

MONITORING REPORT
(Version 01)
China Tongwan Hydropower Project
(CDM registration reference number: 1590)

The 3rd monitoring period: 1 September, 2009—31 December, 2009 (incl. both dates)

Dated: 5 January, 2010

Prepared by

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General Information

Purpose of a Monitoring Report

The aim of monitoring report is to make sure that the net generated electricity was measured, recorded and reported during monitoring period to ensure real, measurable and verifiable emission reductions.

Project Description

China Tongwan Hydropower Project (hereinafter referred to as “the project”) is a newly built hydropower plant, which is located in Zhongfang County of Huaihua City, Hunan Province, P. R. China. The project construction was commenced in March 2005. The total installed capacity of the project is 180 MW (45 MW×4) with expected annual net power supply of 662,000 MWh. The generated electricity by the project is delivered to the regional power grid, i.e. Central China Power Grid (CCPG).

The purpose of the project is to generate electricity by using water resources to alleviate electricity shortage in Central China. The project will contribute to the reduction of GHG emission by displacing part of the electricity supplied by CCPG, which is dominant of fuel-fired power plants.

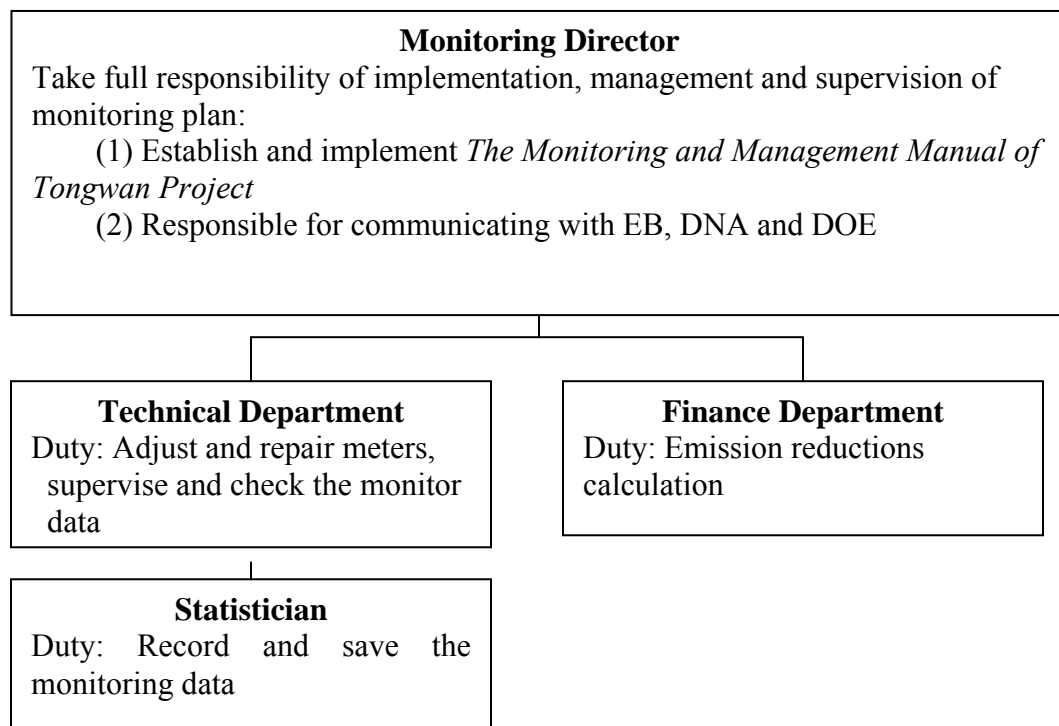
The implementation of the project is as follows:

| Event | Time |
|--|-----------------------------------|
| Project construction | 22/03/2005 |
| Registration date | 30/10/2008 |
| Crediting period | 30/10/2008-29/10/2015 (renewable) |
| Operation of 1 st generator | 25/12/2007 |
| Operation of 2 nd generator | 31/05/2008 |
| Operation of 3 rd generator | 26/10/2008 |
| Operation of 4 th generator | 23/12/2008 |
| 1 st monitoring period | 30/10/2008-31/01/2009 |
| 2 nd monitoring period | 01/02/2009-31/08/2009 |
| 3 rd monitoring period | 01/09/2009-31/12/2009 |

Monitoring Protocol

Monitoring management structure:

The monitoring management structure is as follow:



The responsibilities of the project staff are as follow:

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.

List of the ex-ante parameters: According to ACM0002 (Version 06) and the registered PDD, the ex-ante parameters used for power grid emission factor calculation are as follows:

| Parameter | Remark |
|--|--|
| NCV_i | The net calorific value (energy content) per mass or volume unit of fuel i |
| $OXID_i$ | Oxidation factor of the fuel i |
| $F_{i,j,y}$ | The quantity of fuel i (in a mass or volume unit) consumed for power generation by the relevant provinces j in year(s) y |
| Electricity generation of power plants in Central China Power Grid | Electricity generated by province j in Central China Power Grid in year y . |
| Internal use rate of power plant | The internal power consumption rate of power plants in province j in Central China Power Grid in year y . |
| $EF_{CO_2,i}$ | The CO_2 emission factor per unit of fuel i |
| $CAP_{i,j,y}$ | Installed capacities of power plant category i of province j in years y |
| $GENE_{best,coal}$ | The power supply efficiency of most advanced commercialized coal-fired power plants |
| $GENE_{best,oil/gas}$ | The power supply efficiency of most advanced commercialized oil-fired power plants and gas-fired power plants |

Note: According to registered PDD, the baseline emission factor is calculated ex-ante and will be fixed during 1st crediting period.

Parameters monitored: The monitoring methodology ACM0002 (Version 06)—“Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources” is used for the project. To be in line with monitoring methodology and the monitoring plan contained in the registered PDD, the following parameters are required to be monitored for the project.

| | |
|---|--|
| Data / Parameter: | Surface Area |
| Data unit: | km ² |
| Description: | Surface area at the full reservoir level |
| Source of data to be used: | Water Resources Bureau of Huaihua City |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 12 |
| Description of | The data was measured by Water Resources Bureau of Huaihua |

| | |
|---|---|
| measurement methods and procedures to be applied: | 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 1 st verification. The first verification request has been approved by EB on 21 st August 2009. |
| QA/QC procedures to be applied: | The data measured by Water Resources Bureau of Huaihua City is reliable and creditable. |
| Any comment: | |

| | |
|--|--|
| Data / Parameter: | EG_v |
| Data unit: | MWh |
| Description: | Net generated electricity delivered to CCPG |
| Source of data to be used: | Measured onsite |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 127585.92 |
| Description of measurement methods and procedures to be applied: | The net generated electricity by the project is the difference of power imported from power grid and power exported to power grid. The power imported from power grid and power exported to power grid were measured continuously and were recorded monthly through two bidirectional Master Meters which are installed at the high voltage sides of main transformers. |
| QA/QC procedures to be applied: | <p>The monitoring data is used for emission reductions calculation. Sales/purchase receipts and electricity transaction notes are used for double check to ensure the consistency.</p> <p>For power imported from grid, the power grid company will provide the electricity transaction notes to project owner in the early of each month. The monitoring director from project entity will check and confirm the electricity transaction notes based on the monitored meter readings. The finance department from project entity will issue the electricity sales receipts and then financial manager Mr. He Hua from project entity will confirm the electricity sales receipts. Finally the power grid company will pay the money to project owner for electricity transactions.</p> <p>For power exported to grid, the project owner will pay the money to the grid company based on monitoring records confirmed by grid company and then get the power purchase receipts from grid</p> |

| | |
|--------------|----------|
| | company. |
| Any comment: | |

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.

The seasonal calibration of 2 Master Meters and 2 Backup Meters have been conducted during the monitoring period:

| Item | Serial No. | Accuracy | Last calibration | Calibration during monitoring period | Calibration valid until | Calibration entity |
|---------------------------|------------|----------|------------------|--------------------------------------|-------------------------|--|
| Master Meter ₁ | 03218434 | 0.2s | 15/07/2009 | 14/10/2009 | 13/01/2010 | Testing and Research Institute of Hunan Electric Power Company, which is authorized by Administration of Quality and Technology Supervision of Hunan Province. |
| Master Meter ₂ | 03218457 | 0.2s | 15/07/2009 | 14/10/2009 | 13/01/2010 | |
| Backup Meter ₁ | 03218436 | 0.2s | 15/07/2009 | 14/10/2009 | 13/01/2010 | |
| Backup Meter ₂ | 03218433 | 0.2s | 15/07/2009 | 14/10/2009 | 13/01/2010 | |

The magnification factor of 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, F4GB, F4GC | 503710, 503708, 503707, 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:

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

Emission Reductions Calculation

The Monitoring Plan clearly states the roles and responsibilities of persons from the project owner who are involved in the monitoring of data by the project.

According to ACM0002, the emission reduction of the project is:

$$ER_y = BE_y - PE_y - Ly$$

Project emissions: The project is a newly built hydropower plant, the power density is 15 W/m^2 , greater than 10 W/m^2 , $PE_y = 0$

There is a diesel generator used for construction period of the project. The diesel generator will be still used for operation of gates during emergency situation in the future.

