

**MONITORING REPORT FORM (F-CDM-MR)**
Version 02.0**MONITORING REPORT**

Title of the project activity	China Tongwan Hydropower Project
Reference number of the project activity	1590
Version number of the monitoring report	01
Completion date of the monitoring report	01/10/2012
Registration date of the project activity	30/10/2008
Monitoring period number and duration of this monitoring period	7 th monitoring period: 01/07/2011-30/09/2012
Project participant(s)	Hunan Zhongfang Tongwan Water Resources & Hydropower Development Co., Ltd Carbon Asset Management Sweden AB
Host Party(ies)	People's Republic of China
Sectoral scope(s) and applied methodology(ies)	Sectoral scope 1: Energy industries (renewable-/non-renewable sources) Methodology: ACM0002-Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 06)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	795,471 tCO ₂ (458 days)
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	610,024 tCO ₂

**SECTION A. Description of project activity****A.1. Purpose and general description of project activity**

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The purpose of China Tongwan Hydropower Project (hereafter referred to as “the project”) is to utilise the water resources for power generation to alleviate electricity shortage in central China. The generated electricity is delivered to Central China Power Grid (hereafter referred to as “CCPG”), which is dominant of fuel-fired power plants.

The project is hydropower plant with daily pondage reservoir, the installed capacity of the project is 180 MW, consisting of four 45 MW generators. The annual net electricity generation of the project is forecast to be 662,000 MW. The equipments employed by the project are as follows:

Turbine	Unit	4
	Model	GZ4BN28B-WP-710
	Manufacturer	Tianjin Alstom Hydro Co., Ltd.
	Rated rotate speed	83.3 r/min
	Rated water head	11 m
	Rated flow rate	459.79 m ³ /s
Generator	Unit	Unit: 4
	Model	SFWG45-72/7550
	Manufacturer	Tianjin Alstom Hydro Co., Ltd.
	Single capacity	45 MW
	Rated voltage	10.5 kV

The project construction was started on 22 March 2005. The commissioning dates of 4 generators were 25 December 2007, 31 May 2008, 26 October 2008 and 23 December 2008 respectively.

The total GHG emission reductions achieved in this monitoring period are 610,024 tCO₂.

A.2. Location of project activity

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The project is located at Tongwan Town, Zhongfang County, Huaihua City, Hunan Province, P.R.China. The project is 49 km away from Huaihua City. The geographical coordinates of the project are:

110 °17'19" E
27 °35'02" N

A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	Hunan Zhongfang Tongwan Water Resources & Hydropower Development Co., Ltd	No
Sweden	Carbon Asset Management Sweden AB	No
Netherlands	Carbon Asset Management Sweden AB	No

**A.4. Reference of applied methodology**

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Title of the approved baseline methodology: ACM0002-Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 06, valid from 18 May 2006 to 13 December 2007)

Title of the approved monitoring methodology: ACM0002-Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources (Version 06, valid from 18 May 2006 to 13 December 2007)

Reference: Tool for the demonstration and assessment of additionality (Version 03, 16 February 2007)

A.5. Crediting period of project activity

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Type of the crediting period: Renewable crediting period

Start date of the crediting period: 30/10/2008

Length of the crediting period: 30/10/2008-29/10/2015 (7 years)

SECTION B. Implementation of project activity**B.1. Description of implemented registered project activity**

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The project is hydropower plant with daily pondage reservoir, the installed capacity of the project is 180 MW, consisting of four 45 MW generators. The annual net electricity generation of the project is forecast to be 662,000 MWh.

The project construction was started on 22 March 2005. The commissioning dates of 4 generators were 25 December 2007, 31 May 2008, 26 October 2008 and 23 December 2008 respectively. The project was under normal and continued operation status until now. The 7th monitoring period of the project is 01/07/2011-30/09/2012.

B.2. Post registration changes**B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

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None.

B.2.2. Corrections

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None.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

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None.

B.2.4. Changes to project design of registered project activity

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None.

B.2.5. Changes to start date of crediting period

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None.

B.2.6. Types of changes specific to afforestation or reforestation project activity

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None.

