

# NANSHA HYDRO POWER PROJECT IN YUNNAN PROVINCE CHINA

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|                          |                                                                                                                                                                                                                            |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Title</b>     | Nansha Hydro Power Project in Yunnan Province China                                                                                                                                                                        |
| <b>Version</b>           | Version 03                                                                                                                                                                                                                 |
| <b>Date of Issue</b>     | 10-07-2012                                                                                                                                                                                                                 |
| <b>Project ID</b>        | -                                                                                                                                                                                                                          |
| <b>Monitoring Period</b> | 28-12-2007 to 11-01-2009                                                                                                                                                                                                   |
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## Table of Contents

|          |                                                                     |           |
|----------|---------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Project Details .....</b>                                        | <b>3</b>  |
| 1.1      | Summary Description of Project .....                                | 3         |
| 1.2      | Sectoral Scope and Project Type .....                               | 3         |
| 1.3      | Project Proponent.....                                              | 3         |
| 1.4      | Other Entities Involved in the Project.....                         | 3         |
| 1.5      | Project Start Date .....                                            | 3         |
| 1.6      | Project Crediting Period.....                                       | 4         |
| 1.7      | Project Location .....                                              | 4         |
| 1.8      | Title and Reference of Methodology .....                            | 4         |
| <b>2</b> | <b>Implementation Status.....</b>                                   | <b>4</b>  |
| 2.1      | Implementation Status of the Project Activity .....                 | 4         |
| 2.2      | Deviations from the Monitoring Plan .....                           | 4         |
| 2.3      | Grouped Project.....                                                | 4         |
| <b>3</b> | <b>Data and Parameters.....</b>                                     | <b>4</b>  |
| 3.1      | Data and Parameters Available at Validation.....                    | 5         |
| 3.2      | Data and Parameters Monitored.....                                  | 5         |
| 3.3      | Description of the Monitoring Plan .....                            | 8         |
| <b>4</b> | <b>Quantification of GHG Emission Reductions and Removals .....</b> | <b>9</b>  |
| 4.1      | Baseline Emissions . .....                                          | 9         |
| 4.2      | Project Emissions.....                                              | 10        |
| 4.3      | Leakage.....                                                        | 10        |
| 4.4      | Summary of GHG Emission Reductions and Removals.....                | 11        |
| <b>5</b> | <b>Additional Information .....</b>                                 | <b>11</b> |

## 1 PROJECT DETAILS

### 1.1 Summary Description of Project

Nansha Hydro Power Project in Yunnan Province China (hereafter referred to as the proposed project) is a hydro power plant with a new reservoir in Yuanyang County of Honghe Hani & Yi Autonomous State Yunnan Province China. Three water turbines and related generators with each capacity of 50MW are adopted, and the annual generated electricity is 702,280MWh with annual operation hours of 4,682h, (the annual grid-connected electricity is 616,314MWh). The electricity will be connected to Yunnan Province Power Grid, finally to South China Power Grid through 110KV transmission lines. The surface area at full reservoir level of the proposed project is 8,938,000m<sup>2</sup> and the installed capacity is 150MW(3×50MW), so the power density of the proposed project is 16.8W/ m<sup>2</sup>

The electricity generated by the project is supplied to South China Power Grid (SCPG). The emission reductions are achieved by displacing part of the electricity of SCPG, which is dominated by coal-fired power plants. The estimated average annual emission reductions are 519,768tCO<sub>2</sub>e.

### 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 Hydro Power Development Co.Ltd.                                                                                              |
| Role                 | Project owner                                                                                                                                 |
| Contact Information  | Mr. Wang Hualin<br>Tel: +86 13769371823<br>Fax: +86-873-3743179<br>Address : 780 Building Hongzhuyuan Mengzi County,<br>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

28/12/2007

## 1.6 Project Crediting Period

28/12/2007 – 11/01/2009

Reason to choose This Crediting Period is that the project successfully registered for CDM project on 12/01/2009, meanwhile the Project generated electricity continuously from 28/12/2007.