The diesel consumption monitoring procedure has been established. The plant staff will monitor the time, aim and quantity of diesel consumption. The data will be cross-checked through diesel purchase receipts and stock changes after project construction completion.

According to diesel generator usage records, there were only 6 kilograms diesel used during monitoring period. The diesel was used for diesel generator operation for humidity prevention during monitoring period

The emissions from diesel usage are calculated as 0.02 t CO_2 by using China Energy Statistical Yearbook and IPCC2006 upper values of diesel (net calorific value of diesel in China Energy Statistical Yearbook is 42652 kJ/kg , emission factor of diesel in IPCC default values at

the upper limit of the uncertainty at a 95% confidence interval is 20.4 tC/TJ, oxidation factor of diesel is 100%, thus the emissions due to diesel consumption are calculated as $6 \times 42652 / 1000000000 \times 20.4 \times 100\% \times 44 / 12 = 0.02 \text{ tCO}_2$.)

The emission caused by diesel consumption accounts only 0.000017% of baseline emission reductions. Thus the trivial emissions from diesel usage can be ignored.

Leakage: According to ACM0002, $L_y = 0$

Baseline emissions:

The baseline emission during the monitoring period is:

$$BE_y = EG_y \cdot EF_y$$

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 $\text{tCO}_2\text{e/MWh}$.

The monitored data based on meter readings for the project are as follow:

| Period | Power export (MWh) | Power import (MWh) | Net power supply (MWh) |
|-----------------------|-----------------------|-----------------------|---------------------------|
| | A | B | C |
| 01/09/2009-30/09/2009 | 25737.36 | 0.00 | 25737.36 |
| 01/10/2009-31/10/2009 | 17091.36 | 0.00 | 17091.36 |
| 01/11/2009-30/11/2009 | 34455.96 | 0.00 | 34455.96 |
| 01/12/2009-31/12/2009 | 50301.24 | 0.00 | 50301.24 |
| Sum | 127585.92 | 0.00 | 127585.92 |

Note: All the meter readings in above table are sourced from 2 Master Meters, the meter readings have been confirmed by grid company. According to Monitoring Records of Master Meters of Tongwan Hydropower Plant provided by power grid company, there was no electricity quantity was deducted from seasonal reactive voltage assessment for 3rd season and 4th season of 2009. Due to the regulation of local Power Grid Company, the monthly cut-off time for power export and power import data is 24:00 of the last day of each month.

Net power supply data is: 127585.92 MWh.

According to Page 25 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 MW×8760 h=11826 MWh) is deducted from power supply by Tongwan (66200 –11826=650174 MWh) and the method will always be used to calculate the baseline emission during the whole 3 renewable crediting periods.

The monitoring period is 01/09/2009 to 31/12/2009, totally 122 days.

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

$$1.35 \text{ MW} \times 8760 \text{ h} / 365 \text{ d} \times 122 \text{ d} = 3952.80 \text{ MWh}$$

$$BE_y = (127585.92 - 3952.80) \times 0.97504 \text{ tCO}_2/\text{MWh} = 120,547 \text{ tCO}_2$$

$$ER_y = 120547 - 0 - 0 = 120,547 \text{ tCO}_2$$

The emission reductions generated in the monitoring period is 120,547 tCO₂.

The comparison of the actual emission reductions as well as load factor between the monitoring period and the registered PDD is conducted for the project. In order to further substantiate the comparison, the comparison with the full year (covering the given monitoring period) data is also conducted for the project.

| | Registered PDD (whole year) | Monitoring period (01/09/2009-31/12/2009) | Full year Period (01/01/2009-31/12/2009) |
|--------------------|--|--|---|
| Load factor | 41.98% | 24.21% | 41.02% |
| CERs (t) | 633,945 | 120,547 | 619,091 |

Note: Load factor= $EG_y/180 \text{ MW/hours}$ during calculation period.

According to paragraph 10 of Annex 68 of EB 48:

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.

*Comparison of the actual emission reduction claimed in the monitoring period with the estimate in the registered PDD, **and explanation on any significant increase.***

The result in above table shows that the both actual emission reductions during the given monitoring period and full year period are less than the estimation in the registered PDD. The reason is due to the actual water resources during past years are a little poorer than estimation in Preliminary Design Report of the project. Especially, the actual full year CERs (covering the given monitoring period) is only 2.34% lower than estimation in registered PDD. Thus we conclude that the gap of CERs between the monitoring period and registered PDD is reasonable. It is due to the availability of water resources.