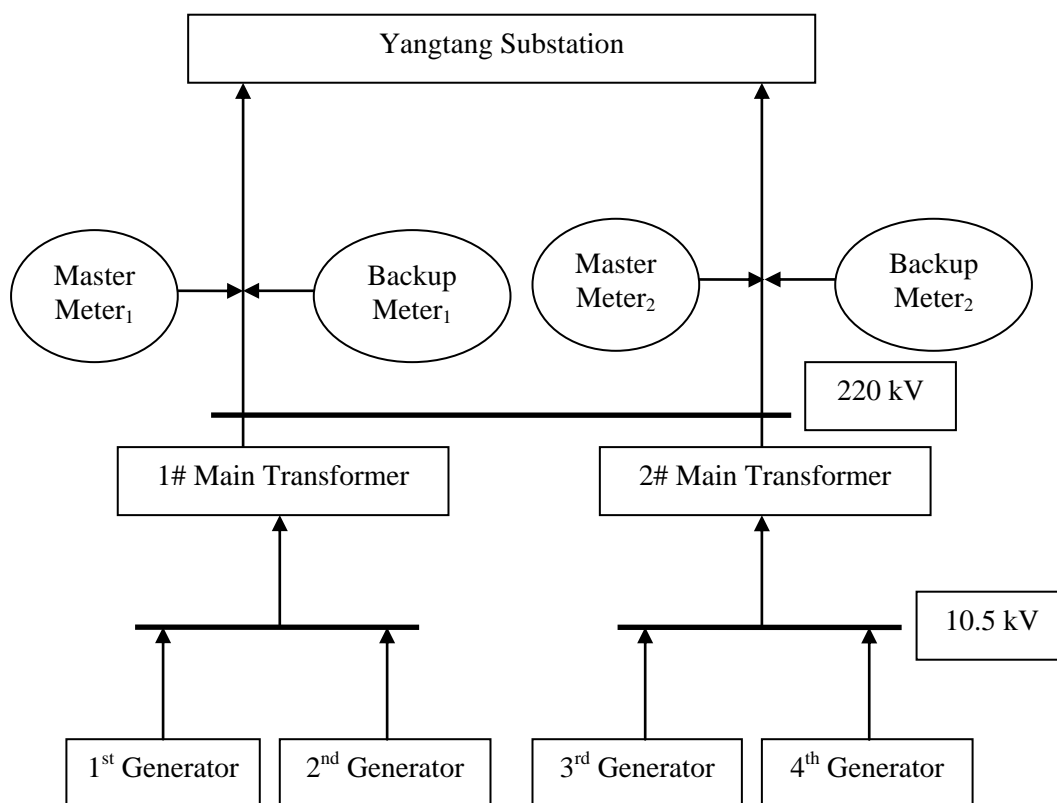
SECTION C. Description of monitoring system

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General description of monitoring system:

The generated electricity from 1# generator and 2# generator is transmitted through 10.5 kV line I into 1# main transformer to boost voltage to 220 kV; the generated electricity from 3# generator and 4# generator is transmitted through 10.5 kV line II into 2# main transformer to boost voltage to 220 kV. Then the electricity is delivered through two 220 kV transmission lines to 220 kV Yangtang Substation and then to power grid.

There are two bidirectional electronic meters (Master Meter₁ and Master Meter₂) are installed at high voltage sides of main transformers to monitor the power exported to power grid and power imported from power grid as per signed Power Purchase Agreement (PPA). Furthermore, there is also a Backup Meter with same accuracy and function for each Master Meter to ensure the monitoring purpose if the Master Meters are found malfunction. The power electric connection diagram is as follow:



The magnification factor of Master Meters is 1,320,000, which is calculated based on voltage ratio of potential transformer (PT) and current ratio of current transformer (CT)

There are totally 6 sets of PT and CT for the project, every 3 sets of PT and CT are for one transmission line. The calibration details of PT and CT are as follows:

Equipment	CT	PT
Serial Number	F2GA F2GB, F2GC, F4GA,	503710, 503708, 503707,



	F4GB, F4GC	503711, 503709, 503712
Calibration Date	06/12/2007	05/12/2007
Calibration Valid Until	05/12/2017	04/12/2017
Calibration Entity	Testing and Research Institute of Hunan Electric Power Company, which is authorized by Administration of Quality and Technology Supervision of Hunan Province.	

