impacts during the operation phase mainly include the alteration of the hydrological conditions in the section of the Datong river due to the intake and the powerhouse. Other potential impacts include alterations of downstream water quality, flood control issue, etc.; however, these impacts are extremely small. The above-mentioned issues will be minimized by means of good engineering practices including enclosed operation, sewage treatment, vibration reduction, sound insulation and other measures. Solid waste will be transported to two dumping sites nearby from the construction sites.

Socio-economic impacts

During the construction and the operation including the reported monitoring period, the project does not result in any negative socio-economic impacts. On the contrary, the project brings many benefits to the local people, such as increase in local residents' living standards, improvement in electric power supply and infrastructure level etc., as mentioned in Section 1.11.

To sum up, the project does not have significant impacts on the environment or on the local society and economy. There is no transboundary impact involved with the project. Negative impacts are mitigated with a set of environmental protection measures in consistent with national and local laws and regulations. After the completion of the construction, the project was put into operation only after inspection and acceptance by the local environmental protection department. During the project operation, the project continues to contribute to the local society and economy.

2.2 Local Stakeholder Consultation

Two public consultations were carried out before the project construction. The first public consultation took place in 2006, and the environment impact of the project activity was introduced to the public. The second round of public consultation was organized in September 2007 with the purpose to introduce the project from the CDM point of view and get stakeholders' comments.

First round of consultation before the project construction

During March 2006, the public consultation concerning the environmental impact of the project was carried out jointly by means of a questionnaire survey, symposiums and an experts' seminar.

Symposiums were held various places including the town hall to investigate and analyze the post-construction impacts of the project on downstream river sections and on local economy and society.

Experts were invited in a seminar to discuss the environmental issues of the post-construction period. Valuable advice and suggestions were brought up and seriously taken into account.

The questionnaire survey involved residents over 18 years old living or working within the area influenced by the hydropower station. The sampling process was based on the principle of gradual degression outward from the densely populated area and on the method of multi-stage stratified random sampling. 50 copies of questionnaire were issued and 50 were recovered, with a recovery ratio of 100%. 50 copies were valid, with a validity ratio of 100%.

The questions were:

- How much do you acquaint yourself with this project? □ More □ A little □ None
- What impacts do you think this engineering construction has on local eco-environment? □ Favorable □ Adverse □ None
- What impacts does this engineering construction have on your living quality? □ Improved □ Reduced □ None
- What impacts do you think this engineering construction has on the development of regional economy? □ Improved □ Reduced □ None
- What problems do you care during construction period? □ Ecological destruction □ Influenced traffic □ Garbage pollution
- Are you satisfied with the policy of land requisition compensation? □ Satisfied □ Unsatisfied □ Extremely unsatisfied
- What is your attitude toward this project? □ Supporting □ Opposed □ Unclear
- Any other suggestions or requirements you would like to propose for this project:

The survey results were concluded as follows: (1) Most of surveyed persons agree the project construction. They think this project can help local economic development, improve the local environment and benefit country and people. (2) The security must be assured in the design and construction of this project. Research on the local ecology and environment should be carried out, and environmental measures should be taken according to the EIA report, which will minimize the damage and avoid the irreversible impact on the environment. (3) They hope that the project starts construction and gets into operation soon.

Second round of consultation before the construction

A stakeholder consultation meeting was held on 25/09/2007. Before the meeting, various ways to inform potential stakeholders of this event included: newspaper announcement on 19/09/2007 in the Gansu Daily (Gansu's leading daily newspaper), online announcement on the website: www.dhv.cn (from 13/09/2007), and distribution of project information leaflets at the neighborhood of the project. Both the project information leaflets and the website included detailed project description as well as the date of the stakeholder consultation meeting.

The host started by giving an introduction of the meeting agenda. The project proponent introduced the project and explained the CDM program. Participants raised questions and comments.

Questions: How many local people are employed in the building site?

Answers: It depends on the progress of the construction. As a whole, there will be more than 500 people employed.

Questions: Is the river polluted? Do local villagers drink river water?

Answers: The river wasn't polluted. For the river is bit far away from settlements, they drink springs nearby, rather than river water.

Questions: How many permanent posts will the station provide when completion?

Answers: It depends on whether local people could meet the requirement. Generally speaking, those challenging positions like managers, technical experts will be appointed by our headquarters; other supplementary posts will be employed locally.

Questions: The opinion of residents.

Answers: The main financial source of local residents is from farming. The station provides them with an additional income source. Some people use their vehicle to cart sand and stone to earn money. Run-of-river station impacts little on the farmland. We benefit a lot from the station.