## 1.7 Project Location

The proposed project is located in Yuanyang County of Honghe Hani & Yi Autonomous State Yunnan Province China. The geographical coordinates of the proposed project are east longitude 102°51'21" and north latitude 23°13'46".

## 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 06). Furthermore, the "the tool for demonstration and assessment of additionality" (version 04) is also quoted.

## 2 IMPLEMENTATION STATUS

### 2.1 Implementation Status of the Project Activity

The construction of the project started on 18/07/2006. The first set of water turbine and generator unit started commissioning on 28/12/2007, the second on 17/06/2008, and the third on 16/08/2008. Since then project is operation at full capacity. Project activity was operational during the first monitoring period.

There is no exchange of equipment during the monitoring period. There is no event occurred during this monitoring period, which may have impact on the applicability of the methodology as well as emission reduction.

### 2.2 Deviations from the Monitoring Plan

For the meters M5, M6, M7 mentioned in monitoring report, there is no calibration certificates provided, but all the information about M5, M6, M7 is derived from the verification report of CDM project for Nansha<sup>1</sup>. Meanwhile, the records of meters M5, M6, M7 is used for cross-check, not for the measuring of electricity and the calculating of emission reductions, hence there is no influence for the final amount of emission reductions.

### 2.3 Grouped Project

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

## 3 DATA AND PARAMETERS

<sup>1</sup> <http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218613554.96/iProcess/BVQI1307446326.28/view>

## 3.1 Data and Parameters Available at Validation

|                        |                                                                                                  |
|------------------------|--------------------------------------------------------------------------------------------------|
| Data Unit / Parameter: | EFy                                                                                              |
| Data unit:             | tCO2/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:         | 0.84335                                                                                          |
| Purpose of the data:   | Baseline emission calculation                                                                    |
| Any comment:           | -                                                                                                |

## 3.2 Data and Parameters Monitored

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |           |                 |           |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------|-----------------|-----------|
| Data Unit / Parameter:                                           | EG PJ to SCPG, y                                                                                                                                                                                                                                                                                                                                                                                                         |                        |           |                 |           |
| Data unit:                                                       | MWh                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |           |                 |           |
| Description:                                                     | Annual Grid-connected power generation of the project to South China Power Grid                                                                                                                                                                                                                                                                                                                                          |                        |           |                 |           |
| Source of data:                                                  | Meter records                                                                                                                                                                                                                                                                                                                                                                                                            |                        |           |                 |           |
| Description of measurement methods and procedures to be applied: | <p>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.</p> <p>The local power grid company is responsible for the maintenance and calibration of the gateway meter.</p> <p>The data of exported electricity can be accurately measured by the gateway meter and recorded.</p> |                        |           |                 |           |
| Frequency of monitoring/recording:                               | Continuously measured and daily recorded.                                                                                                                                                                                                                                                                                                                                                                                |                        |           |                 |           |
| Value monitored:                                                 | 567,450.07                                                                                                                                                                                                                                                                                                                                                                                                               |                        |           |                 |           |
| Monitoring equipment:                                            | Meter                                                                                                                                                                                                                                                                                                                                                                                                                    | M1                     | M3        | M2              | M4        |
|                                                                  | SN                                                                                                                                                                                                                                                                                                                                                                                                                       | 206659001              | 206659280 | 206659630       | 206659002 |
|                                                                  | Location                                                                                                                                                                                                                                                                                                                                                                                                                 | Nanguang Circuit       |           | Xiguang Circuit |           |
|                                                                  | Model / Type                                                                                                                                                                                                                                                                                                                                                                                                             | MK6E, 3×57.7V, 3×1(6)A |           |                 |           |
|                                                                  | Accuracy class                                                                                                                                                                                                                                                                                                                                                                                                           | 0.2s                   |           |                 |           |
|                                                                  | Last calibration                                                                                                                                                                                                                                                                                                                                                                                                         | 19/10/2007             |           |                 |           |
|                                                                  | Validity                                                                                                                                                                                                                                                                                                                                                                                                                 | 19/10/2007~18/10/2012  |           |                 |           |

|                                 |                                                                                                                                               |                                                                                                       |                    |                    |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------|--------------------|
|                                 | period                                                                                                                                        |                                                                                                       |                    |                    |
|                                 | Calibration entity                                                                                                                            | Electric Power Research Institute of Yunnan Electric Power Test & Research Institute (Group) Co., Ltd |                    |                    |
|                                 | Meter                                                                                                                                         | M5                                                                                                    | M6                 | M7                 |
|                                 | SN                                                                                                                                            | 2007094001000<br>5                                                                                    | 2007094001000<br>6 | 2007094001000<br>7 |
|                                 | Location                                                                                                                                      | 1# Generator                                                                                          | 2# Generator       | 3# Generator       |
|                                 | Model / Type                                                                                                                                  | DTSD341                                                                                               |                    |                    |
|                                 | Accuracy class                                                                                                                                | 0.5s                                                                                                  |                    |                    |
| QA/QC procedures to be applied: | EG <sub>PJ to SCPG, y</sub> from meter records has been double-checked against the electricity sales receipts, and they are fully consistent. |                                                                                                       |                    |                    |
| Calculation method:             | -                                                                                                                                             |                                                                                                       |                    |                    |
| Any comment:                    | -                                                                                                                                             |                                                                                                       |                    |                    |

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                           |                        |           |                 |           |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------|-----------------|-----------|
| Data Unit / Parameter:                                           | EG<br>SCPG to PJ, y                                                                                                                                                                                                                                                                                                                                                                                       |                        |           |                 |           |
| Data unit:                                                       | MWh                                                                                                                                                                                                                                                                                                                                                                                                       |                        |           |                 |           |
| Description:                                                     | The annual amount of power supplied by the South China Power Grid Corporation to the project                                                                                                                                                                                                                                                                                                              |                        |           |                 |           |
| 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.<br>The local power grid company is responsible for the maintenance and calibration of the gateway meter.<br>The data of exported electricity can be accurately measured by the gateway meter and recorded. |                        |           |                 |           |
| Frequency of monitoring/recording:                               | Continuously measured and daily recorded.                                                                                                                                                                                                                                                                                                                                                                 |                        |           |                 |           |
| Value monitored:                                                 | 164.12                                                                                                                                                                                                                                                                                                                                                                                                    |                        |           |                 |           |
| Monitoring equipment:                                            | Meter                                                                                                                                                                                                                                                                                                                                                                                                     | M1                     | M3        | M2              | M4        |
|                                                                  | SN                                                                                                                                                                                                                                                                                                                                                                                                        | 206659001              | 206659280 | 206659630       | 206659002 |
|                                                                  | Location                                                                                                                                                                                                                                                                                                                                                                                                  | Nanguang Circuit       |           | Xiguang Circuit |           |
|                                                                  | Model / Type                                                                                                                                                                                                                                                                                                                                                                                              | MK6E, 3×57.7V, 3×1(6)A |           |                 |           |
|                                                                  | Accuracy class                                                                                                                                                                                                                                                                                                                                                                                            | 0.2s                   |           |                 |           |

|                                 |                                                                                                                                              |                                                                                                       |                    |                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------|--------------------|
|                                 | Last calibration                                                                                                                             | 19/10/2007                                                                                            |                    |                    |
|                                 | Validity period                                                                                                                              | 19/10/2007~18/10/2012                                                                                 |                    |                    |
|                                 | Calibration entity                                                                                                                           | Electric Power Research Institute of Yunnan Electric Power Test & Research Institute (Group) Co., Ltd |                    |                    |
|                                 | Meter                                                                                                                                        | M5                                                                                                    | M6                 | M7                 |
|                                 | SN                                                                                                                                           | 2007094001000<br>5                                                                                    | 2007094001000<br>6 | 2007094001000<br>7 |
|                                 | Location                                                                                                                                     | 1# Generator                                                                                          | 2# Generator       | 3# Generator       |
|                                 | Model / Type                                                                                                                                 | DTSD341                                                                                               |                    |                    |
|                                 | Accuracy class                                                                                                                               | 0.5s                                                                                                  |                    |                    |
| QA/QC procedures to be applied: | EG <sub>SCPG to PJ, y</sub> from meter records has been double-checked against the electricity sales receipts, and they are fully consistent |                                                                                                       |                    |                    |
| 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:                               | Measured once at the start of the operation of the project                                                                                                                                                      |
| Value monitored:                                                 | $8,930,000 m^2$                                                                                                                                                                                                 |
| Monitoring equipment:                                            | $A_{PJ}$ has been measured through an engineering survey by Zhujiang Water Resource Protection Science Institute and the project owner at the start of the operation of the project.                            |
| QA/QC procedures to be applied:                                  | Zhujiang Water Resource Protection Science Institute is a qualified design institute with A level of Engineering Survey Certificate (190005-kj), and the measured data was cross-checked with the approved FSR. |

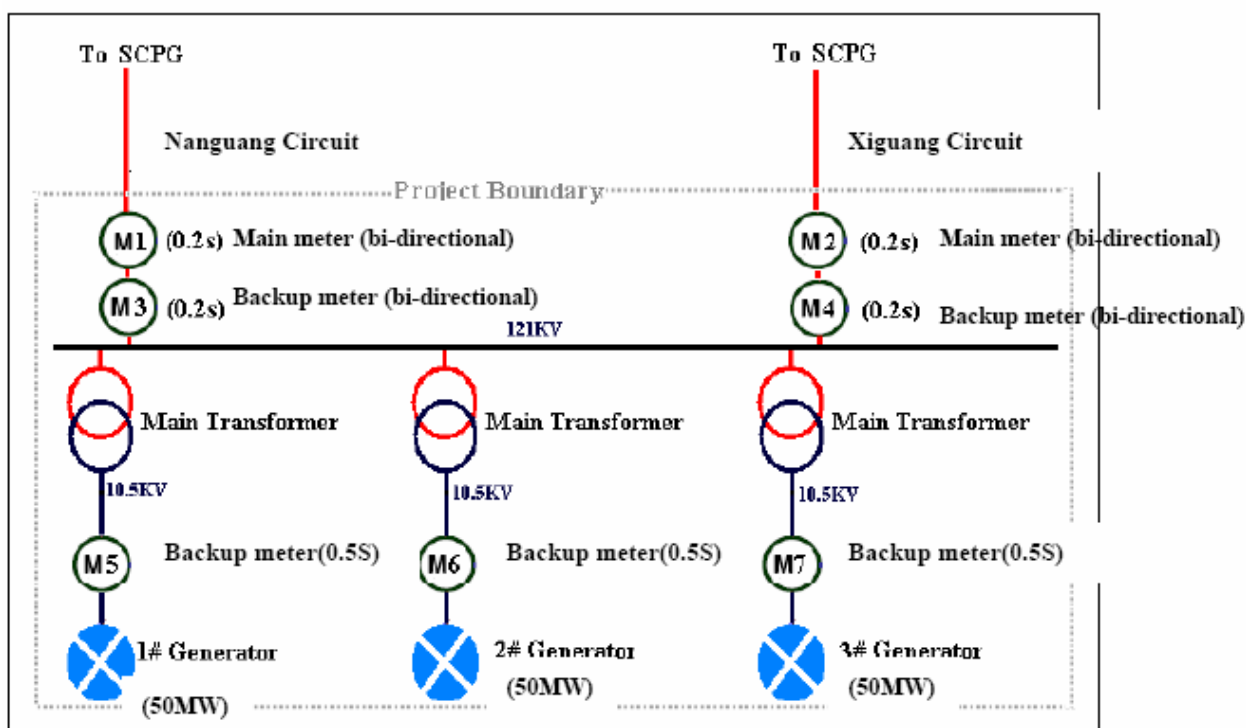
|                     |   |
|---------------------|---|
| Calculation method: | - |
| Any comment:        | - |

### 3.3 Description of the Monitoring Plan

#### 1. Monitoring system

The electricity generated by the project is connected into the SCPG through Nanguang Circuit and Xiguang Circuit. The exported and imported electricity through each circuit is monitored respectively by the bidirectional meters installed at the 151 Switch of Nanguang Circuit and 152 Switch of Xiguang Circuit.

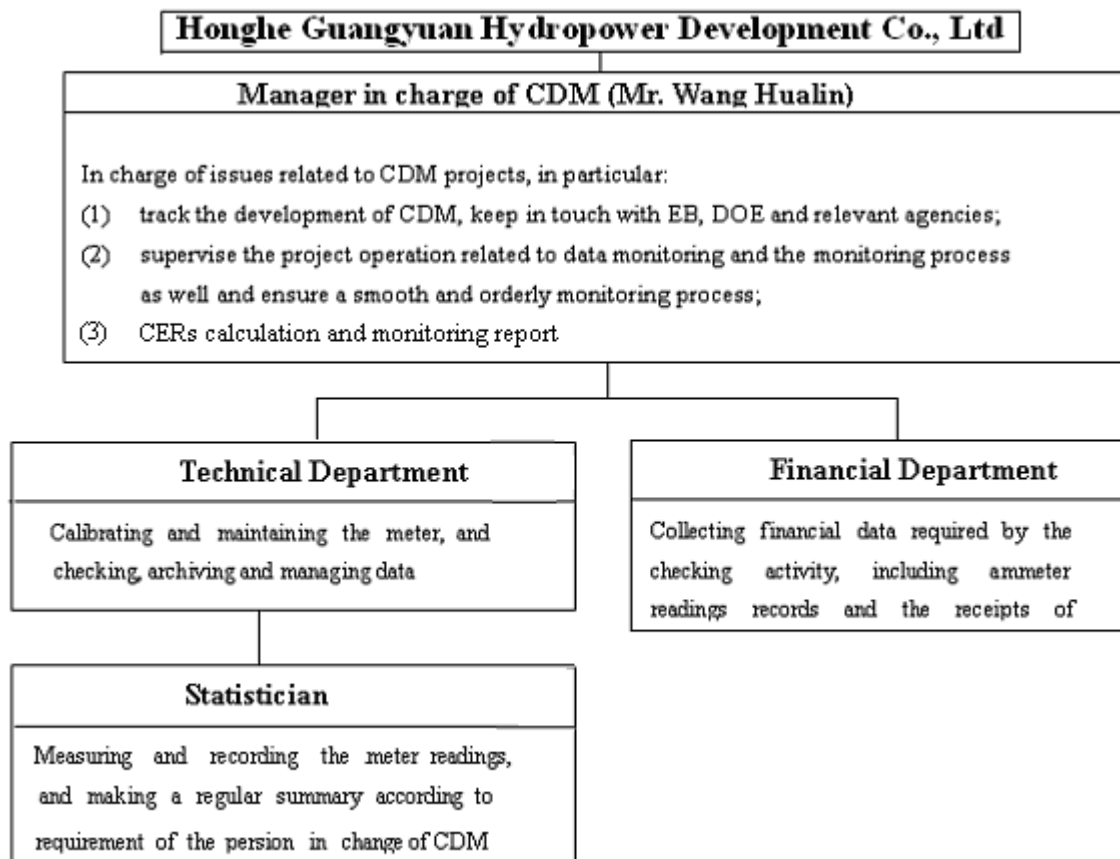
M1 and M2 are the main meters; M3 and M4 are backup meters in case of emergency use. M5, M6 and M7 are used to monitor the electricity generated for internal power consumption calculation, and they are not related to monitoring of the electricity exchange with the grid as well as the emission reduction calculation. Figure 1 is the monitoring system diagram of the project.