Note: The CT and PT are calibrated as per Verification Regulation of Instrument Transformers in Power System (JJG 1021-2007). As per JJG 1021-2007, the calibration frequency for CT and PT is 10 years.

According to calibration records for PT & CT conducted by Testing and Research Institute of Hunan Electric Power Company on 5th and 6th December 2007:

Rated primary voltage of PT is 220 kV

Rated secondary voltage of PT is 100 V

Then voltage ratio of PT is 2200 (it equals to 220 kV/100 V)

Rated primary current of CT is 600 A

Rated Secondary current of CT is 1 A

Then current ratio of CT is 600 (it equals to 600 A/1 A)

Thus the final magnification factor applied for the meter is:

$$\text{voltage ratio} \times \text{current ratio} = 2200 \times 600 = 1,320,000$$

Data collection procedures:

The power imported from power grid and power exported to power grid data were measured continuously by two Master Meters and were recorded by grid company monthly. The meter readings were aggregated on two Master Meters.

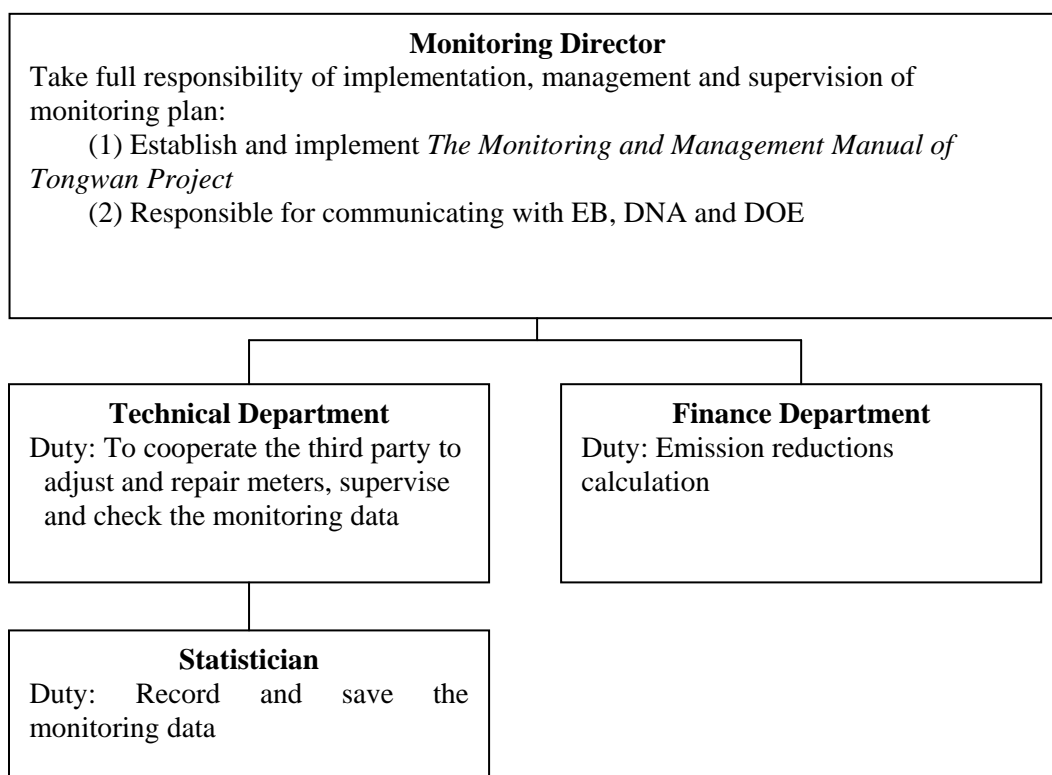
For power exported to grid, the meter readings of two Master Meters recorded by grid company were used for CERs calculation. Based on meter readings of two Master Meters provided by grid company, the power grid company provided the electricity transaction notes to project owner in the early of each month. The monitoring director from project entity checked and confirmed the electricity transaction notes based on the project owner's own monitored meter readings (project owner also has access to the two Master Meters). The finance department from project entity issued the electricity sales receipts and then financial manager Mr. He Hua from project entity confirmed the electricity sales receipts. Finally the power grid company paid the money to project owner for electricity transactions.