Questions: Do your family work in the station? How about their income?

Answers: Yes, 40-50 RMB/person/day. It is a good payment.

Questions: The compensation for temporarily and permanently requisitioned land.

Answers: To compensate for temporarily requisitioned land, the policy is to pay 6 years of farmland income for 3-year requisition. For permanently requisitioned land, the compensation fee would be 28000 RMB/Mu (Chinese acre, 1Mu = 666.7 m^2). For Bunge prickly ash trees, 280 RMB/tree.

Questions: Are you satisfied with the compensation?

Answers: Yes.

No comments were received by e-mail, on the website or by telephone.

Stakeholder consultation during the reported monitoring period

During the project operation, local stakeholder consultation activities are also held on a regular basis. During the reported monitoring period, the project proponent carried out surveys by means of questionnaire, for two separate times in March 2015 and July 2017. Questionnaires, with questions concerning the impacts of the project operation in different aspects, were distributed to local residents working and living around the area. No negative comments were received. The respondents generally expressed their support to the project.

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

The project is a run-of-river hydro power generation project, with a total installed capacity of 34 MW, consisting of two 13.5 MW and one 7 MW turbine generators. The designed operation lifetime of the project is 25 years. The main technical parameters of the project equipment are shown in **Table 3.1**, according to the Product Manuals of the equipment provided by the project proponent.

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

Water turbines		
Manufacturer	Tianjin Tianfa Heavy Hydropower Equipment Co., Ltd.	
Type	HLA551C-LJ-230	HLA551C-LJ-165
Quantity	2	1
Rated power	13.9 MW	7.3 MW
Rated water head	38 m	38 m
Rated flow	39.67 m^3/s	20.88 m^3/s
Generators		
Manufacturer	Tianjin Tianfa Heavy Hydropower equipment Co., Ltd.	
Type	SF13.5-28/4870	SF7000-20/3250
Quantity	2	1
Rated power	13.5 MW	7 MW
Rated voltage	10.5 kV	10.5 kV
Rated current	873.3 A	452.8 A
Rated speed	214.3 r/min	300 r/min

The project started construction on 13/04/2006, the first generator was put into operation on 24/03/2008, and all generators were put into operation on 02/06/2008, as is shown in **Table 3.2**. The project construction mainly consists of a water retaining structure (a main dam and an auxiliary dam), a water release structure (a release and flushing sluice and five flood diversion sluices), a diversion tunnel, a powerhouse (three turbine generators) and a switch station. The

generated electricity is delivered to the Gansu Power Grid (an integral part of the NWCPG) through two 110 kV transmission lines to a station located at 51 km away from the project site.

Since commissioning, the project operation has been in good conditions. During this monitoring period, the project was also running orderly without any overhauling and downtimes of equipment. No special events occurred during the monitoring period which may impact the applicability of the methodology or the GHG emission reductions and monitoring.

Table 3.2 Implementation timeline of the project

Construction started	13/04/2006
The generator #1 started operation	24/03/2008
The generator #2 started operation	28/04/2008
The generator #3 started operation	02/06/2008
CDM registration date	18/12/2009
First CER issuance (monitoring period: 30/01/2010 – 29/01/2011)	20/07/2011
Second CER issuance (monitoring period: 18/12/2009 – 05/29/2010)	03/01/2012
Third CER issuance (monitoring period: 30/01/2011 – 28/11/2011)	25/04/2012
VCS registration	03/05/2012
First VCU issuance (monitoring period: 24/03/2008 – 17/12/2009)	23/05/2012
Fourth CER issuance (monitoring period: 29/11/2011 – 31/12/2012)	24/04/2013
Fifth CER issuance (monitoring period: 01/01/2013 – 28/11/2013)	20/06/2014
Sixth CER issuance (monitoring period: 29/11/2013 – 29/12/2014)	23/05/2016
Seventh CER issuance (monitoring period: 30/12/2014 – 29/12/2015)	23/11/2016

3.2 Deviations

3.2.1 Methodology Deviations

There is no methodology deviation applied to this monitoring period.

3.2.2 Project Description Deviations

There is a deviation for the crediting period. For the first monitoring period under the VCS program, the crediting period requested was 24/03/2008 – 17/12/2009. However, as the project was registered under *VCS Standard version 3* and completed validation before 19/03/2020, 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.

As per *VCS Standard v4.1*, projects registered under other GHG programs are not eligible for VCU issuance beyond the end of the total project crediting period under those programs. Since the project is also a registered CDM project and has a fixed ten-year crediting period of 18/12/2009 to 17/12/2019 under the CDM program, the total length of the VCS crediting period should be no more than 10 years. Therefore, the crediting period of the project should be updated from 24/03/2008 – 17/12/2009 to 24/03/2008 – 23/03/2018.

