



DATONG RIVER TIANWANGGOU HYDROPOWER STATION

Document Prepared by Gansu Heihe Electric Power Sales Co. Ltd.

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Project Title	Datong River Tianwanggou Hydropower Station
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Datong River Tianwanggou Hydropower Station (hereafter, “the Project”) developed by GEPIC Darong Electric Power Company Ltd. (hereafter, the project owner) is a run-of-river hydropower project in Gansu Province, the People’s Republic of China.

The purpose of the project is to utilize the hydrological resources of the Datong River through construction of a run-of-river hydro project to generate electricity for the Gansu Power Grid, which is a part of the Northwest China Power Grid (hereafter, the NWCPG). The electricity currently generated by the NWCPG is relatively carbon intensive. The project is therefore expected to reduce emissions of greenhouse gases by reducing the need of thermally generated power and reducing needed capacity expansion of fossil fuel-based generation of the NWCPG.

The construction of the project was started on 24-Oct-2005. The generator started operation on 20-Jun-2008. The project installs three 17MW turbines providing a total installed capacity of 51MW, and the average annual generation of 212,000MWh, the power supplied is estimated to be 211,576MWh (with Auxiliary Power Ratio 0.2%).

In this monitoring period (from 30-Dec-2015 to 19-Jun-2018 including both days), the total net electricity supplied is 570,405.179 MWh, and the emission reductions achieved is 484,727 tCO₂e.

1.2 Sectoral Scope and Project Type

Sectoral scope: 1. Energy (renewable/non-renewable);

Project type: Hydropower generation project;

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, 69, Hedong Road., Chengguan District, Lanzhou City, Gansu Province, the People’s Republic of China.
Telephone	+86 931-8822631

Email	caocao_537@163.com
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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	Consultancy
Contact person	Mengde Liu
Title	General Manager
Address	Level 6, Heihe Hydropower Office Building, No.116 Changshou Street, Ganzhou District, Zhangye City, Gansu Province
Telephone	+86 936-8251641
Email	hhsdyinlongxing@vip.163.com ; projects@climatebridge.com

1.5 Project Start Date

The project started on 20-Jun-2008 (The start date of generator operation).

1.6 Project Crediting Period

There is a deviation for the crediting period. The project is registered under VCS standard Version 3.2 and completed validation before 19-Mar-2020. thus, it remains eligible to apply the crediting period requirements under VCS standard Version 3.2 which shall be a maximum of ten years and may be renewed at most twice, so the first renewable crediting period of the project should be updated from 20-Jun-2008~24-Oct-2010 to 20-Jun-2008~19-Jun-2018.

1.7 Project Location

The Project located in Yongdeng County, Lanzhou City, Gansu Province, the People's Republic of China. The geographical coordinates of the dam are 102°44'57" E and 36°42'49" N, and the geographical coordinates of the powerhouse are 102°46'20" E and 36°39'58" N.



Figure 1 Location of the Project in Provincial Map

1.8 Title and Reference of Methodology

Following approved baseline & monitoring methodology is applied:

Methodology:

1. The baseline and monitoring methodology ACM0002 is used: “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” version 07.

http://cdm.unfccc.int/filestorage/C/D/M/CDMWF_AM_323M30IDF1IH6AG3GRCJ4PKR9CKM7P/ACM0002_ver07.pdf?t=VUJ8bWdweHkzfDB_8lh0VRzzhpKw-b635j5e.

Tools applied:

2. “Tool to calculate the emission factor for an electricity system” version 01.1.
<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf>.
3. “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”, version 2.
<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf>.
4. “Tool for demonstration and assessment of additionality”, Version 05.2.

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

1.9 Participation under other GHG Programs

The project has been registered as a Clean Development Mechanism (CDM) project in UNFCCC on 25-Oct-2010 (UNFCCC Ref. 2840), with the fixed 10 years crediting period started from 25-Oct-2010. Total GHG emission reductions of 966,228 tCO₂ generated from 25-Oct-2010 to 29-Dec-2015 (both first and last days included) by the project has been issued as CER under CDM program. Please refer to the following link for details.

<https://cdm.unfccc.int/Projects/DB/TUEV-SUED1249300679.15/view>.

Except for CDM, the project did not register under any other GHG program.

1.10 Other Forms of Credit

Emission Trading Programs and Other Binding Limits

China has a national emissions trading scheme only cover the high-emission industries, such as thermal power generation, petrochemical, chemical, building materials, iron and steel, non-ferrous, paper, aviation and other key emission industries that emitted at least 26,000 tons of CO₂e/year, not including renewable project¹. And the project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner according to the enforced company list² in public information. Besides, based on the evidence from project owner, it is promised that the emission reduction in the monitoring period from 30-Dec-2015 to 19-Jun-2018 (the first and last days included) will request for VCU and will not be submitted under any other GHG programs or mechanism. Hence, it is confirmed that the emission reductions will not be double counted.

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

Other Forms of Environmental Credit

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

¹ http://www.mee.gov.cn/xxgk2018/xxgk/xxgk05/202103/t20210330_826728.html

² <http://mee.gov.cn/xxgk2018/xxgk/xxgk03/202012/W020201230736907682380.pdf>

1.11 Sustainable Development

The project activity is a renewable energy project in line with Chinese national policy of an optimum use of natural resources. The Project will hence contribute the sustainable development of the country through:

- Use of local renewable energy resources to displace fossil fuel-based power generation and thereby reduces CO₂ emissions as well as associated emissions such as PM, SO_x and NO_x creating local and global air pollutants benefits.
- Adverse environmental impacts are limited. During the Project impacts will be avoided and/or mitigated with a proper Environmental Management Plan.
- Relieve the power shortage problem in the local area and facilitate the economic development of local area.
- Supply of reliable, zero-emitting renewable energy to the provincial grid, reduce other pollutant resulting from the power generation industry so as to improve and protect the environment.
- Increase local people's income, create job opportunities and improve the quality of life.
- Improved access roads that will enhance transport for the local goods and people.

2 SAFEGUARDS

2.1 No Net Harm

According to the results of EIA and the reply from the Environmental Protection Bureau, the impacts on the environment are not significant. Thus, there are no negative environmental and/or socio-economic impacts due to the project. In fact, the project as a clean renewable energy project can reduce greenhouse gas emissions and the environmental pollution caused by fossil fuels consumption. Meanwhile, the implementation of the project will improve local socio-economic development through creating career opportunities and paying taxes.

2.2 Local Stakeholder Consultation

Local Stakeholder Consultation during the project preparation stage:

There were two public consultations carried out. The first one took place in August 2005, of which the emphasis has been put on the environment impact of the project activity. The second round of the public consultation has been organized in September 2007 with the purpose to introduce the Project from the CDM point of view and get stakeholders' comments.

In order to receive the permit for construction and operation of any power, an Environmental Impact Assessment is needed. One of the most important elements of the EIA are public consultations. In August 2005, Environmental Assessment Research Center of Lanzhou University, under the assistance of Gansu Liancheng National Nature Reserve Administration, Yongdeng County Environmental Protection Administration and other agencies, a survey of public participation has been carried out.

Questionnaire survey: The questionnaire described the general project situation, the basic conditions of the Project, and the effect of the construction phase on the local economy and environment. The survey was focused on: farmers within the area affected by the Project, the flooded area (expropriated land), Gansu Liancheng National Nature Reserve Administration, protection station and people in Yongdeng County. The participants were representing all the social groups with different professions, educational degrees and ages. This survey was done with a questionnaire that was handed out to 50 people. Surveyed were 34 males, 6 females, 12 persons aged above 40, 28 persons aged below 40, 20 persons with educational degree of senior high school, 20 persons with educational degree of junior high school, 13 cadres, 17 farmers and 10 others. 40 copies were filled out and returned.

In September 2007, the newspaper announcement was carried out in the Gansu Daily, online announcement was on the website: www.dhv.cn, and project owner distributed project information leaflets among the neighborhood of the Project.

In summary, there was no negative comments received in the first and second consultations.

Local Stakeholder Consultation during the project implementation stage:

Communications with local stakeholders are being carried out at periodic intervals. In this monitoring period, the project owner carried out questionnaire survey for the local stakeholder to collect the relevant comments and suggestions in April 2016, March 2017 and March 2018. And there are no negative comments received for the project. In line with VCS requirements all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

2.3 AFOLU-Specific Safeguards

There is not applicable due to the project is non-AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project is a run-of-river hydropower plant, which is composed of a concrete gravity dam, release sluice, channels, powerhouse, and switch station. The construction of the Project was started on 24-Oct-2005. The turbine and generator started operation on 20-Jun-2008. The key events of its implementation are summarized in the Table 1.

During this monitoring period, the project is normal operation, no special event occurred which may impact the applicability of the methodology, the GHG emission reductions or removals and monitoring.

Table 1 Key events of the project implementation

Key events	Date
The Project started construction	24-Oct-2005
The generator #3 started operation	20-Jun-2008
The generator #1 started operation	28-Jun-2008
The generator #2 started operation	02-Jul-2008
The Project registered under CDM	25-Oct-2005
1 st verification period under CDM	25-Oct-2010~28-Sep-2011
2 nd verification period under CDM	29-Sep-2011~31-Dec-2012
3 rd verification period under CDM	01-Jan-2013~28-Nov-2013
4 th verification period under CDM	29-Nov-2013~29-Dec-2014
5 th verification period under CDM	30-Dec-2014~29-Dec-2015
The Project registered under VCS	03-May-2012
1 st verification period under VCS	20-Jun-2008~24-Oct-2010
This monitoring period under VCS	30-Dec-2015~19-Jun-2018

The project has been registered as a Clean Development Mechanism (CDM) project in UNFCCC on 25-Oct-2010 (UNFCCC Ref. 2840), with the fixed 10 years crediting period started from 25-Oct-2010. Total GHG emission reductions of 966,228 tCO₂ generated from 25-Oct-2010 to 29-Dec-2015 (both first and last days included) by the project has been issued as CER under CDM program. The project also has registered as a VCS project on 03-May-2012 (VCS ID 823), issued 467,771 tCO₂e during the first monitoring period from 20-Jun-2008 to 24-Oct-2010. The first crediting period of the VCS project is from 20-Jun-2008 to 19-Jun-2018. In this second monitoring period (from 30-Dec-2015 to 19-Jun-2018 including both days), the total net electricity supplied is 570,405.179 MWh, and the emission reductions achieved is 484,727tCO₂e.

The electricity for the project is generated by three units of HLA551-LJ-215 turbines and three units of SF-J17-22/4250 generators. The annual power generation is expected to be

approximately 212,000MWh over an expected operational lifetime of 25 years. Key technical specifications are listed in Table 2 below. The power is delivered to the Gansu Power Grid (which is a part of the NWCPG) via two 110kV lines to a designated transformer station. The technical process is indicated in the Figure 2.

Table 2 Key technical parameters of the project

Generator		Turbine	
Model	SF-J17-22/4250	Model	HLA551-LJ-215
Quantity	3	Quantity	3
Rated Power	17 MW	Rated Power	17.5 MW
Rated Voltage	10.5 kV	Rated Water Head	50 m
Rated Current	1100 A	Rated Flux	38.21 m ³ /s
Rated Speed	272.7 r/min	-	-
Manufacturer	Hangzhou Resource Power Equipment Co. Ltd.		

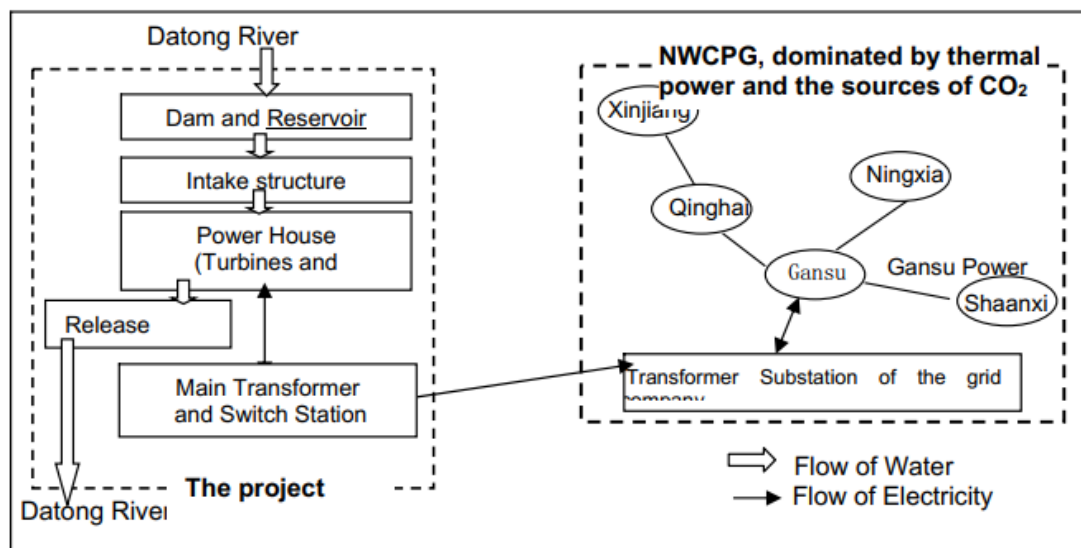


Figure 2 Technical Process Diagram

3.2 Deviations

3.2.1 Methodology Deviations

There is no deviation applied to this monitoring period.

3.2.2 Project Description Deviations

The project is registered under VCS standard Version 3.2 and completed validation before 19-Mar-2020. thus, it remains eligible to apply the crediting period requirements under VCS standard Version 3.2 which shall be a maximum of ten years and may be renewed at most twice.

As per VCS standard Version 3.2, the first renewable crediting period of the project should be updated from 20-Jun-2008~24-Oct-2010 to 20-Jun-2008~19-Jun-2018.

The project has been registered as a Clean Development Mechanism (CDM) project in UNFCCC on 25-Oct-2010 (UNFCCC Ref. 2840), with the fixed 10 years crediting period started from 25-Oct-2010. The project monitoring plan followed the CDM PDD until 28-Sep-2010 when a new regulation signed between the project owner and Gansu Province Electric Power Company on the project monitoring point. And the revised monitoring plan was approved on 18-May-2011 under CDM program, which is applicable to part of the VCS first monitoring period (from 29-Sep-2010 to 24-Oct-2010) and all the following monitoring period, including this monitoring period (from 30-Dec-2015 to 19-Jun-2018). The revised diagram of monitoring points is showed in figure 4 of section 4.3. More details for calculation are described in section 4.3.

However, these deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario.

3.3 Grouped Projects

The Project is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

The baseline grid emission factor $EF_{grid,CM,y}$ is obtained directly from the official source *Notification on Determining Baseline Emission Factor of China's Grid* by China's DNA. Thus, the relevant basis parameters for calculation of $EF_{grid,CM,y}$ are not described in detail here. With consideration of the fact of the Project, data and parameters that are available at validation are summarized in below table.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ e/MWh
Description	The baseline grid emission factor
Source of data	Registered CDM PDD
Value applied	0.8498
Justification of choice of data or description of	Published official statistics by Chinese DNA.

measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Ex ante determined and fixed in 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 (m^2). For new reservoirs, this value is zero.
Source of data	The status of the project. There is a new reservoir for this project
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emissions.
Comments	-

Data / Parameter	Cap_{BL}
Data unit	W
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 status of the project. There is a new reservoir for this project
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	-

Purpose of Data	Calculation of project emissions.
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{out,y}$												
Data unit	MWh												
Description	Annual on-grid electricity supplied to NWCPG by the project.												
Source of data	Measured by meter recordings												
Description of measurement methods and procedures to be applied	Data type: Continuously measured. Archiving procedure: Electronic. Responsibility: The electricity meter was calibrated by a qualified third party regularly. Calibration Frequency: Annually.												
Frequency of monitoring/recording	Continuously measured, and monthly recorded												
Value monitored	Please refer to section 5.1 for the monthly data. <table border="1"> <thead> <tr> <th>Year³</th><th>Value</th></tr> </thead> <tbody> <tr> <td>30-Dec-2015~31-Dec-2015</td><td>629.870</td></tr> <tr> <td>01-Jan-2016~31-Dec-2016</td><td>221,531.382</td></tr> <tr> <td>01-Jan-2017~31-Dec-2017</td><td>254,485.224</td></tr> <tr> <td>01-Jan-2018~19-Jun-2018</td><td>96,149.643</td></tr> <tr> <td>Total</td><td>572,796.119</td></tr> </tbody> </table>	Year ³	Value	30-Dec-2015~31-Dec-2015	629.870	01-Jan-2016~31-Dec-2016	221,531.382	01-Jan-2017~31-Dec-2017	254,485.224	01-Jan-2018~19-Jun-2018	96,149.643	Total	572,796.119
Year ³	Value												
30-Dec-2015~31-Dec-2015	629.870												
01-Jan-2016~31-Dec-2016	221,531.382												
01-Jan-2017~31-Dec-2017	254,485.224												
01-Jan-2018~19-Jun-2018	96,149.643												
Total	572,796.119												
Monitoring equipment	The electricity meters are bidirectional. M2, main meter. M2', auxiliary meter for the M2, which could check the data and will replace the M2 in case of the failure of M2.												

³The grid company and the plant operation staff read and record the meters at 24:00 of the third last day of each month separately. The recording of the exported and imported electricity is at 24:00 of the third last day of each month separately during period from 30-Dec-2015 to 19-Jun-2018, the electricity from 30th in December to 29th in January of each year is divided into two periods (period from 30th to 31st in December and the other period from 1st to 29th in January), and the electricity from 30th to 31st in December of each year is from daily meter recordings and then added into December. Additionally, the electricity during period from 30-May-2018 to 19-Jun-2018 is from daily meter recordings. These electricity data is approved by the local grid company.

	No.	Type	Serial number	Accuracy class	Date of calibration	Validity
	M2	SL7000	36088342	0.2S	21-Jan-2015 19-Jan-2016 17-Jan-2017 15-Jan-2018	20-Jan-2016 18-Jan-2017 16-Jan-2018 14-Jan-2019
	M2'	SL7000	36088343	0.2S	21-Jan-2015 19-Jan-2016 17-Jan-2017 15-Jan-2018	20-Jan-2016 18-Jan-2017 16-Jan-2018 14-Jan-2019
QA/QC procedures to be applied	- M2 and M2' are calibrated once a year. - Power is double checked with sales receipts. - Data record and relevant documents has been archived for a period of 2 years after the crediting period. - Special CDM project team has been set up. - A detailed rule on monitoring management has been made.					
Purpose of the data	Calculation of baseline emissions					
Calculation method	To calculate EG_y					
Comments	-					

Data / Parameter	$EG_{in,y}$
Data unit	MWh
Description	Annual on-grid electricity purchased from NWCPG by the project for the plant operation
Source of data	Measured by meter recordings
Description of measurement methods and procedures to be applied	Data type: Continuously measured. Archiving procedure: Electronic. Responsibility: The electricity meter was calibrated by a qualified third party regularly. Calibration Frequency: Annually.

Frequency of monitoring/recording	Continuously measured, and monthly recorded.					
Value monitored	Please refer to section 5.1 for the monthly data.					
	Year ⁴				Value	
	30-Dec-2015~31-Dec-2015				0.094	
	01-Jan-2016~31-Dec-2016				22.336	
	01-Jan-2017~31-Dec-2017				6.946	
	01-Jan-2018~19-Jun-2018				12.926	
	Total				42.302	
Monitoring equipment	The electricity meters are bi-direction. M2, main meter. M2', auxiliary meter for the M2, which could check the data and will replace the M2 in case of the failure of M2.					
	No.	Type	Serial number	Accuracy class	Date of calibration	Validity
	M2	SL7000	36088342	0.2S	21-Jan-2015 19-Jan-2016 17-Jan-2017 15-Jan-2018	20-Jan-2016 18-Jan-2017 16-Jan-2018 14-Jan-2019
	M2'	SL7000	36088343	0.2S	21-Jan-2015 19-Jan-2016 17-Jan-2017 15-Jan-2018	20-Jan-2016 18-Jan-2017 16-Jan-2018 14-Jan-2019
QA/QC procedures to be applied	- M2 and M2' are calibrated once a year. - Power is double checked with sales receipts. - Data record and relevant documents has been archived for a period of 2 years after the crediting period.					

⁴ The grid company and the plant operation staff read and record the meters at 24:00 of the third last day of each month separately. The recording of the exported and imported electricity is at 24:00 of the third last day of each month separately during period from 30-Dec-2015 to 19-Jun-2018, the electricity from 30th in December to 29th in January of each year is divided into two periods (period from 30th to 31st in December and the other period from 1st to 29th in January), and the electricity from 30th to 31st in December of each year is from daily meter recordings and then added into December. Additionally, the electricity during period from 30-May-2018 to 19-Jun-2018 is from daily meter recordings. These electricity data is approved by the local grid company.

	- Special CDM project team has been set up. - A detailed rule on monitoring management has been made.
Purpose of the data	Calculation of baseline emissions
Calculation method	To calculate EG_y
Comments	-

Data / Parameter	EG_y												
Data unit	MWh												
Description	Net electricity exported to the NWCPG by the project.												
Source of data	Calculated												
Description of measurement methods and procedures to be applied	-												
Frequency of monitoring/recording	-												
Value monitored	<table border="1"> <thead> <tr> <th>Year</th><th>Value</th></tr> </thead> <tbody> <tr> <td>30-Dec-2015~31-Dec-2015</td><td>627.193</td></tr> <tr> <td>01-Jan-2016~31-Dec-2016</td><td>220,600.676</td></tr> <tr> <td>01-Jan-2017~31-Dec-2017</td><td>253,434.860</td></tr> <tr> <td>01-Jan-2018~19-Jun-2018</td><td>95,742.450</td></tr> <tr> <td>Total</td><td>570,405.179</td></tr> </tbody> </table>	Year	Value	30-Dec-2015~31-Dec-2015	627.193	01-Jan-2016~31-Dec-2016	220,600.676	01-Jan-2017~31-Dec-2017	253,434.860	01-Jan-2018~19-Jun-2018	95,742.450	Total	570,405.179
Year	Value												
30-Dec-2015~31-Dec-2015	627.193												
01-Jan-2016~31-Dec-2016	220,600.676												
01-Jan-2017~31-Dec-2017	253,434.860												
01-Jan-2018~19-Jun-2018	95,742.450												
Total	570,405.179												
Monitoring equipment	-												
QA/QC procedures to be applied	- Data record and relevant documents has been archived for a period of 2 years after the crediting period. - Special CDM project team has been set up. - A detailed rule on monitoring management has been made.												

Purpose of the data	Calculation of baseline emissions
Calculation method	To calculate $EG_y = EG_{out,y} \times (1-TLR) - EG_{in,y} \times (1+TLR)$ To calculate the EG_y, transmission losses during this electricity transmission between the Project site and designated substation should be deducted. The rate of transmission losses (TLR) is set as 0.41%. Thus, EG_y, Net electricity exported to the NWCPG by the project, is calculated by $EG_y = EG_{out,y} \times (1-TLR) - EG_{in,y} \times (1+TLR) = 99.59\% EG_{out,y} - 100.41\% EG_{in,y}$. Please refer to the detailed description in Annex 4 of the approved revised monitoring plan.
Comments	-

Data / Parameter	TEG_y				
Data unit	MWh				
Description	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y.				
Source of data	Measured by meter recordings				
Description of measurement methods and procedures to be applied	Data type: Continuously measured. Archiving procedure: Electronic. Responsibility: The electricity meter was calibrated by a qualified third party regularly. Calibration Frequency: Once three years.				
Frequency of monitoring/recording	Continuously measured, and monthly recorded.				
Value monitored	Please refer to section 5.2 for the monthly data. <table border="1"> <thead> <tr> <th>Year⁵</th><th>Value</th></tr> </thead> <tbody> <tr> <td>30-Dec-2015~31-Dec-2015</td><td>821.700</td></tr> </tbody> </table>	Year ⁵	Value	30-Dec-2015~31-Dec-2015	821.700
Year ⁵	Value				
30-Dec-2015~31-Dec-2015	821.700				

⁵ The data of each meter is automatically measured continuously and be read and recorded at the 24:00 daily by the plant operation staff on the monthly reading records. The recording of the generated electricity during period from 30th to 31st in December of each year, and period from 30th of May to 19th of June in 2018 are from daily meter recordings.

	01-Jan-2016~31-Dec-2016	224,516.148				
	01-Jan-2017~31-Dec-2017	259,202.313				
	01-Jan-2018~19-Jun-2018	98,902.679				
	Total	583,442.840				
Monitoring equipment	The electricity meters M3, M4, M5 are used to monitor the electricity produced by each generator.					
	No.	Type	Serial number	Accu- racy class	Date of calibration	Validity
	M3	DTSD3 41	323030 238	0.5	17-Apr-2015 15- Apr-2018	16-Apr-2018 14-Apr-2021
	M4	DTSD3 41	323030 237	0.5	19-Jun-2015 15-Jun-2018	18-Jun-2018 14-Jun-2021
	M5	DTSD3 41	323030 239	0.5	19-Jun-2015 15-Jun-2018	18-Jun-2018 14-Jun-2021
QA/QC procedures to be applied	- M3, M4 and M5 are calibrated once three years. - Data record and relevant documents will be archived for a period of 2 years after the crediting period. - Special CDM project team has been set up - A detailed rule on monitoring management has been made					
Purpose of the data	Calculation of project emissions					
Calculation method	Calculated as the sum of M3, M4 and M5.					
Comments	-					

Data / Parameter	A_{PL}
Data unit	m ²
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m ²)
Source of data	Measurement from the project site
Description of measurement methods and	Measured from topographical surveys

procedures to be applied											
Frequency of monitoring/recording	Yearly										
Value monitored	<table> <tr> <th>Year</th><th>Value</th></tr> <tr> <td>30-Dec-2015~31-Dec-2015</td><td>237,400</td></tr> <tr> <td>01-Jan-2016~31-Dec-2016</td><td>237,400</td></tr> <tr> <td>01-Jan-2017~31-Dec-2017</td><td>237,400</td></tr> <tr> <td>01-Jan-2018~19-Jun-2018</td><td>237,400</td></tr> </table>	Year	Value	30-Dec-2015~31-Dec-2015	237,400	01-Jan-2016~31-Dec-2016	237,400	01-Jan-2017~31-Dec-2017	237,400	01-Jan-2018~19-Jun-2018	237,400
Year	Value										
30-Dec-2015~31-Dec-2015	237,400										
01-Jan-2016~31-Dec-2016	237,400										
01-Jan-2017~31-Dec-2017	237,400										
01-Jan-2018~19-Jun-2018	237,400										
Monitoring equipment	Survey										
QA/QC procedures to be applied	The data will be kept for at least 2 years after the end of the fixed crediting period.										
Purpose of the data	-										
Calculation method	-										
Comments	-										

Data / Parameter	Cap_{PL}
Data unit	MW
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	nameplates
Description of measurement methods and procedures to be applied	Check the nameplate of the equipment on the site.
Frequency of monitoring/recording	yearly
Value monitored	51

Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	-
Calculation method	-
Comments	-

4.3 Monitoring Plan

1. Organizational and monitoring structure

The project owner set up a monitoring team responsible for the monitoring plan. The structure of the monitoring team is outlined in Figure 3.

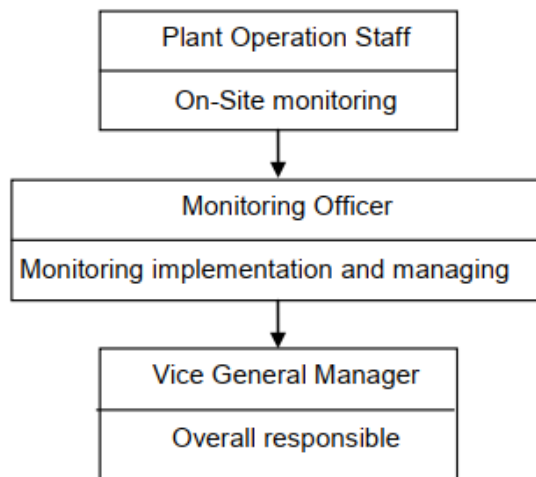


Figure 3 Structure of the monitoring team

The responsibilities of the team are briefly described as following:

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

Monitoring Officer: in charge of 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: responsible for the measurement of the monitored data and assisted the monitoring officer on the plant site.

Training: The Monitoring Officer has organized training for staffs in relation with monitoring team on VCS knowledge; monitoring methodology and VCS monitoring Manual; data recording and archiving; relevant laws and regulations.

2. Monitoring system and data collection

As the Figure 4 indicated, monitoring data are monitored at these points.