For power imported from grid, the meter readings of two Master Meters recorded by grid company were used for CERs calculation. Based on meter readings of two Master Meters provided by grid company, the project owner paid the money to the grid company after checking project owner's own monitoring meter readings (project owner also has access to the two Master Meters) and then got the power purchase receipts from grid company.

All the electronic and paper monitoring documents will be archived during the crediting period and two years after.

Organizational structure:

The monitoring organizational structure is as follow:

**Roles and responsibilities of personnel:**

Monitoring Director: Mr. Liu Changsheng is responsible for the overall management of the monitoring plan and for the internal verification of the monitored data.

Technical Department: It is consisted of operational employees, the group is leaded by the Mr. Li Binbin. The department is responsible for internal regular maintenance of monitoring equipment and DCS system

Statistician: To conduct the monitoring task strictly based on the monitoring manual and registered PDD. The statisticians are responsible for recording required monitored parameters, for reporting the monitoring results and for reporting the abnormal situation of the project. Each shift is responsible for the works.

Finance Department: Mr. He Hua is responsible for the department. The department is responsible for calculating the emission reductions regularly and for preparing the sales receipts of electricity transaction. The internal audit for CERs calculation is conducted by monitoring director.

Training:

The project staffs have been trained respectively regarding operational regulations, quality control, data monitoring & archive and CDM knowledge.

Emergency procedures:

The Backup Meter will be used for monitoring when Master Meter is in malfunction status. During the given monitoring period, the Master Meters were in well functions and Backup Meters were not used for monitoring.

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

Data/Parameter	EF_y
Unit	tCO ₂ e/MWh
Description	Baseline emission factor of CCPG
Source of data	Chinese DNA's Guideline of emission factors of Chinese grids and registered PDD
Value(s) applied	0.97504
Purpose of data	Used for emission reductions calculation
Additional comment	N/A

Data/Parameter	Surface Area
Unit	km ²
Description	Surface area at the full reservoir level
Source of data	Water Resources Bureau of Huaihua City
Value(s) applied	12
Purpose of data	<p>The data is used for power density calculation. The power density is calculated as 15 W/m², thus the project emissions are not needed to be considered.</p> <p>The data was measured by Water Resources Bureau of Huaihua City at the start of the operation of the project. According to ACM0002 (Version 06), the data should only be monitored at start of the project during the crediting period. The data is not needed to be monitored since the data has been verified during 1st verification. The first verification request has been approved by EB on 21st August 2009.</p>
Additional comment	N/A



D.2. Data and parameters monitored

Data/Parameter	EG _y				
Unit	MWh				
Description	Net generated electricity delivered to CCPG				
Measured/Calculated/Default	Calculated based on difference between power exported to power grid and power imported from power grid.				
Source of data	Meter readings of two Master Meters provided by grid company and confirmed by project owner based on project owner’s own logbooks of two Master Meters.				
Value(s) of monitored parameter	Power export: 640497.924 MWh Power import: 17.952 MWh				
Monitoring equipment	The data is used for baseline emission calculations.				
Measuring/Reading/Recording frequency	The power imported from power grid and power exported to power grid were measured continuously by two bidirectional Master Meters and were recorded monthly. The information of meters are as follows:				
	Item	Master Meter ₁	Master Meter ₂	Backup Meter ₁	Backup Meter ₂
	Type	AINTRAL-X	AINTRAL-X	AINTRAL-X	AINTRAL-X
	Serial Number	03218434	03218457	03218436	03218433
	Accuracy	0.2S	0.2S	0.2S	0.2S
	Calibration information:				
	Meter	Calibration date		Valid until	
	Master Meter ₁	03/04/2011		02/07/2011	
		30/06/2011		29/09/2011	
		28/09/2011		27/12/2011	
		27/12/2011		26/03/2012	
		25/03/2012		24/06/2012	
	Master Meter ₂	03/04/2011		02/07/2011	
		30/06/2011		29/09/2011	
		28/09/2011		27/12/2011	
		27/12/2011		26/03/2012	
		25/03/2012		24/06/2012	
Backup Meter ₁	03/04/2011		02/07/2011		
	30/06/2011		29/09/2011		
	28/09/2011		27/12/2011		
	27/12/2011		26/03/2012		
	25/03/2012		24/06/2012		
Backup Meter ₂	03/04/2011		02/07/2011		
	30/06/2011		29/09/2011		
	28/09/2011		27/12/2011		
	27/12/2011		26/03/2012		
	25/03/2012		24/06/2012		
Calibration Frequency		Quarterly			
Calibration Entity		Testing and Research Institute of Hunan Electric Power Company, which is authorized			