This deviation of crediting period has no impact on the applicability of the methodology, additionality or the appropriateness of the baseline scenario and meet all appropriate rules and requirements of VCS standard.

3.3 Grouped Projects

Not applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y*
Source of data	The registered PDD
Value applied	0.8498
Justification of choice of data or description of measurement methods and procedures applied	The registered PDD calculated the value of this parameter as per the requirements in TOOL07 (01.0). See Annex 3 of the PDD for details.

Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period

Data / Parameter	A_{BL}
Data unit	m^2
Description	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full. For new reservoirs, this value is zero.
Source of data	The registered PDD
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	For new reservoirs, this value is zero, as per ACM0002 (version 07).
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	CAP_{BL}
Data unit	MW
Description	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero.
Source of data	The registered PDD
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	For new hydro power plants, this value is zero, as per ACM0002 (version 07).
Purpose of Data	Calculation of project emissions
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{out,y}$
Data unit	MWh

<table>
<tr><td>Description</td><td>Annual on-grid electricity supplied to the NWCPG by the project during the year y</td></tr>
<tr><td>Source of data</td><td>On-site measurement</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>The measurement is conducted by meters continuously and recorded monthly.

Power Measurement Center of Gansu Province Electric Power Company, recognized by the National Metrology Administration, is responsible for the verification, calibration and test of the meters involved in the project.

The calibration is carried out every year for both the main meters and the backup meters.

The accuracy of the electric meters is 0.2 S.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Continuous monitoring and monthly recording by the grid company.</td></tr>
<tr><td>Value monitored</td><td>Accumulated value: 345,296.080 during this monitoring period, see Table 5.1 for details.</td></tr>
<tr><td>Monitoring equipment</td><td>The main meters for monitoring this parameter are M1 and M1’:
<table>
<tr><td></td><td>M1</td><td>M1’</td></tr>
<tr><td>Type</td><td>SL7000</td><td>SL7000</td></tr>
<tr><td>Accuracy class</td><td>0.2 S</td><td>0.2 S</td></tr>
<tr><td>Serial number</td><td>36145166</td><td>36145167</td></tr>
<tr><td>Calibration frequency</td><td>Yearly</td><td>Yearly</td></tr>
<tr><td>Calibration date</td><td>07/01/2015
06/01/2016
05/01/2017
04/01/2018</td><td>07/01/2015
06/01/2016
05/01/2017
04/01/2018</td></tr>
</table>
The check meters for this parameter are M2 and M2’:
<table>
<tr><td></td><td>M2</td><td>M2’</td></tr>
<tr><td>Type</td><td>SL7000</td><td>SL7000</td></tr>
<tr><td>Accuracy class</td><td>0.2 S</td><td>0.2 S</td></tr>
<tr><td>Serial number</td><td>36145165</td><td>36145164</td></tr>
<tr><td>Calibration frequency</td><td>Once every three years</td><td>Once every three years</td></tr>
</table></td></tr>
</table>

	<table><tr><td>Calibration date</td><td>07/01/2015 06/01/2018</td><td>07/01/2015 06/01/2018</td></tr></table>
QA/QC procedures to be applied	The meters are calibrated following relevant national standards and regulations. The amount of electricity delivered to the grid is recorded by both the project proponent and the grid company. The collected data are cross-checked with sales receipts, and the lower values are used for the calculation of emission reductions to ensure the conservativeness. Data record and relevant documents will be archived until at least two years after the crediting period.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$EG_{in,y}$
Data unit	MWh
Description	Annual on-grid electricity purchased from the NWCPG by the project for the plant operation during the year y
Source of data	On-site measurement
Description of measurement methods and procedures to be applied	The measurement is conducted by meters continuously and recorded monthly. Power Measurement Center of Gansu Province Electric Power Company, recognized by the National Metrology Administration, is responsible for the verification, calibration and test of the meters involved in the project. The calibration is carried out every year for both the main meters and the backup meters. The accuracy of the electric meters is 0.2 S.
Frequency of monitoring/recording	Continuous monitoring and monthly recording by the grid company.
Value monitored	Accumulated value: 116.155 during the monitoring period, see **Table 5.1** for details.
Monitoring equipment	The main meters for monitoring this parameter are M1 and M1': <table><tr><td></td><td>M1</td><td>M1'</td></tr></table>

