



**Verified Carbon  
Standard**

# 48 MW HOUQIAO HYDROPOWER PROJECT



Mt. Stonegate Green Asset Management Ltd

|                          |                                                                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Title</b>     | <i>48 MW Houqiao Hydropower Project, Yunnan, China</i>                                                                                                                                                                                  |
| <b>Version</b>           | <i>Version 5</i>                                                                                                                                                                                                                        |
| <b>Report ID</b>         | <i>N/A</i>                                                                                                                                                                                                                              |
| <b>Date of Issue</b>     | <i>15-Feb-2023</i>                                                                                                                                                                                                                      |
| <b>Project ID</b>        | <i>192</i>                                                                                                                                                                                                                              |
| <b>Monitoring Period</b> | <i>01-Dec-2011 to 31-Mar-2016</i>                                                                                                                                                                                                       |
| <b>Prepared By</b>       | <i>Mt. Stonegate Green Asset Management</i>                                                                                                                                                                                             |
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## CONTENTS

|             |                                                                             |           |
|-------------|-----------------------------------------------------------------------------|-----------|
| <b>1</b>    | <b>PROJECT DETAILS .....</b>                                                | <b>4</b>  |
| <b>1.1</b>  | <b>SUMMARY DESCRIPTION OF THE IMPLEMENTATION STATUS OF THE PROJECT.....</b> | <b>4</b>  |
| <b>1.2</b>  | <b>SECTORAL SCOPE AND PROJECT TYPE.....</b>                                 | <b>5</b>  |
| <b>1.3</b>  | <b>PROJECT PROPONENT .....</b>                                              | <b>5</b>  |
| <b>1.4</b>  | <b>OTHER ENTITIES INVOLVED IN THE PROJECT.....</b>                          | <b>5</b>  |
| <b>1.5</b>  | <b>PROJECT START DATE.....</b>                                              | <b>6</b>  |
| <b>1.6</b>  | <b>PROJECT CREDITING PERIOD .....</b>                                       | <b>6</b>  |
| <b>1.7</b>  | <b>PROJECT LOCATION.....</b>                                                | <b>6</b>  |
| <b>1.8</b>  | <b>TITLE AND REFERENCE OF METHODOLOGY .....</b>                             | <b>7</b>  |
| <b>1.9</b>  | <b>PARTICIPATION UNDER OTHER GHG PROGRAMS .....</b>                         | <b>8</b>  |
| <b>1.10</b> | <b>OTHER FORMS OF CREDIT AND SUPPLY CHAIN (SCOPE 3) EMISSIONS.....</b>      | <b>8</b>  |
| <b>1.11</b> | <b>SUSTAINABLE DEVELOPMENT CONTRIBUTIONS.....</b>                           | <b>8</b>  |
| <b>2</b>    | <b>SAFEGUARDS .....</b>                                                     | <b>12</b> |
| <b>2.1</b>  | <b>NO NET HARM.....</b>                                                     | <b>12</b> |
| <b>2.2</b>  | <b>LOCAL STAKEHOLDER CONSULTATION .....</b>                                 | <b>13</b> |
| <b>2.3</b>  | <b>AFOLU-SPECIFIC SAFEGUARDS.....</b>                                       | <b>15</b> |
| <b>3</b>    | <b>IMPLEMENTATION STATUS .....</b>                                          | <b>15</b> |
| <b>3.1</b>  | <b>IMPLEMENTATION STATUS OF THE PROJECT ACTIVITY .....</b>                  | <b>15</b> |
| <b>3.2</b>  | <b>DEVIATIONS .....</b>                                                     | <b>17</b> |
| <b>3.3</b>  | <b>GROUPED PROJECTS .....</b>                                               | <b>17</b> |
| <b>4</b>    | <b>DATA AND PARAMETERS .....</b>                                            | <b>17</b> |
| <b>4.1</b>  | <b>DATA AND PARAMETERS AVAILABLE AT VALIDATION .....</b>                    | <b>17</b> |
| <b>4.2</b>  | <b>DATA AND PARAMETERS MONITORED .....</b>                                  | <b>18</b> |