			by Administration of Quality and Technology Supervision of Hunan Province		
	Note: During the given monitoring period, the Master Meters were in well functions and Backup Meters were not used for monitoring.				
	The Master Meters and Backup Meters were replaced by new meters due to requirements of power grid company. The information of new meters are as follows:				
	Item	Master Meter ₁	Master Meter ₂	Backup Meter ₁	Backup Meter ₂
	Type	MK6E	MK6E	MK6E	MK6E
	Serial Number	212039451	212039455	212039452	212039456
	Accuracy	0.2S	0.2S	0.2S	0.2S
	Calibration information:				
	Meter	Calibration date	Valid until		
	Master Meter ₁	05/06/2012	04/06/2017		
15/06/2012		14/09/2012			
12/09/2012		11/12/2012			
Master Meter ₂	05/06/2012	04/06/2017			
	15/06/2012	14/09/2012			
	12/09/2012	11/12/2012			
Backup Meter ₁	05/06/2012	04/06/2017			
	15/06/2012	14/09/2012			
	12/09/2012	11/12/2012			
Backup Meter ₂	05/06/2012	04/06/2017			
	15/06/2012	14/09/2012			
	12/09/2012	11/12/2012			
Calibration Frequency		Quarterly			
Calibration Entity		Testing and Research Institute of Hunan Electric Power Company, which is authorized by Administration of Quality and Technology Supervision of Hunan Province			
Note: During the given monitoring period, the Master Meters were in well functions and Backup Meters were not used for monitoring.					
The meter replacement report is provided by grid company for reference. The meter readings of the old meters and new meters at the time of meter replacement are recorded in the report.					
Calculation method (if applicable)	The data were measured continuously and recorded monthly.				
QA/QC procedures	N/A				
Purpose of data	Used for calculation of baseline emission reductions				
Additional comment	N/A				

D.3. Implementation of sampling plan

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N/A

SECTION E. Calculation of emission reductions or GHG removals by sinks**E.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

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The baseline emission during the monitoring period is:

$$BE_y = EG_y - EF_y$$

Where:

EG_y is electricity supplied by the project activity to the grid in year y , in MWh;

EF_y is baseline emission factor in year y , in tCO₂e/MWh.

Net power supply data is 640479.972 MWh.

According to Page 26 of registered Tongwan PDD¹:

The project will involve influencing 3 small hydropower plants, the total installed capacity of the 3 small hydropower plants is 1.35 MW. The 3 small hydropower plants have been compensated by Tongwan project owner. The average annual total power generation of the 3 small hydropower plants is 7000 MWh. In order to be conservative, the 3 small hydropower plants are assumed to operate full year. Thus, the annual power generation of 11826 MWh ($1.35 \text{ MW} \times 8760 \text{ h} = 11826 \text{ MWh}$) is deducted from power supply by Tongwan ($66200 - 11826 = 650174 \text{ MWh}$) and the method will always be used to calculate the baseline emission during the whole 3 renewable crediting periods.