#### 2. Data collection

EG<sub>PJ to SCPG, y</sub> and EG<sub>SCPG to PJ, y</sub> are continuously measured by the meters. At 24:00 on the last day of every month, SCPG and the project owner record the monthly meter readings and also confirm jointly, after that the two parties deal the electricity transaction based on the confirmed monthly reading records. In addition, the daily readings are also manually recorded by the project owner.

#### 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:

$$BE_y = EG_y \times EF_y = (EG_{PJ \text{ to } SCPG, y} - EG_{SCPG \text{ to } PJ, y}) \times EF_y$$

$$EG_y = EG_{PJ \text{ to } SCPG, y} - EG_{SCPG \text{ to } PJ, y}$$

Where

$EG_y$  – net power transmitted to the grid (MWh);

$EF_y$  – emission factor (tCO<sub>2</sub>e/MWh)

**EG<sub>PJ to SCPG, y</sub>** – exported electricity to the grid (MWh)

**EG<sub>SCPG to PJ, y</sub>** – imported electricity from the grid (MWh)

The detailed calculation procedure is described below:

| Period                | Exported Electricity (MWh) | Imported Electricity (MWh) | EG <sub>y</sub> (MWh) |
|-----------------------|----------------------------|----------------------------|-----------------------|
|                       | A                          | B                          | C=A-B                 |
| 28/12/2007-31/01/2008 | 13,927.21                  | 6.38                       | 13,920.83             |
| 01/02/2008-28/02/2008 | 18,572.73                  | 0.00                       | 18,572.73             |
| 01/03/2008-31/03/2008 | 26,656.85                  | 12.76                      | 26,644.09             |
| 01/04/2008-30/04/2008 | 12,071.51                  | 33.88                      | 12,037.63             |
| 01/05/2008-31/05/2008 | 25,998.17                  | 4.51                       | 25,993.66             |
| 01/06/2008-30/06/2008 | 31,527.65                  | 0.33                       | 31,527.32             |
| 01/07/2008-31/07/2008 | 56,568.16                  | 21.12                      | 56,547.04             |
| 01/08/2008-31/08/2008 | 82,913.38                  | 5.83                       | 82,907.55             |
| 01/09/2008-30/09/2008 | 91,401.75                  | 0.00                       | 91,401.75             |
| 01/10/2008-31/10/2008 | 67,062.16                  | 19.47                      | 67,042.69             |
| 01/11/2008-30/11/2008 | 80,361.49                  | 0.00                       | 80,361.49             |
| 01/12/2008-31/12/2008 | 45,722.38                  | 59.84                      | 45,662.54             |
| 01/01/2009-11/01/2009 | 14,666.63                  | 0.00                       | 14,666.63             |
| <b>Total</b>          | <b>567,450.07</b>          | <b>164.12</b>              | <b>567,285.95</b>     |

## 4.2 Project Emissions

The power density is calculated to be  $16.8\text{W/m}^2$  ( $16.8\text{W/m}^2=150,000,000\text{W}/8,930,000\text{m}^2$ ) which is greater than  $10\text{W/m}^2$ . According to the methodology ACM0002, the project emissions may not be considered during this monitoring period.