|     |                                                             |    |
|-----|-------------------------------------------------------------|----|
| 4.3 | MONITORING PLAN.....                                        | 22 |
| 5   | QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS..... | 27 |
| 5.1 | BASELINE EMISSIONS .....                                    | 27 |
| 5.2 | PROJECT EMISSIONS .....                                     | 33 |
| 5.3 | LEAKAGE.....                                                | 35 |
| 5.4 | NET GHG EMISSION REDUCTIONS AND REMOVALS.....               | 35 |
|     | APPENDIX 1: PROOF OF EMPLOYMENT FOR SDG 8.....              | 38 |
|     | APPENDIX 2: PROOF OF ELECTRICITY BILL FOR SDG 7 .....       | 40 |
|     | APPENDIX 3: PROOF OF EMISSION REDCUTION FOR SDG13.....      | 40 |

# 1 PROJECT DETAILS

## 1.1 Summary Description of the Implementation Status of the Project

48 MW Houqiao Hydropower Project, Yunnan, China (hereafter referred to as the project) is consists of three 16MW, in total 48MW capacity of hydropower generation units developed at Binglang River in Tengchong County, Baoshan City, Yunnan Province, P. R. China. The objective of the project is to utilize water resources of the Binglang River for electricity generation, which was registered on 24th November, 2009 by the VCS board. The project is a grid-connected renewable energy project, the electricity generated replaces the part of electricity generated at the China Southern Power Grid (hereafter referred to as CSPG); the project activity contributes to the obvious GHG emission reductions by avoiding CO<sub>2</sub> emissions, as CSPG is dominated with fossil fuel fired power plants.

The monitoring period for this time is from 1st Dec 2011 to 31st March, 2016. The total electricity replaced by the project during this monitoring period was 678,250.36 MWh; therefore, the emission reduction is 596,949 tCO<sub>2</sub>e throughout the monitoring period

| Audit Type   | Period                                                       | Program             | VVB Name                       | Number of years           |
|--------------|--------------------------------------------------------------|---------------------|--------------------------------|---------------------------|
| Validation   | 15 <sup>th</sup> October 2009 <sup>1</sup>                   | <a href="#">VCS</a> | <a href="#">JCI</a>            | -                         |
| Verification | 1 <sup>st</sup> Apr 2006 – 30 <sup>st</sup> November - 2011  | <a href="#">VCS</a> | <a href="#">JCI</a>            | 5 years 7 months          |
| Verification | 1 <sup>st</sup> December 2011 to 31 <sup>st</sup> March 2016 | <a href="#">VCS</a> | <a href="#">TUV Nord</a>       | 4 years 3 months          |
| Total        | 1 <sup>st</sup> Apr 2006 – March 2016                        | VCS                 | <a href="#">JCI + TUV Nord</a> | 10 years for Verification |

<sup>1</sup> Date of Issue of validation report

## 1.2 Sectoral Scope and Project Type

According to the categorization system of CDM, which is the part of greenhouse gas (GHG) program that has been approved by the VCS Board, the project is categorized as:

Sectoral Scope Number: 1

Sectoral Scope: Energy industries (renewable/non-renewable sources)

Project Activity: Grid-connected renewable power generation project activities from hydropower plants with accumulated reservoir.

The project is a non-grouped project with one dam, one reservoir and hydropower generation units, which has been validated by JCI at the validation stage on 15th October, 2009.

## 1.3 Project Proponent

*Provide contact information for the project proponent(s). Copy and paste the table as needed.*

|                   |                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------|
| Organization name | Yunnan Baoshan Binglang River Hydropower Development Co., Ltd.                          |
| Contact person    | Yibin Liu                                                                               |
| Title             | President                                                                               |
| Address           | No.208, Zhengyang North Road, Yongchang Town, Longyang Section, Yunnan Province, 678000 |
| Telephone         | + 86 875 5897067                                                                        |
| Email             | MXP8448@126.com                                                                         |