	<table><tr><td>Type</td><td>SL7000</td><td>SL7000</td></tr><tr><td>Accuracy class</td><td>0.2 S</td><td>0.2 S</td></tr><tr><td>Serial number</td><td>36145166</td><td>36145167</td></tr><tr><td>Calibration frequency</td><td>Yearly</td><td>Yearly</td></tr><tr><td>Calibration date</td><td>07/01/2015 06/01/2016 05/01/2017 04/01/2018</td><td>07/01/2015 06/01/2016 05/01/2017 04/01/2018</td></tr></table> The check meters for this parameter are M2 and M2': <table><tr><td></td><td>M2</td><td>M2'</td></tr><tr><td>Type</td><td>SL7000</td><td>SL7000</td></tr><tr><td>Accuracy class</td><td>0.2 S</td><td>0.2 S</td></tr><tr><td>Serial number</td><td>36145165</td><td>36145164</td></tr><tr><td>Calibration frequency</td><td>Once every three years</td><td>Once every three years</td></tr><tr><td>Calibration date</td><td>07/01/2015 06/01/2018</td><td>07/01/2015 06/01/2018</td></tr></table>
QA/QC procedures to be applied	The meters are calibrated following relevant national standards and regulations. The amount of electricity delivered to the grid is recorded by both the project proponent and the grid company. The collected data are cross-checked with sales receipts. Data record and relevant documents will be archived until at least two years after the crediting period.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	EG_y
Data unit	MWh

Description	Annual net electricity exported to the NWCPG by the project during the year *y*
Source of data	Calculated
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	-
Value monitored	Accumulated value: 345,179.925 during the monitoring period. See **Table 5.1** for details.
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of baseline emissions
Calculation method	$EG_y = EG_{out,y} - EG_{in,y}$, as Equation (2) in Section 5.1.
Comments	-

Data / Parameter	TEG_y
Data unit	MWh
Description	Annual total electricity produced by the project, including the electricity supplied to the grid and the electricity supplied to internal loads, during the year *y*
Source of data	On-site measurement
Description of measurement methods and procedures to be applied	The measurement is conducted by meters continuously and recorded monthly. Power Measurement Center of Gansu Province Electric Power Company, recognized by the National Metrology Administration, is responsible for the verification, calibration and test of the meters involved in the project. The calibration is carried out every three years. The accuracy of the electric meters is 0.5 S.
Frequency of monitoring/recording	Continuous monitoring and monthly recording by the grid company.
Value monitored	360,457.760 during the monitoring period, see the table below for details.

Period	Electricity produced by G1 (M3)	Electricity produced by G2 (M4)	Electricity produced by G3 (M5)	Total
	MWh	MWh	MWh	MWh
30/12/2015 – 31/12/2015	32.400	356.880	22.920	412.200

Subtotal 30/12/2015 – 31/12/2015	32.400	356.880	22.920	412.200
01/01/2016 – 29/01/2016	1,961.520	3,873.600	187.200	6,022.320
30/01/2016 – 27/02/2016	2,881.440	7.440	1,622.280	4,511.160
28/02/2016 – 29/03/2016	1,218.320	0.000	1,034.880	2,253.200
30/03/2016 – 28/04/2016	5,201.440	1,099.200	1,927.160	8,227.800
29/04/2016 – 29/05/2016	7,076.640	4,861.680	2,246.400	14,184.720
30/05/2016 – 28/06/2016	6,500.160	1,584.480	2,181.960	10,266.600
28/06/2016 – 29/07/2016	8,174.520	6,497.280	2,892.240	17,564.040
30/07/2016 – 29/08/2016	8,366.400	6,767.520	3,139.560	18,273.480
30/08/2016 – 28/09/2016	9,428.400	9,105.360	4,561.560	23,095.320
29/09/2016 – 29/10/2016	4,894.000	6,784.480	3,428.440	15,106.920
30/10/2016 – 28/11/2016	3,893.760	6,438.720	772.080	11,104.560
29/11/2016 – 29/12/2016	5,681.520	7,424.640	1,622.760	14,728.920
30/12/2016 – 31/12/2016	358.240	294.080	250.560	902.880
Subtotal 01/01/2016 – 31/12/2016	65,636.360	54,738.480	25,867.080	146,241.920
01/01/2017 – 29/01/2017	5,889.280	6,382.400	610.050	12,881.730
30/01/2017 – 26/02/2017	5,418.000	3,820.080	653.100	9,891.180
27/02/2017 – 29/03/2017	5,821.920	2,354.560	1,232.760	9,409.240
30/03/2017 – 28/04/2017	3,503.920	5,344.960	692.560	9,541.440
29/04/2017 – 29/05/2017	7,851.760	6,491.040	2,337.600	16,680.400
30/05/2017 – 28/06/2017	8,668.880	9,092.400	4,086.900	21,848.180

28/06/2017 – 29/07/2017	8,130.320	8,536.400	3,444.600	20,111.320
30/07/2017 – 29/08/2017	10,147.840	9,865.200	6,113.200	26,126.240
30/08/2017 – 28/09/2017	8,079.950	7,505.920	3,388.500	18,974.370
29/09/2017 – 29/10/2017	9,091.040	8,966.960	4,482.400	22,540.400
30/10/2017 – 28/11/2017	4,345.920	6,062.160	1,275.960	11,684.040
29/11/2017 – 29/12/2017	7,699.600	8,026.720	3,238.900	18,965.220
30/12/2017 – 31/12/2017	311.840	243.520	105.800	661.160
Subtotal 01/01/2017 – 31/12/2017	84,960.270	82,692.320	31,662.330	199,314.920
01/01/2018 – 29/01/2018	4,097.600	203.760	2,040.000	6,341.360
30/01/2018 – 26/02/2018	4,406.800	0.000	258.960	4,665.760
27/02/2018 – 23/03/2018	1,988.560	0.000	1,493.040	3,481.600
Subtotal 01/01/2018 – 23/03/2018	10,492.960	203.760	3,792.000	14,488.720
Total	161,121.990	137,991.440	61,344.330	360,457.760

Monitoring equipment

	M3	M4	M5
Type	DTSD341	DTSD341	DTSD341
Accuracy class	0.5 S	0.5 S	0.5 S
Serial number	200707-01070015	200707-24040044	200707-24040070
Calibration frequency	Once every three years	Once every three years	Once every three years
Calibration date	19/03/2014 18/03/2017	19/03/2014 18/03/2017	19/03/2014 18/03/2017

QA/QC procedures to be applied	The meters are calibrated every three years following relevant national standards and regulations.
Purpose of the data	-
Calculation method	-

Comments	-

Data / Parameter	A_{PJ}
Data unit	m^2
Description	Area of the reservoir measured at the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	On-site measurement
Description of measurement methods and procedures to be applied	*Survey Report on Surface Area of the Reservoir*, provided by Northwest Hydro Consulting Engineers, China Hydropower Engineering Consulting Group
Frequency of monitoring/recording	Yearly
Value monitored	60,900 (2015), 60,900 (2016), 60,900 (2017), 60,900 (2018)
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of project emissions
Calculation method	NA
Comments	NA

Data / Parameter	CAP_{PJ}
Data unit	MW
Description	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data	Nameplate of the equipment
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Yearly
Value monitored	34
Monitoring equipment	-

QA/QC procedures to be applied	-
Purpose of the data	Calculation of project emissions.
Calculation method	-
Comments	-

4.3 Monitoring Plan

1) Organizational structure, responsibilities and competencies

In order to ensure monitoring of the project is in compliance with the monitoring plan and the methodology, the project proponent set up a monitoring team responsible for the monitoring plan, the structure of the monitoring team is outlined in **Figure 4.1**.

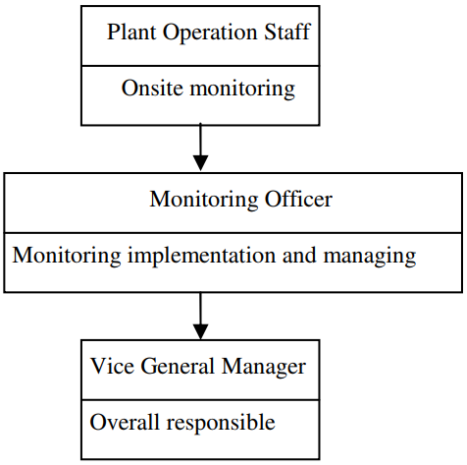

Figure 4.1 Management structure for monitoring

The responsibilities of the team members are briefly described as following:

Vice General Manager: holds the overall responsibility for the monitoring process and approval of the monitoring report.

Monitoring Officer: oversees all relevant matters with the monitoring activity, including but not limited to supervision and verification of metering and recording, collection of additional data, sales / billing receipts, calibration, calculation of emission reductions, preparation of monitoring report.

Plant Operation Staff: is responsible for the measurement of the monitored data, and assists the monitoring officer on the plant site.

2) Monitoring system and procedures

As per the registered PDD, net electric power exported to the grid EG_y is calculated as the difference of the electricity supplied by the project to NWCPG $EG_{out,y}$ and the electricity imported from the NWCPG to the project $EG_{in,y}$. **Figure 4.2** shows the monitoring points and meters.

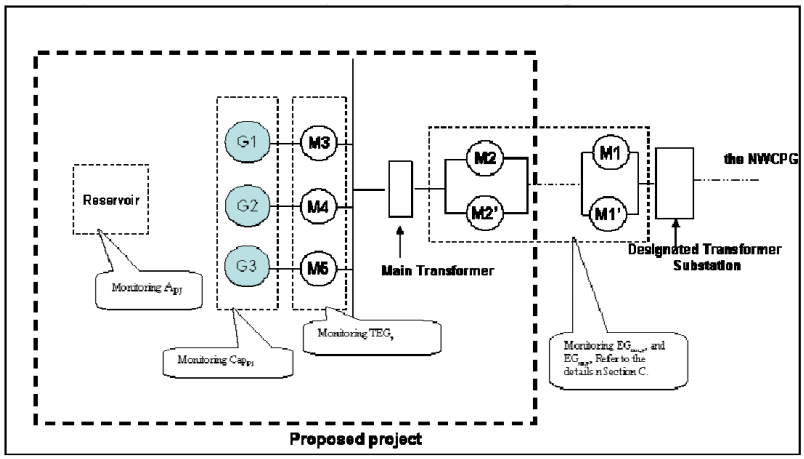

Figure 4.2 Diagram of monitoring points

$EG_{out,y}$, the electricity supplied by the project to NWCPG, is measured by two metering systems, a main metering system (M1 and M1') and a check metering system (M2 and M2') as backup. The main metering system which measured the electricity supplied by the project to NWCPG is installed at the Designated Transformer Substation. The check metering system is installed at the project site as a reference and backup to the main metering system. The meters are monitored continuously. The grid company reads and records the meters of the main metering system around 24:00 of the third last day of each month (equivalent to 0:00 of the second last day of the month). The plant operation staff reads and records the meters of the check metering system every day. The readings of the plant operation staff are submitted to the grid company. The grid company compares the readings with theirs and provides Electricity Trading Notes (ETN) to the project proponent. The project proponent confirms the ETN and issues invoices to the grid company. The invoices copying book or the ETN, serving as sales receipts, can be used for double check.

$EG_{in,y}$, the electricity imported from the NWCPG, is measured by the same systems as the systems to monitor $EG_{out,y}$, as the meters are bidirectional. The meters are monitored continuously. The grid company reads and records the meters of the main metering system around 24:00 of the third last day of each month (equivalent to 0:00 of the second last day of the month). The plant operation staff reads and records the meters of the check metering system every day. The grid company provides monthly records and invoices for the electricity imported from the NWCPG to the project proponent. The invoices, serving as sales receipts, can be used for double check.

TEG_y, total electricity produced by the project activity, is measured by the sum of the three meters (M3, M4, M5) installed at the outlet of generators. The data of each meter is automatically measured continuously and read and recorded daily by the plant operation staff on the Operation Log. The sum of the three meters is also recorded on the Operation Log. The monthly data is recorded electronically.

CAP_{PL}, installed capacity of the hydro power plant after the implementation of the project activity, is checked and recorded every year from nameplate of the equipment on the site.

A_{PL}, area of the reservoir measured at the surface of the water, after the implementation of the project activity, when the reservoir is full, is measured every year by the Northwest Hydro Consulting Engineers, China Hydropower Engineering Consulting Group.

3) QA/QC procedures

All data collected as part of the monitoring will be archived electronically and be kept for at least two years after the end of the last crediting period. In case metering equipment is damaged and no reliable readings can be recorded, the project proponent will use the following procedure:

• In case two meters (i.e. M1 and M1') recorded by the grid company are in malfunction only:

If only M1 exceeds the allowable tolerance or otherwise the meter mal functioned, M1' will be used to monitor the data. If both M1 and M1' are in malfunction, the monitoring data logged by the project proponent, will be used to calculate the data for the sales receipts/billing invoices.

• In case meters recorded by project proponent are in malfunction only:

If only M2 exceeds the allowable tolerance or otherwise the meter malfunctioned, M2' will be used to play the check role. If both M2 and M2' are in malfunction, the monitoring data by the M3, M4 and M5 will be used to play the check role.

• In case all meters are in malfunction:

The project proponent and the grid company will jointly calculate a conservative estimate of all the data. If the project proponent and the grid company fail to reach an agreement concerning the correct reading, then the matter will be submitted for arbitration according to agreed procedures.

During the reported monitoring period, all the meters were in good conditions, and no malfunction or replacement occurred. The meters were calibrated on a regular basis according to relevant national standards.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_{grid,CM,y} \quad \text{Equation (1)}$$

where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
EG_y	=	Net electricity exported to the grid by the project activity (MWh)
$EG_{baseline}$	=	Baseline electricity exported to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is zero. For this project, it is 0, i.e. $EG_{baseline}$ = 0.
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the "Tool to calculate the emission factor for an electricity system". The value has been calculated ex ante as 0.8498 tCO_2/MWh and there is no need for monitoring and recalculation.

EG_y, net electricity exported to the grid by the project activity, is calculated as follows:

$$EG_y = EG_{out,y} - EG_{in,y} \quad \text{Equation (2)}$$

Where:

$EG_{out,y}$	=	On-grid electricity supplied to the NWCPG by the project during the year *y* (MWh)
$EG_{in,y}$	=	On-grid electricity purchased from the NWCPG by the project for the plant operation during the year *y* (MWh)

The detailed calculation of the baseline emissions is listed in **Table 5.1.**

Table 5.1 Calculation of the baseline emissions for the monitoring period 30/12/2015 -23/03/2018

Period[1]	Electricity exported (MWh)	Electricity imported (MWh)	Net electricity exported (MWh)	Baseline emissions (tCO_2/MWh)
	$EG_{out,y}$	$EG_{in,y}$	$EG_y = EG_{out,y} - EG_{in,y}$	$BE_y = EG_y \times 0.8498$
30/12/2015 – 31/12/2015	401.395	0.132	401.263	340.99
Subtotal 30/12/2015 – 31/12/2015	**401.395**	**0.132**	**401.263**	**340.99**
01/01/2016 – 29/01/2016	5,820.227	34.843	5,785.384	4,916.42
30/01/2016 – 27/02/2016	4,347.882		4,347.882	3,694.83
28/02/2016 – 29/03/2016	2,044.548		2,044.548	1,737.46
30/03/2016 – 28/04/2016	7,990.620		7,990.620	6,790.43
29/04/2016 – 29/05/2016	13,942.830		13,942.830	11,848.62
30/05/2016 – 28/06/2016	10,098.858	1.320	10,097.538	8,580.89
28/06/2016 – 29/07/2016	17,251.014	0.660	17,250.354	14,659.35
30/07/2016 – 29/08/2016	18,053.310	0.858	18,052.452	15,340.97
30/08/2016 – 28/09/2016	18,719.774	0.660	18,719.114	15,907.50
29/09/2016 – 29/10/2016	14,611.014	9.900	14,601.114	12,408.03
30/10/2016 – 28/11/2016	10,886.964		10,886.964	9,251.74

[1] As stated in Section 4.3, the time of meter reading for $EG_{out,y}$ and $EG_{in,y}$ for the grid company is at 24:00 of the third last day of each month (equivalent to 0:00 of the second last day of the month). The electricity for 30/12/2015 – 31/12/2015 and 01/01/2016 – 29/01/2016 is calculated by dividing the data for 30/12/2015 – 29/01/2016 by 31 and then multiplying the result by the number of covering days (2 days and 29 days, respectively). Likewise, the electricity for 30/12/2016 – 31/12/2016 and 01/01/2017 – 29/01/2017 and the electricity for 30/12/2017 – 31/12/2017 and 01/01/2018 – 29/01/2018 are calculated following the same method.

29/11/2016 – 29/12/2016	14,416.512		14,416.512	12,251.15
30/12/2016 – 31/12/2016	873.687		873.687	742.46
Subtotal 01/01/2016 – 31/12/2016	**139,057.240**	**48.241**	**139,008.999**	**118,129.84**
01/01/2017 – 29/01/2017	12,668.457		12,653.277	10,752.76
30/01/2017 – 26/02/2017	9,677.514	15.180	9,677.514	8,223.95
27/02/2017 – 29/03/2017	9,081.270		9,081.270	7,717.26
30/03/2017 – 28/04/2017	9,155.982	7.062	9,148.920	7,774.75
29/04/2017 – 29/05/2017	16,279.824	0.660	16,279.164	13,834.03
30/05/2017 – 28/06/2017	21,543.654		21,533.622	18,299.27
28/06/2017 – 29/07/2017	19,296.750		19,296.750	16,398.38
30/07/2017 – 29/08/2017	23,445.972		23,445.972	19,924.39
30/08/2017 – 28/09/2017	18,623.946	10.032	18,623.946	15,826.63
29/09/2017 – 29/10/2017	22,185.174		22,185.174	18,852.96
30/10/2017 – 28/11/2017	11,357.544		11,357.544	9,651.64
29/11/2017 – 29/12/2017	18,712.386		18,712.386	15,901.79
30/12/2017 – 31/12/2017	433,514		433.514	368.40
Subtotal 01/01/2017 – 31/12/2017	**192,461.987**	**32.934**	**192,429.053**	**163,526.21**
01/01/2018 – 29/01/2018	6,285.946	2.640	6,283.306	5,339.55
30/01/2018 – 26/02/2018	4,525.092	1.254	4,523.838	3,844.36
27/02/2018 – 23/03/2018[2]	2,564.420	30.954	2,533.466	2,152.94
Subtotal 01/01/2018 – 23/03/2018	**13,375.458**	**34.848**	**13,340.610**	**11,336.85**
Total 30/12/2015 – 23/03/2018	**345,296.080**	**116.155**	**345,179.925**	**293,333.90**