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

## 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

$$ER_y = BE_y - PE_y - L_y$$

$$BE_y = \text{Baseline Emissions} = 478,420(\text{tCO}_2\text{e})$$

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

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

$$ER_y = BE_y = 478,420(\text{tCO}_2\text{e})$$

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

$$ER_y = BE_y - PE_y - L_y = 478,420 - 0 - 0 = 478,420(\text{tCO}_2\text{e})$$

Emission reductions generated in this monitoring period (28/12/2007–11/01/2009): 478,420(tCO<sub>2</sub>e).

#### 5 ADDITIONAL INFORMATION

| Item                                     | Values of ex-ante calculation    | Actual values reached during the monitoring period |
|------------------------------------------|----------------------------------|----------------------------------------------------|
| Emission reductions (tCO <sub>2</sub> e) | 539,704(379 days) <sup>2</sup> ; | 478,420 (379 days) <sup>3</sup> ;                  |

According to the registered PD, the annual estimated emission reductions were 519,768tCO<sub>2</sub>e which is based on the electricity generated by all the three generators. The project got three generators into full operation on 16/08/2008. To be simplified the comparison has been done between the estimated emission reduction from PD and the actual one from 01/09/2008 to 11/01/2009(133days). Thus comparing with the estimated emission reduction 189,394tCO<sub>2</sub>e (519,768/365d\*133days), the actual emission reduction from 01/09/2008 to 11/01/2009 is 252,276 tCO<sub>2</sub>e more than the estimated one, but the actual emission reduction from 01/09/2008 to 31/08/2010 is totally 678,398tCO<sub>2</sub>e<sup>4</sup> much less than the estimated one 1,039,536 (519,768\*2 years). Above all although the actual emission reduction in 2008 is more than the estimated one, the actual emission reduction from the 2008 to 2010 is less than the estimated one.

<sup>2</sup> It is calculated by 519768/365\*379

<sup>3</sup> The actual emission reduction is covered the days within which just first generator is in operation and some days with second generator operation.

<sup>4</sup> It is sourced from the project CDM web site: <http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218613554.96/view>.

The actual emission reduction of 2008 is much more than the estimated emission reduction because the rainfall amount for the wet season of Yunnan Province in 2008 beyond the average level<sup>5</sup>. From the perspective of nationwide, the 2008 is the year with most precipitation in the past 10 years according to the data from National Climate Center, the annual average precipitation is 651.3mm, which is 38.4mm more than previous average perspective<sup>6</sup>. For another, the precipitation of Yunnan Province from January to April is 123.7mm, it is 21% more than the previous average level<sup>7</sup>. And from May to August, the average precipitation is 749.4mm, it is 5% more than previous average level<sup>8</sup>. Furthermore, due to the abundant rainfall, the annual average runoff is 39% more than former years. According to the statistics about the runoff in 2008 from Yuanjiang and Manhao hydrometric station.

| Emission reductions   | CO <sub>2</sub> e (tCO <sub>2</sub> e) | CH <sub>4</sub> (tCH <sub>4</sub> ) | N <sub>2</sub> O (t N <sub>2</sub> O) | HFCs (t HFC) | PFCs (t PFC) | SF <sub>6</sub> (tSF <sub>6</sub> ) | Sum (tCO <sub>2</sub> e) |
|-----------------------|----------------------------------------|-------------------------------------|---------------------------------------|--------------|--------------|-------------------------------------|--------------------------|
| 28/12/2007-11/01/2009 | 478,420                                |                                     |                                       |              |              |                                     | 478,420                  |

<sup>5</sup> <http://www.docin.com/p-349193089.html>

<sup>6</sup> [http://www.ynf.gov.cn/ynczt\\_model/article.aspx?id=866458](http://www.ynf.gov.cn/ynczt_model/article.aspx?id=866458)

<sup>7</sup> [http://www.ynswj.gov.cn/article\\_show.asp?ID=649](http://www.ynswj.gov.cn/article_show.asp?ID=649)

<sup>8</sup> [http://www.ynswj.gov.cn/article\\_show.asp?ID=652](http://www.ynswj.gov.cn/article_show.asp?ID=652)