## 1.4 Other Entities Involved in the Project

*Provide contact information and roles/responsibilities for any other project participant(s). Copy and paste the table as needed.*

|                     |                                                 |
|---------------------|-------------------------------------------------|
| Organization name   | Nanjitan Asset Management Ltd.                  |
| Role in the Project | Preparation of the Project Description Document |
| Contact person      | Dr Jules Chuang                                 |
| Title               | Managing Director                               |

|           |                                                                           |
|-----------|---------------------------------------------------------------------------|
| Address   | 7th Flr- 7, No. 925, Section 4, Xitun District, Taichung City, Taiwan 407 |
| Telephone | +886 4 23585129                                                           |
| Email     | jchuang@nanjitan.com                                                      |

## 1.5 Project Start Date

The project started operation from 23rd September, 2005 in fact however, it has to be later than 28th March, 2006 according to VCS Standard (version 1), so that the starting date of the project was set as 1st April, 2006 for the conservative principle.

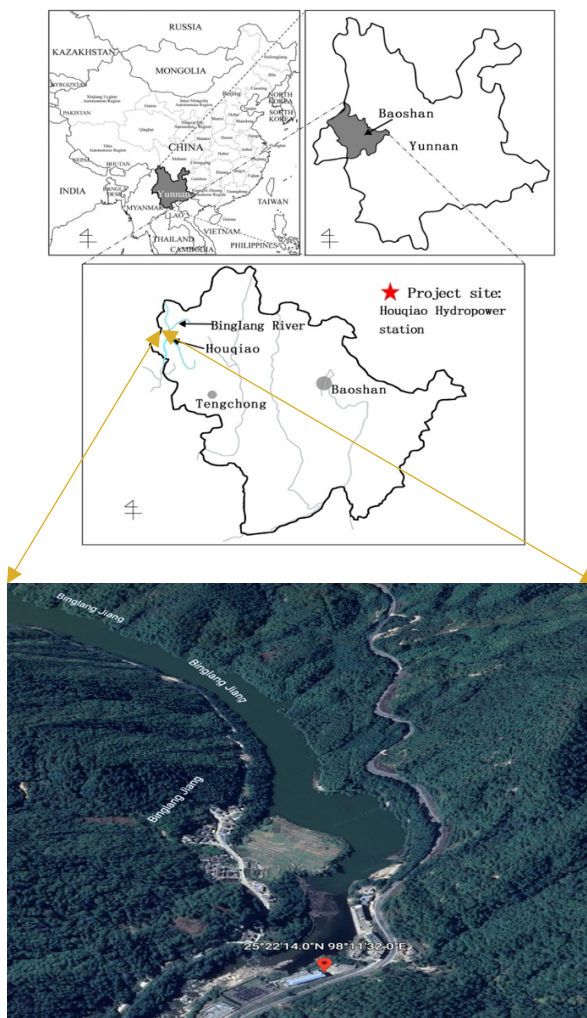
## 1.6 Project Crediting Period

The crediting period for the project is selected the renewable crediting period of 10 years which is renewed at most two times, the maximum of 30 years. The starting date of the first crediting period is 1st April 2006 then it lasts till 31st March 2016

## 1.7 Project Location

The geographical coordinates of location of the power house is lat. 25° 22'14"N, long. 98° 11'32"E

Binglang River in Tengchong County, Baoshan City, Yunnan Province, P. R. China



## 1.8 Title and Reference of Methodology

The approved methodology applied to the project is ACM0002 (ver.10), “Consolidated methodology for grid-connected electricity generation from renewable sources”.

ACM0002 refers to the following tools:

Tool for the demonstration and assessment of additionality (ver.05.2)

Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion (ver.02)

Tool to calculate the emission factor for an electricity system (ver.01.1)

For more information regarding the methodology please refer to “<http://cdm.unfccc.int/methodologies/DB/C505BV9P8VSNNV3LTK1BP3OR24Y5L>”

## 1.9 Participation under other GHG Programs

Not applicable. The project is a voluntary project and has not participated under any GHG programs

## 1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

Emission Trading Programs and Other Binding Limits: China has a national emissions trading scheme only cover the high-emission industries, such as thermal power generation, petrochemical, chemical, building materials, iron and steel, non-ferrous, paper, aviation and other key emission industries that emitted at least 26,000 tons of CO<sub>2</sub>e/year, not including renewable project. And the project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner.

Other Forms of Environmental Credit: No other forms of environmental credit have been claimed by the project and has not sought or received another form of GHG-related environmental credit, including renewable energy certificates, during this monitoring period.

Supply Chain (Scope 3 Emissions: This project does not affect emissions associated with a good or service so there is no potential risk of Scope 3 emissions double claiming.

## 1.11 Sustainable Development Contributions

The project activity includes the implementation of 16 \*3MW Grid Connected Hydro Power Project in China. Electricity generated from the project activity is supplied to China Southern Power Grid, thus substitutes high carbon intensive grid electricity by clean and renewable based electricity. Installation of the project activity will enhance the 2016 renewable energy share of 25.44%<sup>2</sup> in the national grid as well as contribute towards reducing greenhouse gas emission which would have otherwise been emitted due to generation of electricity in the fossil fuel powered power projects. The project will also result in permanent job creation during the monitoring period.

| SDG Goal                                       | Initiatives                                                                                                                       | Expected contribution to sustainable development                                                                                 |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| SDG 7 – Ensure access to affordable, reliable, | The project activity will result in generation of electricity by harnessing hydro energy which will in turn be fed into the CSPG. | The project will increase substantially the share of renewable energy in the energy mix of CSPG from renewable based electricity |

<sup>2</sup> [https://en.wikipedia.org/wiki/Renewable\\_energy\\_in\\_China](https://en.wikipedia.org/wiki/Renewable_energy_in_China)

|                                                                                                                             |                                                                                                                                                                          |                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| sustainable, and modern energy for all                                                                                      |                                                                                                                                                                          | generated by the project activity and fed to the grid.                                                                                                                                                                             |
| SDG 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all | Project activity required involvement and engagement of human resources during operation phases                                                                          | The project activity has resulted in employability on a permanent basis and permanent basis (during operation)                                                                                                                     |
| SDG 13 - Take urgent action to combat climate change and its impacts                                                        | The electricity generated from the project activity that is fed to the grid will reduce generation of electricity in the fossil fuel-based grid connected power project. | Feeding of renewable based electricity to the grid will replace generation of electricity from fossil fuel-based power projects that is currently supplying electricity to the grid and reduce equivalent greenhouse gas emission. |

Table 1: Sustainable Development Contributions

| Row number            | SDG Target        | SDG Indicator                                                                                                                                                                          | Net Impact on SDG Indicator                                                                                                                                  | Current Project Contributions                                                                                                         | Contributions Over Project Lifetime                                                                                                                 |
|-----------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Sequential row number | SDG Target number | Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator                                                                                | Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)                                                    | Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.  | Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.        |
| 1)                    | 7.2               | 7.2.1 Renewable energy share in the total final energy consumption                                                                                                                     | The project being a renewable based power generation unit feeding power to the grid will enhance the renewable energy share in the final energy consumption. | Provides 694,429.156 MWh of net electricity during the Monitoring Period.                                                             | The project has started its operation in the year 2006. So, it has supply 1,777,368.811 MWh of electricity to grid over its first crediting period. |
| 2)                    | 8.5               | By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value | The project activity will result in permanent employment opportunity during operation phase                                                                  | The project has contributed to the SDG goals by creating employment opportunities for 25 people, and 5 of them were female employees. | Creation of employment opportunity for 25 individuals.                                                                                              |

|    |      |                                                       |                                                                                                                                                                          |                                                                                                                                                                    |                                                                                                   |
|----|------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 3) | 13.0 | Tonnes of greenhouse gas emissions avoided or removed | Implemented activities to result in avoidance of greenhouse gas emission by refraining generation of electricity in fossil fuel-based power plant connected to the grid. | Generation of 694,429.156 MWh of renewable electricity by the project activity will result in avoidance of 596,949tCO <sub>2</sub> e during the monitoring period. | Prevented 1,540,403 tonnes of carbon dioxide into the atmosphere over the first crediting period. |
|----|------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|

## 2 SAFEGUARDS

### 2.1 No Net Harm

According to Environmental Protection Law of the People's Republic of China, the assessment of environmental impacts of the project activities must be completed before the exploiting and using of natural resources. The Houqiao Hydropower Project has been approved by Yunnan Environmental Protection Bureau on August 25th, 2004, in the form of official document (approved file No. [2004] 599), that shows the proposed project is in accordance with the claim to environmental protection by the host party. The basic conclusions on environmental impacts assessment of the proposed project are as follows:

#### Main Benefits

- (1) The Houqiao hydropower station will become the strong guaranteeing power supply for exploiting the local resources and promoting the local economic development, with the average capacity of 235 million kWh over years.
- (2) The power plant generates electricity with renewable energy source (hydro-energy resources). Compared with the same scale thermal power plant, it can save 77, 600t standard coal per year. This is advantageous to the protection of non-renewable resources.
- (3) The massive input of manpower and investment during the construction period will create the employment opportunities for the locality and promote the local economic development. In the operational period, the hydropower station will not only bring the locality considerable profits and taxes, moreover lead the development of the related industries.

#### Impacts

Construction Phase: Three main wastes (wastewater, exhaust gas, rubbish) and noise will be produced during the construction period. The vegetation will be destroyed and the soil erosion will be brought forth with the excavating, the abandoned dregs and the land occupying in the construction. All of these will negatively influence the regional environment to a certain extent.

Ecological effect: The main vegetation type influenced by the construction and submerged by the reservoir will be the deciduous broadleaved forest, which is the secondary vegetation formed from the destroyed plants. Due to the small scale of this vegetation, the regional vegetation will not be impacted significantly. The construction of the power plant will not substantially influence the species resources of plants, no significant foreseeable influence to the terrestrial vertebrate will come forth.

Soil Erosion: It is predicted that a surface area of 65hm<sup>2</sup> will be disturbed and 54.99 hm<sup>2</sup> area including paddy field, garden plot and wood will be destroyed, accompanying 44.8×10<sup>4</sup>m<sup>3</sup> waste residue produced. Without proper conservation methods, soil erosion amounting to 12.35×10<sup>4</sup> t will be added with the construction and the intensity of soil erosion will achieve to be fierce.

**Ecological Conversion:** The concentration of pollutants in the construction plant effluent and the domestic sewage during the construction period of the Houqiao Hydropower Station exceeds the limitation of the national discharge standard, And this will impact the water environment of the construction area adversely to a certain extent. Therefore, wastewater treatment facilities are required to prevent the water of the Binglang River from pollution. Dust and noise produced from construction machine working, rock excavating, blast, construction material processing, and transporting on site, which will be destructive mentally and physically to the construction worker and resident nearby, should be eliminated by adopting proper steps. There are seven locations planned to stack waste residue excavated during construction, where measures for water and soil conservation should be taken to avoid new damage of soil erosion caused by erosion and collapse of the dregs. In addition, domestic waste in construction area should be managed well to prevent the spread of disease among the workers.

**Impact on people health:** It will increase the risk of outbreaks of malaria, phthisis, and water-borne infection during construction period that massive constructors garrison the construction site. The incidence of water-borne diseases will increase, on condition that the sanitation and epidemic prevention have not been enhanced.

#### Operational Phase

Although there won't produce pollutants during the operation phase, some woodland will be submerged by reservoir filling, and the primary ecosystem of the river will be changed with the obstruction of the dam, which will finally influence the fish as an impediment. The river will be intercepted by the dam built, and the habitat for the fishes will be artificially divided into two regions, resulting in the failure of gene exchange between fishes upstream and downstream and consequently the reduction of species vitality. Although the quantity of terrestrial plants will decrease, no species will be lost in the construction area.

## 2.2 Local Stakeholder Consultation

The PP conducted a Stakeholders Consultation meeting on 31-January-2016 at project site. The project owner pasted bulletins at markets around the project site to inform local stakeholders and distributed questionnaires during the meeting. The geographic scope of the survey involved stakeholder of the Tengchong County, Baoshan City so that maximum number of local stakeholders can be accounted. Identified local stakeholders at the project site were farmer, Local community, student, shop owner.