The monitoring period is 01/07/2011 to 30/09/2012, totally 458 days.

Thus the power generation to 3 small hydropower power plants during monitoring period is:

$$1.35 \text{ MW} \times 8760 \text{ h} / 365 \text{ d} \times 458 \text{ d} = 14839.200 \text{ MWh}$$

$$BE_y = (640479.972 - 14839.200) \times 0.97504 \text{ tCO}_2\text{e/MWh} = 610,024 \text{ tCO}_2\text{e}$$

E.2. Calculation of project emissions or actual net GHG removals by sinks

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The project is a newly built hydropower plant, the power density is 15 W/m², greater than 10 W/m², $PE_y = 0$

¹ According to explanation document from design institute, the 3 small hydropower plants are located at the 3 different branches of Yuanshui River while Tongwan is located at Yuanshui River. The 3 small hydropower plants are 11 km, 12 km and 29 km away from Tongwan project site respectively. Due to construction of Tongwan project, the water level of the river is increased. The 3 small hydropower plants are affected by the increased water level. However, after modification of the 3 small hydropower plants, these 3 small hydropower plants are operational as before now. In order to be conservative and in line with the registered PDD, we'd like to abide by the calculation method in the registered PDD for Tongwan project.

A diesel-based electricity generator exists for back-up purposes. This generator has not been in use during the monitoring period and only been activated during maintenance checks.

According to Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion, the CO₂ emissions from diesel combustion are calculated as follows:

$$PE_{\text{diesel}} = FC_{\text{diesel}} * COEF_{\text{diesel}}$$
$$COEF_{\text{diesel}} = NCV_{\text{diesel}} * EF_{CO_2, \text{diesel}}$$

Where:

PE_{diesel} = Are the CO₂ emissions from diesel combustion during the monitoring period (tCO₂e);
 FC_{diesel} = Is the quantity of diesel combusted during the monitoring period (mass or volume unit);
 $COEF_{\text{diesel}}$ = Is the CO₂ emission coefficient of diesel (tCO₂e/mass or volume unit);
 NCV_{diesel} = Is the weighted average net calorific value of diesel (GJ/mass or volume unit).
 EF_{CO_2} = Is the weighted average CO₂ emission factor of diesel (tCO₂e/GJ)

According to diesel generator operation records, there were only around 27 kilograms diesel used during monitoring period. $FC_{\text{diesel}} = 27$ kg.

According to China Energy Statistical Yearbook, the weighted average net calorific value of diesel (NCV_{diesel}) is 0.000042652 TJ/kg.

According to 2006 IPCC Guidelines for National Greenhouse Gas Inventories, the default value at the upper limit of the uncertainty at a 95% confidence interval of CO₂ emission factor of diesel (EF_{CO_2}) is 74.8 tCO₂e/TJ.

Therefore, the CO₂ emissions from diesel combustion are calculated as:

$$PE_{\text{diesel}} = FC_{\text{diesel}} * NCV_{\text{diesel}} * EF_{CO_2, \text{diesel}} = 27 * 0.000042652 * 74.8 = 0.09 \text{ tCO}_2\text{e}$$

The emissions from these maintenance checks are far less than 1 tCO₂e i.e. only 0.000015% of the total baseline emission reductions. In any case, in line with ACM0002 version 6 and the VVM, there are no project emissions for hydro power projects need to be considered

E.3. Calculation of leakage

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According to ACM0002, $L_y = 0$

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e)	Project emissions or actual net GHG removals by sinks (tCO ₂ e)	Leakage (tCO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO ₂ e)
Total	610,024	0	0	610,024

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO₂e)	795,471 (458 days)	610,024



*The data is average one calculated based on registered PDD. The monitoring period covers 458 days. The annual estimated CERs are 633,945 tCO₂ as per registered PDD.

The actual values of the emission reductions achieved during the monitoring period are 23.31% lower than registered PDD.

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

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The actual values of the emission reductions achieved during the monitoring period are 23.31% lower than registered PDD and is even lower than a full year CERs data prediction (633,945 tCO₂) in the registered PDD, no further argumentation is needed.

History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance		