

MADUSHAN HYDROPOWER PROJECT ON HONGHE RIVER IN YUNNAN PROVINCE, CHINA

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Project Title	Madushan Hydro Power Project on Honghe River in Yunnan Province, China
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1 PROJECT DETAILS

1.1 Summary Description of Project

Madushan Hydropower Project on Honghe River in Yunnan Province, China (hereafter referred to as “the project”) is a newly-built hydropower project. The total installed capacity of the project is 288MW, consisting of three sets of 96 MW hydro turbine and generator units.

The electricity generated by the project is supplied to South China Power Grid (SCPG). The estimated annual grid-connected electricity is 1,217,569MWh. The emission reductions are achieved by displacing part of the electricity of SCPG, which is dominated by coal-fired power plants. The estimated annual emission reductions are 906,656 tCO₂e.

1.2 Sectoral Scope and Project Type

This project falls under the sectoral scope 1: Energy industries (Renewable/non-renewable sources) as per the sectoral scopes defined by the VCS and the project falls into Type 1 Renewable Energy projects. It is not a grouped project.

1.3 Project Proponent

Project Participants	Honghe Guangyuan Madushan Hydropower Development Co., Ltd.
Role	Project owner
Contact Information	Mr. Wang Hualin Tel: +86 13769371823 Fax: +86-873-3743179 Address : 780 Building Hongzhuyuan Mengzi County, Yunnan Province, China
Responsibilities	Be responsible for the management of the proposed project.

1.4 Other Entities Involved in the Project

There is no any other Project Participant(s)

1.5 Project Start Date

28/02/2011

1.6 Project Crediting Period

28/02/2011 – 06/06/2011

The project successfully registered for CDM project on 07/06/2011, meanwhile the Project generated electricity continuously from 28/02/2011.

1.7 Project Location

The proposed project is located in Gejiu City and Jinping County/ Honghe Hani & Yi Autonomous State/ Yunnan Province/ China GPS coordinates: 103°16'58.5" E, 23°02'43.9" N (Dam); 103°17'15" E, 23°02'39" N (Power house)

1.8 Title and Reference of Methodology

Title of the methodology applied: ACM0002-Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 11). Furthermore, the "Tool for the Emission Factor Calculation of Electricity System" (version 2) is also quoted.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The construction of the project started on 25/01/2009. The first set of water turbine and generator unit was commissioned on 28/02/2011, the second on 29/06/2011, and the third on 27/07/2011.

Over this monitoring period, the water turbine and generator units and the monitoring meters operated normally, no malfunction or replacement of the equipments took place. Moreover, no events or situations have occurred during this monitoring period that could have impacted the applicability of the applied methodology.

2.2 Deviations from the Monitoring Plan

Not applicable

2.3 Grouped Project

This project is not a grouped project; this section is therefore not applicable.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	EF _{grid, CM, y}
Data unit:	tCO ₂ /MWh
Description:	Emission factor
Source of data:	China's DNA : Report on Determination of Baseline Grid Emission Factor issued on 9th August 2007
Value applied:	0.78795
Purpose of the data:	Baseline emission calculation
Any comment:	-

3.2 Data and Parameters Monitored

Data Unit / Parameter:	EG facility to SCPG, y		
Data unit:	MWh/yr		
Description:	Quantity of electricity supplied by the proposed project to the grid in year y		
Source of data:	Meter records		
Description of measurement methods and procedures to be applied:	The measurement/monitoring equipment should adopt the colligated automation system complying with state standard and technology. These equipment and systems should be calibrated and checked. The local power grid company is responsible for the maintenance and calibration of the gateway meter. The data of exported electricity can be accurately measured by the gateway meter and recorded.		
Frequency of monitoring/recording:	Continuous measurement and at least monthly recording		
Value monitored:	53,769.27		
Monitoring equipment:	Meter	M1(Main meter)	M2(Backup meter)
	SN	210299938	210299936
	Location	Manhao Switching Station	
	Type	Electric energy meter	
	Accuracy class	0.2s	
	Calibration frequency	At least once a year	
	Last calibration	12/02/2011	
	Validity period	12/02/2011-11/02/2016	
	Calibration entity	Electric Power Research Institute of Yunnan Electric Power Test & Research Institute (Group) Co., Ltd	
QA/QC procedures to be applied:	Measurement results should be cross-checked by electricity sales receipts.		
Calculation method:	-		
Any comment:	-		

Data Unit / Parameter:	EG SCPG to facility, y
Data unit:	MWh/yr
Description:	Quantity of electricity imported from the grid in year y
Source of data:	Meter records
Description of measurement	The measurement/monitoring equipment should adopt the colligated automation system complying with state standard and technology. These equipment and systems should be calibrated

methods and procedures to be applied:	and checked. The local power grid company is responsible for the maintenance and calibration of the gateway meter. The data of exported electricity can be accurately measured by the gateway meter and recorded.		
Frequency of monitoring/recording:	Continuous measurement and at least monthly recording		
Value monitored:	191.01		
Monitoring equipment:	Meter	M1(Main meter)	M2(Backup meter)
	SN	210299938	210299936
	Location	Manhao Switching Station	
	Type	Electric energy meter	
	Accuracy class	0.2s	
	Calibration frequency	At least once a year	
	Last calibration	12/02/2011	
	Validity period	12/02/2011-11/02/2016	
	Calibration entity	Electric Power Research Institute of Yunnan Electric Power Test & Research Institute (Group) Co., Ltd	
QA/QC procedures to be applied:	Measurement results should be cross-checked by electricity sales receipts.		
Calculation method:	-		
Any comment:	-		

Data Unit / Parameter:	EG facility, y
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data:	Meter records
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	53,578.26
Monitoring equipment:	Refer to EG facility to SCPG, y and EG SCPG to facility, y for details.
QA/QC procedures to be applied:	Refer to EG facility to SCPG, y and EG SCPG to facility, y for details.

Calculation method:	$EG_{\text{facility, y}} = EG_{\text{facility to SCPG, y}} - EG_{\text{SCPG to facility, y}}$
Any comment:	-

Data Unit / Parameter:	Cap_{PJ}
Data unit:	MW
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site
Description of measurement methods and procedures to be applied:	According to the "Tool to calculate the emission factor for an electricity system", values from government records or official publications can be used.
Frequency of monitoring/recording:	Yearly measured
Value monitored:	288
Monitoring equipment:	Verified by the nameplates of water turbine and generator units.
QA/QC procedures to be applied:	Cross check against the project documentation
Calculation method:	-
Any comment:	-

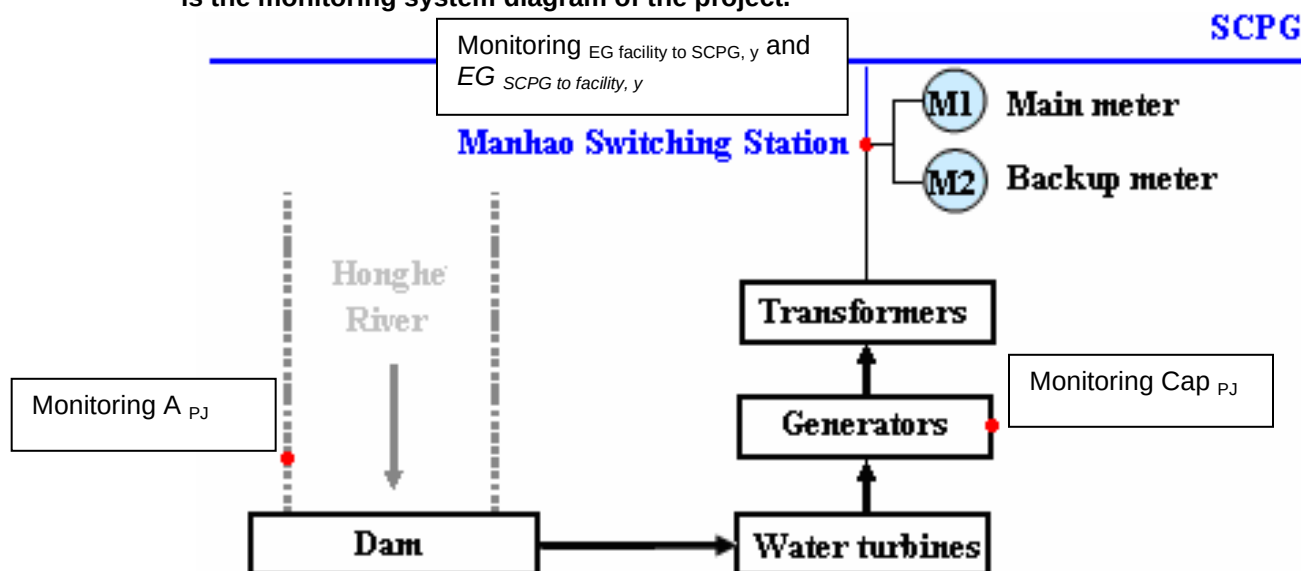
Data Unit / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data:	Project site
Description of measurement methods and procedures to be applied:	The data will be measured by professional survey method.
Frequency of monitoring/recording:	Yearly measured
Value monitored:	19,180,000 m^2
Monitoring	A_{PJ} has been measured through an engineering survey by Pearl

equipment:	River Water Resources Scientific Research Institute of Pearl River Water Resources Commission.
QA/QC procedures to be applied:	The measured frequency is once a year.
Calculation method:	-
Any comment:	-

3.3 Description of the Monitoring Plan

1. Monitoring system

The electricity exported to the grid and imported from the grid by the project is monitored through two bidirectional electric energy meters (M1 and M2) installed in Manhao Switching Station. M1 is the main meter; M2 is the backup meter in case of emergency use. Figure 1 is the monitoring system diagram of the project.



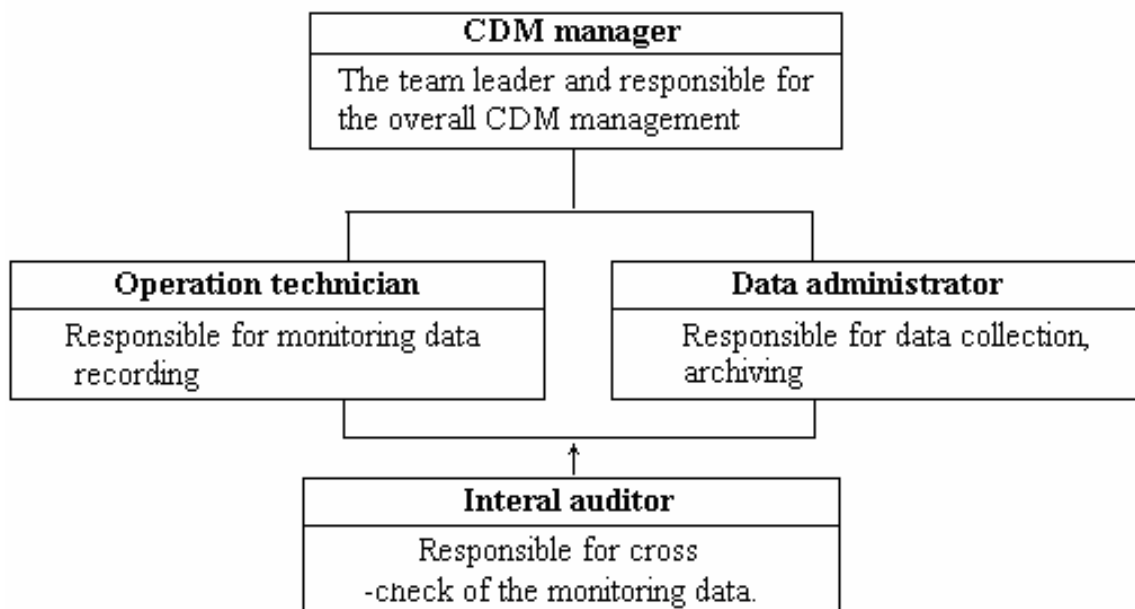
2. Data collection

EG_{facility to SCPG, y} and EG_{SCPG to facility, y} is continuously measured and automatically accumulated by the electric energy meters. The designated personnel from the grid company and the project owner record the meter readings at the appointed time of each month in Monthly Readings Records (MRRs), and then the grid company issues electricity sales receipts to the project owner.

Cap_{PJ} is monitored yearly by the CDM management team. No replacement of hydro turbines and generators has taken place during this monitoring period. Cap_{PJ} of the project could be verified by the nameplates of water turbine and generator units.

A_{PJ} is measured by Pearl River Water Resources Scientific Research Institute of Pearl River Water Resources Commission, which is a qualified institute. The measurement result of A_{PJ} in Year 2011 has been provided by Pearl River Water Resources Scientific Research Institute of Pearl River Water Resources Commission.

3. Organizational structure and responsibilities



4. Emergency procedures

In normal condition, meter records from the main meters are used for ER calculation. If the malfunction happened to the main meters, the meter records from the backup meters will be used for ER calculation, and the electricity transaction receipts will be kept for cross check.

During this monitoring period, the meters operated normally, and no emergency occurred.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions .

According the ACM0002, the baseline emissions(BE_y) is calculated as follows:

$$BE_y = EG_{PJ, y} \times EF_{grid, CM, y} = EG_{facility, y} \times EF_{grid, CM, y} = (EG_{Facility\ to\ SCPG, y} - EG_{SCPG\ to\ Facility, y}) \times EF_{grid, CM, y}$$

$$EG_{facility, y} = EG_{Facility\ to\ SCPG, y} - EG_{SCPG\ to\ Facility, y}$$

Where

$EG_{facility, y}$ – net power transmitted to the grid (MWh);

$EG_{PJ\ to\ SCPG, y}$ – exported electricity to the grid (MWh)

$EG_{SCPG\ to\ PJ, y}$ – imported electricity from the grid (MWh)

The detailed calculation procedure is described below:

Period	$EG_{Facility\ to\ SCPG, y}$ (MWh)	$EG_{SCPG\ to\ Facility, y}$ (MWh)	$EG_{facility, y}$ (MWh)

	A	B	C=A-B
28/02/2011	133.06	6.34	126.72
01/03/2011-31/03/2011	14,606.52	34.50	14,572.02
01/04/2011-30/04/2011	19,210.82	62.66	19,148.16
01/05/2011-31/05/2011	15,375.57	75.89	15,299.68
01/06/2011-06/06/2011	4,443.30	11.62	4,431.68
Total	53,769.27	191.01	53,578.26

So $BE_y = EG_{\text{facility, y}} \times EF_{\text{grid, CM, y}} = (EG_{\text{Facility to SCPG, y}} - EG_{\text{SCPG to Facility, y}}) \times EF_{\text{grid, CM, y}} = (53769.27 - 191.01) \times 0.78795 = 42,216(\text{tCO}_2\text{e})$

4.2 Project Emissions

The project is a newly-built hydropower project. As per the nameplates of water turbine and generator units, the value of Cap_{PJ} is 288MW. According to the measurement result issued by Pearl River Water Resources Scientific Research Institute of Pearl River Water Resources Commission on 01/06/2011, the measured value of A_{PJ} is 19,180,000m², thus the power density of the project is calculated to be 15W/m² (15W/m²=288×106W/ 19,180,000m²) which is greater than 10W/m², so the project emission (PE_y) is 0.

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

4.3 Leakage

According to ACM0002, there is no need for the proposed project to consider leakage. Besides there is no fossil fuel engine/generator which is in place for emergency purpose during the monitoring period. The leakage from the project is zero.

$L_y = 0$

4.4 Summary of GHG Emission Reductions and Removals

$ER_y = BE_y - PE_y - L_y$

$BE_y = \text{Baseline Emissions} = 42,216(\text{tCO}_2\text{e})$

$PE_y = \text{Project emissions} = 0(\text{tCO}_2\text{e})$

$L_y = \text{Leakages} = 0(\text{tCO}_2\text{e})$

$ER_y = BE_y = 42,216(\text{tCO}_2\text{e})$

The total Emission Reductions (ER_y) is calculated as follow:

$ER_y = BE_y - PE_y - L_y = 42,216 - 0 - 0 = 42,216(\text{tCO}_2\text{e})$

Emission reductions generated in the monitoring period (28/02/2011-06/06/2011): 42,216(tCO₂e).

5 ADDITIONAL INFORMATION

Item	Values of ex-ante calculation	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	81,972 (99 days);	42,216 (99 days);

According to the registered PDD, the annual estimated emission reductions were 906,656tCO₂e. so the average emission reduction of one day for each generator should be calculated as follows:

$$ER(\text{average}) = (906,656 / 365) / 3 (\text{tCO}_2\text{e}) = 828 (\text{tCO}_2\text{e})$$

Where

906,656 - estimated annual emission reductions

365 - days of one year

3 - amount of generators

This monitoring period covers 28/02/2011–06/06/2011 which is 99 days in total. In consideration of only one generator in operation in this monitoring period, the estimated emission reductions in this monitoring period calculated as follows:

$$828 * 99 = 81,972 (\text{tCO}_2\text{e})$$

Where

99 – the total days of this monitoring period

Then the estimated emission reduction for this monitoring period should be: 81,972tCO₂e

The actual GHG emission reduction of this monitoring period (42,216tCO₂e) are 49% less than the estimated emission reductions. It is because the drought in this monitoring period.

Emission reductions	CO ₂ e (tCO ₂ e)	CH ₄ (tCH ₄)	N ₂ O (tN ₂ O)	HFCs (tHFC)	PFCs (t PFC)	SF ₆ (tSF ₆)	Sum (tCO ₂ e)
28/02/2011-06/06/2011	42,216						42,216