[2] The electricity for 27/02/2018 – 23/03/2018 is calculated by dividing the data for 27/02/2018 – 29/03/2017 by 31 and then multiplying the result by 25.

5.2 Project Emissions

The power density (PD) of the project activity is calculated as follows:

$$PD = \frac{CAP_{PJ} - CAP_{BL}}{A_{PJ} - A_{BL}} \quad \text{Equation (3)}$$

where:

PD	=	Power density (PD) 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 power plants this value is zero.
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 (m²).
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 (m²). For new reservoirs, this value is zero.

For the current monitoring period 30/12/2015 to 23/03/2018, A_{PJ} = 60,900 m², A_{BL} = 0, CAP_{PJ} = 34,000,000 W, CAP_{BL} = 0.

Therefore, according to Equation (3), PD = 558 W/m², which is greater than 10 W/m². As per ACM0002 (version 07), if the power density of the power plant is greater than 10 W/m², the project emission is zero.

Therefore, project emissions PE_y = 0.

5.3 Leakage

According to ACM0002 (version 07), the leakage in the project is neglected, i.e. LE_y = 0.

5.4 Net GHG Emission Reductions and Removals

The emission reductions ER_y are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \text{Equation (4)}$$

where:

ER_y	=	Emission reductions in year *y* (tCO_2e/yr)

BE_y = Baseline emissions in year *y* (tCO_2e/yr)

PE_y = Project emissions in year *y* (tCO_2e/yr). For the project, PE_y = 0.

LE_y = Leakage emissions in year *y* (tCO_2e/yr). For the project, LE_y = 0.

The emission reductions of the project activity during the monitoring period 30/12/2015 – 23/03/2018 are summarized in **Table 5.2**.

Table 5.2 Calculation of the emission reductions for the monitoring period 30/12/2015 – 23/03/2018

Period	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
30/12/2015 – 31/12/2015	340	0	0	340
01/01/2016 – 31/12/2016	118,129	0	0	118,129
01/01/2017 – 31/12/2017	163,526	0	0	163,526
01/01/2018 – 23/03/2018	11,336	0	0	11,336
Total	293,331	0	0	293,331

According to the registered CDM PDD, the estimated annual emission reductions are 121,617 tCO_2e. For this monitoring period 30/12/2015 – 23/03/2018 (815 days), the estimated emission reductions would have been 271,555 tCO_2e[3], and the actual emission reductions are 293,331 tCO_2e, 8.02%[4] higher than the estimated value, due to higher water flow caused by floods during this monitoring period.

The emission reductions achieved in the year 2017 are 163,526 CO_2e, 34% [5] higher than the ex ante estimation. However, this was a very particular year during the monitoring period and the entire crediting period. *2017 Annual Report on Water Conditions* published by the Ministry of

[3] The estimated GHG emission reductions in the registered PDD, 121,617 tCO_2e, corresponds to a year of 365 days. There are 815 days reported monitoring period 30/12/2015 to 23/03/2018 (first day and last day included). Therefore, the estimated GHG emission reductions in the monitoring period would have been: (121,617 / 365) × 815 = 271,555 tCO_2e.

[4] 293,331 / 271,555 – 1 = 8.02%

[5] 163,526 / 121,617 – 1 = 34%

Water Resources of China recorded the floods and higher river flows in that year [6]. According to the IRR spreadsheet of the project [7], when the annual power supply increases by 10%, the IRR becomes 6.84%, still less than the 8% benchmark. Therefore, for the reported monitoring period, the 8.02% increase in the emission reductions does not impact the additionality of the project.

[6] *2017 Annual Report on Water Conditions*, http://www.mwr.gov.cn/sj/tjgb/sqnb/201902/P020190213636482806061.pdf

[7] https://cdm.unfccc.int/Projects/DB/TUEV-SUED1249311745.95/view