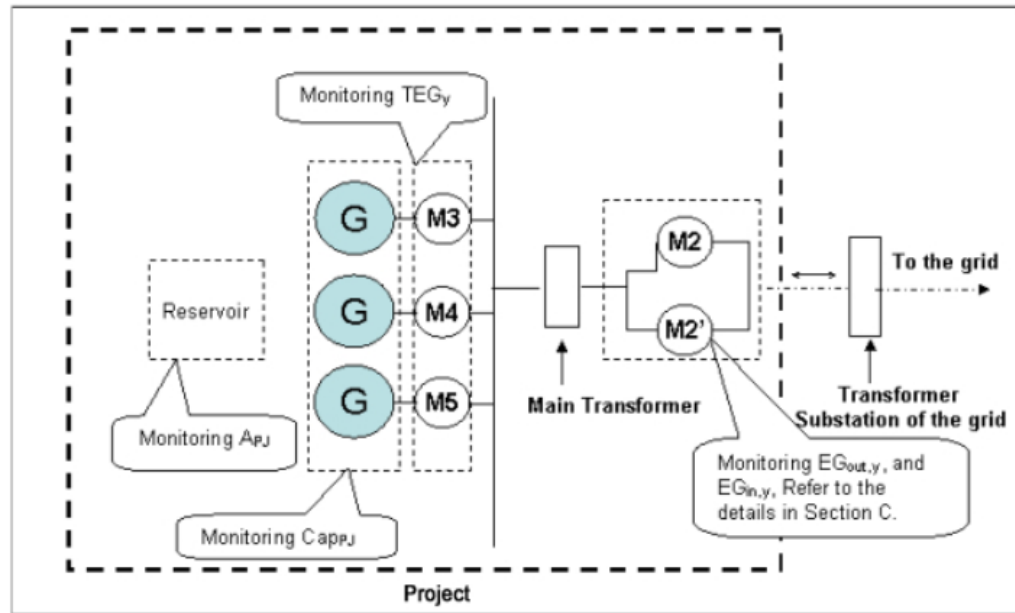


Figure 4 Diagram of monitoring points

As per the revised monitoring plan, net electric power exported to the grid (EG_y) is calculated by the following formula:

$$EG_y = EG_{out,y} \times (1 - TLR) - EG_{in,y} \times (1 + TLR) = 99.59\% EG_{out,y} - 100.41\% EG_{in,y}$$

Where:

BE_y	=	Baseline emissions in year y (tCO ₂ e)
$EF_{grid,CM,y}$	=	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 monitor and recalculation. (tCO ₂ e/MWh)
EG_y	=	Net electricity exported to the NWCPG by the project (MWh)
$EG_{out,y}$	=	Annual on-grid electricity supplied to NWCPG by the project (MWh)
$EG_{in,y}$	=	Annual on-grid electricity purchased from NWCPG by the project for the plant operation (MWh)
TLR	=	The rate of transmission losses is set as 0.41%. Please refer to the detailed description in Annex 4 of the approved revised monitoring plan

$EG_{out,y}$, is measured directly and continuously by computed and precise meters installed in the project site (M2, M2'). M2 is the main meter. M2', the auxiliary meter for the M2, which could check the data and will replace the M2 in case of the failure of M2. The meters are monitored continuously. The grid company and the plant operation staff read and record the meters at 24:00 of the third last day of each month separately. The readings of the plant operation staff are submitted to the grid company. The grid company compares the readings with theirs and provides sales receipts to the project owner. The project owner confirms the sales receipts and issues invoices to the grid company.

$EG_{in,y}$, is also measured by M2 and M2' , as the meters are bidirectional. The meters are monitored continuously. The grid company and the plant operation staff read and record the meters at the 24:00 of the third last day of each month separately. The readings of the plant operation staff are submitted to the grid company. The grid company compares the readings with theirs and provides sales receipts and the invoices for the electricity imported from the NWCPG to the project owner.

TEG_y , total electricity produced by the project activity, is measured by the sum of the three meters (M3, M4, M5) at the outlet of generators. The data of each meter is automatically measured continuously and be read and recorded at the 24:00 daily by the plant operation staff on the monthly reading records. The sum of the three meters is also recorded on the monthly reading records. The monthly data is recorded electronically.

Cap_{PJ} , installed capacity of the hydro power plant after the implementation of the project activity, is checked and recorded from nameplate of the equipment on the site yearly.

A_{PJ} , the surface area of full reservoir level, is measured by the Northwest Hydro Consulting Engineers, CHECC yearly.

3. Quality Assurance and Quality Control

M2 and M2' are calibrated once a year, and M3, M4 and M5 are calibrated once three years.

Data record and relevant documents has been archived for a period of 2 years after the crediting period. Power is double checked with sales receipts.

Emergency procedures for the monitoring system:

In case metering equipment is damaged and no reliable readings can be recorded the project owner will use the following procedure:

- In case meters recorded by project owner are in malfunction only:

If only M2 exceeds the allowable tolerance or otherwise the meter malfunctioned, M2' will be used to monitor. If both M2 and M2' are in malfunction, the project owner and the grid company will jointly calculate a conservative estimate of the data.

- In case all meters are in malfunction:

The project owner and the grid company will jointly calculate a conservative estimate of all the data. If the project owner 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.

The monitoring system operated normally during the monitoring period.

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:

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

$$EG_y = EG_{out,y} \times (1 - TLR) - EG_{in,y} \times (1 + TLR) = 99.59\% EG_{out,y} - 100.41\% EG_{in,y} \quad (2)$$

Where:

BE_y	=	Baseline emissions in year y (tCO ₂ e)
$EF_{grid,CM,y}$	=	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 monitor and recalculation. (tCO ₂ e/MWh)
EG_y	=	Net electricity exported to the NWCPG by the project (MWh)
$EG_{out,y}$	=	Annual on-grid electricity supplied to NWCPG by the project (MWh)
$EG_{in,y}$	=	Annual on-grid electricity purchased from NWCPG by the project for the plant operation (MWh)
TLR	=	The rate of transmission losses is set as 0.41%. Please refer to the detailed description in Annex 4 of the approved revised monitoring plan

The emission factor $EF_{grid,CM,y}$ is calculated ex ante and fixed for the first crediting period.

The $EF_{grid,CM,y}$ is equal to 0.8498 tCO₂/MWh.

The monitored data based on meter readings and sales receipts for the project are as following:

Period ⁶	Electricity supplied by the project activity to the grid (EG _{out,y}), MWh			Electricity imported from the grid (EG _{in,y}), MWh			Net electricity exported to the grid (EG _y =99.59% EG _{out,y} -100.41% EG _{in,y}), MWh
	A ⁷	B ⁸	C=MIN(A,B)	D ¹	E ²	F=MAX(D,E)	G=99.59%*C-100.41%*F
30-Dec-2015~31-Dec-2015	629.870	629.870	629.870	0.094	0.034	0.094	627.193
01-Jan-2016~29-Jan-2016	9,133.114	9,762.984	9,133.114	1.358	0.492	1.358	9,094.305
30-Jan-2016~27-Feb-2016	6,977.520	6,977.520	6,977.520	2.244	0.526	2.244	6,946.659
28-Feb-2016~29-Mar-2016	7,866.897	7,866.897	7,866.897	1.320	0.526	1.320	7,833.317
30-Mar-2016~28-Apr-2016	15,609.924	15,609.924	15,609.924	12.640	0.526	12.640	15,533.231
29-Apr-2016~29-May-2016	23,656.116	23,576.950	23,576.950	0.000	0.526	0.526	23,479.756
30-May-2016~28-Jun-2016	19,213.392	19,213.392	19,213.392	0.000	0.526	0.526	19,134.089
29-Jun-2016~29-Jul-2016	25,513.616	25,513.616	25,513.616	0.264	0.526	0.526	25,408.482
30-Jul-2016~29-Aug-2016	26,149.196	26,149.196	26,149.196	0.924	0.526	0.924	26,041.057
30-Aug-2016~28-Sep-2016	26,657.164	26,630.556	26,630.556	0.660	0.526	0.660	26,520.708
29-Sep-2016~29-Oct-2016	25,007.532	25,007.532	25,007.532	0.264	0.526	0.526	24,904.473
30-Oct-2016~28-Nov-2016	18,522.632	18,522.632	18,522.632	0.000	0.526	0.526	18,446.161
29-Nov-2016~29-Dec-2016	16,364.892	16,472.808	16,364.892	0.000	0.526	0.526	16,297.268

⁶ The grid company and the plant operation staff read and record the meters at 24:00 of the third last day of each month separately. The recording of the exported and imported electricity is at 24:00 of the third last day of each month separately during period from 30-Dec-2015 to 19-Jun-2018, the electricity from 30th in December to 29th in January of each year is divided into two periods (period from 30th to 31st in December and the other period from 1st to 29th in January), and the electricity from 30th to 31st in December of each year is from daily meter recordings and then added into December. Additionally, the electricity during period from 30-May-2018 to 19-Jun-2018 is from daily meter recordings. These electricity data is approved by the local grid company.

⁷ Data is from the monthly reading records of the project owner.

⁸ Data is from the sales receipts of the grid company.

30-Dec-2016~31-Dec-2016	965.161	965.161	965.161	0.000	0.034	0.034	961.170
01-Jan-2017~29-Jan-2017	13,994.839	13,994.839	13,994.839	0.000	0.492	0.492	13,936.966
30-Jan-2017~26-Feb-2017	17,053.872	17,053.872	17,053.872	0.000	0.526	0.526	16,983.423
27-Feb-2017~29-Mar-2017	19,030.176	19,030.176	19,030.176	0.000	1.052	1.052	18,951.096
30-Mar-2017~28-Apr-2017	19,623.384	19,623.384	19,623.384	0.264	0.000	0.264	19,542.663
29-Apr-2017~29-May-2017	23,878.724	24,000.000	23,878.724	0.396	0.552	0.552	23,780.267
30-May-2017~28-Jun-2017	23,022.458	23,000.000	23,000.000	0.264	0.526	0.526	22,905.172
29-Jun-2017~29-Jul-2017	23,500.000	23,500.000	23,500.000	0.000	0.526	0.526	23,403.122
30-Jul-2017~29-Aug-2017	26,888.456	26,888.456	26,888.456	0.264	0.526	0.526	26,777.685
30-Aug-2017~28-Sep-2017	26,602.512	26,602.512	26,602.512	0.000	0.526	0.526	26,492.914
29-Sep-2017~29-Oct-2017	24,782.596	24,782.596	24,782.596	0.396	0.614	0.614	24,680.371
30-Oct-2017~28-Nov-2017	19,430.792	19,430.792	19,430.792	0.000	0.526	0.526	19,350.598
29-Nov-2017~29-Dec-2017	16,181.960	16,000.000	16,000.000	0.000	0.526	0.526	15,933.872
30-Dec-2017~31-Dec-2017	699.873	699.873	699.873	0.290	0.255	0.290	696.712
01-Jan-2018~29-Jan-2018	10,148.151	10,148.151	10,148.151	4.198	3.705	4.198	10,102.328
30-Jan-2018~26-Feb-2018	8,090.412	8,090.412	8,090.412	5.016	0.526	5.016	8,052.205
27-Feb-2018~29-Mar-2018	11,697.368	11,689.476	11,689.476	0.000	0.526	0.526	11,641.021
30-Mar-2018~28-Apr-2018	24,000.304	24,000.000	24,000.000	0.264	2.130	2.130	23,899.461
29-Apr-2018~29-May-2018	25,000.520	25,000.000	25,000.000	0.000	0.526	0.526	24,896.972
30-May-2018~19-Jun-2018	17,221.604	24,602.292	17,221.604	0.000	0.530	0.530	17,150.463

The annual baseline emissions are as following:

Period	EGy (MWh)	EF _{grid,CM,y} , tCO _{2e} /MWh	BEy (tCO _{2e})
30-Dec-2015 ~ 31-Dec-2015	627.193	0.8498	532
01-Jan-2016 ~ 31-Dec-2016	220,600.676	0.8498	187,466
01-Jan-2017 ~ 31-Dec-2017	253,434.860	0.8498	215,368

01-Jan-2018 ~ 19-Jun-2018	95,742.450	0.8498	81,361
Total	570,405.179		484,727

In summary, the baseline emissions BE_y during this monitoring period is 484,727 tCO₂e.

5.2 Project Emissions

According to the methodology ACM0002 (Version 07), if the power density (PD) of the power plant is greater than 10 W/m²: $PE_y=0$.

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (3)$$

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

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

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

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 this project: $PD = (51,000,000-0) \text{ W} / (237,400-0) \text{ m}^2 = 215 \text{ W/m}^2$, is greater than 10 W/m². So, the Project emission is zero, $PE_y=0$.

The monitoring data of the TEG_y is 583,442.840 MWh from 30-Dec-2015 to 19-Jun-2018, as indicated in the following table. These data weren't used for the calculation of ERs in this monitoring period for $PD > 10 \text{ W/m}^2$ as calculation above.

Period	Electricity produced by G1, MWh	Electricity produced by G2, MWh	Electricity produced by G3, MWh	Total electricity produced by the project activity (TEG _y), MWh
30-Dec-2015~31-Dec-2015	650.100	171.600	0.000	821.700
01-Jan-2016~29-Jan-2016	6,042.900	1,533.300	1,586.400	9,162.600
30-Jan-2016~27-Feb-2016	4,105.800	161.700	2,895.900	7,163.400
28-Feb-2016~29-Mar-2016	6,873.631	731.402	431.525	8,036.558
30-Mar-2016~28-Apr-2016	7,886.100	4,209.600	3,730.800	15,826.500
29-Apr-2016~29-May-2016	11,102.700	9,191.400	3,654.900	23,949.000
30-May-2016~28-Jun-2016	11,119.200	5,652.300	2,686.800	19,458.300
29-Jun-2016~29-Jul-2016	10,518.603	8,524.791	6,766.201	25,809.595
30-Jul-2016~29-Aug-2016	10,130.026	7,327.434	8,989.058	26,446.518
30-Aug-2016~28-Sep-2016	9,056.317	8,900.753	9,005.530	26,962.600
29-Sep-2016~29-Oct-2016	11,387.400	6,244.800	7,685.100	25,317.300
30-Oct-2016~28-Nov-2016	8,450.909	3,827.865	6,487.756	18,766.530
29-Nov-2016~29-Dec-2016	7,901.724	2,750.544	5,956.586	16,608.854
30-Dec-2016~31-Dec-2016	350.337	178.178	479.878	1,008.393

01-Jan-2017~29-Jan-2017	7,605.697	907.621	5,771.965	14,285.283
30-Jan-2017~26-Feb-2017	1,992.000	5,969.700	9,369.600	17,331.300
27-Feb-2017~29-Mar-2017	7,703.400	6,054.300	5,587.800	19,345.500
30-Mar-2017~28-Apr-2017	10,257.600	3,444.300	6,210.300	19,912.200
29-Apr-2017~29-May-2017	9,253.034	5,845.650	9,081.482	24,180.166
30-May-2017~28-Jun-2017	8,160.592	7,556.295	7,750.633	23,467.520
29-Jun-2017~29-Jul-2017	8,753.397	7,131.680	7,898.222	23,783.299
30-Jul-2017~29-Aug-2017	9,269.143	8,841.417	9,076.054	27,186.614
30-Aug-2017~28-Sep-2017	9,239.088	8,690.114	8,977.266	26,906.468
29-Sep-2017~29-Oct-2017	9,317.231	6,642.238	9,175.260	25,134.729
30-Oct-2017~28-Nov-2017	8,138.017	2,380.876	9,246.605	19,765.498
29-Nov-2017~29-Dec-2017	6,158.546	4,247.968	6,065.622	16,472.136
30-Dec-2017~31-Dec-2017	707.700	288.000	435.900	1,431.600
01-Jan-2018~29-Jan-2018	4,427.653	2,301.206	3,785.043	10,513.902
30-Jan-2018~26-Feb-2018	7,539.000	96.900	763.200	8,399.100
27-Feb-2018~29-Mar-2018	8,511.139	708.543	2,756.832	11,976.514
30-Mar-2018~28-Apr-2018	9,005.091	7,128.758	8,181.852	24,315.701
29-Apr-2018~29-May-2018	10,051.675	5,577.992	9,656.795	25,286.462
30-May-2018~19-Jun-2018	7,405.200	6,364.800	4,641.000	18,411.000
Total	249,070.950	149,584.025	184,787.865	583,442.840

5.3 Leakage

According to the methodology ACM0002 (Version 07), the leakage in the project is neglected, i.e. $LE_y = 0$ tCO_{2e}.

5.4 Net GHG Emission Reductions and Removals

According to the Section 5.1, 5.2 and 5.3 above,

$$BE_y = 484,727 \text{ tCO}_2\text{e};$$

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

$$LE_y = 0 \text{ tCO}_2\text{e};$$

$$\text{Therefore, } ER_y = BE_y - PE_y - LE_y = 484,727 \text{ tCO}_2\text{e}$$

This monitoring period started from 30-Dec-2015 to 19-Jun-2018, with totally 903 days. Based on the annual estimated emission reductions from the registered VCS PD, the amount of emission reductions for this monitoring period would be 179,797 tCO_{2e}/ 365 days × 903 days = 444,813 tCO_{2e}. The actual emission reductions in this monitoring period (903 days) are 484,727 tCO_{2e}, which is 8.97% high than the estimation in the registered VCS PD. And the total electricity exported to the grid is 8.97% higher than the ex-ante estimation in registered VCS PD, the main

reason is that the net electricity supplied to the grid by the project in the vintages 2016 and 2017 of this monitoring period are 3.98% and 19.78% higher than that estimated in registered PD respectively. It is because the water flow of Datong River in Yellow River Valley caused by the abundant rainfall for 2016⁹ and 2017¹⁰ is higher than other seasons in previous year.

As per the calculation of IRR¹¹ under CDM program, if annual power supply increases 18.05% higher than the ex-ante estimation in registered CDM PDD, the IRR (after income tax) of the project will be 8% which does not impact the additionality. During this monitoring period, the electricity exported to the grid is only 8.97% higher than the ex-ante estimation in registered VCS PD, which is at normal fluctuation and not impact the additionality.

So, it is reasonable that during this monitoring period, the actual emission reduction is higher than the estimated value.

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)
30-Dec-2015~31-Dec-2015	532	0	0	532
01-Jan-2016~31-Dec-2016	187,466	0	0	187,466
01-Jan-2017~31-Dec-2017	215,368	0	0	215,368
01-Jan-2018~19-Jun-2018	81,361	0	0	81,361
Total	484,727	0	0	484,727

⁹ 2016 Annual Report on Water Conditions, http://www.mwr.gov.cn/sj/tjgb/sqnb/201708/t20170810_973261.html

¹⁰ 2017 Annual Report on Water Conditions, <http://www.mwr.gov.cn/sj/tjgb/sqnb/201902/P020190213636482806061.pdf>

¹¹ <https://cdm.unfccc.int/Projects/DB/TUEV-SUED1249300679.15/view>