The stakeholders were made aware about the project activity and discussed about the various benefits arising out of the project activity. A feedback round was held in which the views of the local stakeholders were addressed.

Attendance records, summary of comments received has been collected to provide to VVB during verification. There were no negative comments received from the stakeholders' questionnaires and they also appreciated the proactive efforts taken by project proponent towards reducing emission.

Below were the questions given to stakeholders and were asked to give their positive and negative feedback. Apart from that separate suggestion column was provided to take their inputs, although no negative comments were received from the stakeholders.

- 1 How do you assess the impact of the project on air quality?
- 2 How do you evaluate the impact of the project on the water resources and water quality in the region?
- 3 How do you assess the impact of the project on soil quality in the region?
- 4 How do you think the project will affect other issues, such as noise or imagery?
- 5 How do you assess the impact of the project on animal and plant life in the region?
- 6 How do you think the project will affect employment in the region?
- 7 How do you think the project will affect livelihoods in the region?
- 8 How do you think the project will affect clean energy production and access to services?
- 9 How do you think the project will affect the institutional capacity in the region?
- 10 What are your positive opinions about the project?
- 11 What are your negative opinions about the project?
- 12 If you have any comments and/or comments that you would like to add, please specify them?

| Item                            |        | 31 <sup>st</sup> January 2016 |
|---------------------------------|--------|-------------------------------|
|                                 |        | Percentage                    |
| Amount of stakeholders surveyed | Male   | 58.33%                        |
|                                 | Female | 41.67%                        |
| Age                             | <30    | 10.42%                        |
|                                 | 30-45  | 64.58%                        |

|            |                    |        |
|------------|--------------------|--------|
|            | 45-55              | 16.67% |
|            | >55                | 8.33%  |
| Education  | Primary school     | 41.67% |
|            | Junior high school | 45.83% |
|            | Senior high school | 8.33%  |
|            | College or above   | 4.17%  |
| Occupation | Farmer             | 23.08% |
|            | Student            | 15.38% |
|            | Local Contractors  | 11.54% |
|            | Local community    | 42.31% |
|            | Shop owners        | 7.69%  |

Total participants who attended in the meeting is 26 and questionnaires were distributed and collected from all the 26 stakeholders.

The PP has also placed a grievance register onsite, wherein, the stakeholders can put down his/her queries, feedback etc. and the same will be addressed on timely manner. However, there is no negative feedback/grievance has been reported within this monitoring period. Therefore, no action has been undertaken.

## 2.3 AFOLU-Specific Safeguards

The project is a non-AFOLU project.

# 3 IMPLEMENTATION STATUS

## 3.1 Implementation Status of the Project Activity

The Houqiao Hydropower Station had an installed capacity of 48MW, provided by three 16 MW hydro turbines. The construction was started on July 28, 2003 and the first generators are put into operation on September 23, 2005. However, the Project Crediting Period Start Date under the VCS 2007.1 is defined as should not be earlier than 28 March 2006. Hence, we determined

the Project Crediting Period Start Date of the proposed project as 1 April 2006 according to the conservative principle.

No major shutdown was observed during the monitoring period. Necessary tests were carried out regularly in the metering devices during the monitoring period and therefore no problems were encountered.

Technical Details of the project:

| <b>Turbines</b>            | <b>Generators</b>           |
|----------------------------|-----------------------------|
| Quantity - 3               | Quantity - 3                |
| Model: HLA696-LJ-130       | Model: SF16-10 / 2860       |
| Rated Output: 16.6MW       | Rated Capacity: 16 MW       |
| Rated Revolution: 600r/min | Rated Revolution: 600 r/min |
| Rated Head: 115m           | Rated Voltage: 10.5 kV      |
| Rated Flow: 15.82 m3/s     | Power Factor: 0.8           |

Since the start date of the monitoring period, there is no special event that may have impact on monitoring of GHG emission reductions. The following table summarizes the project milestones:

| Main event                                                                              | Year | Date    |
|-----------------------------------------------------------------------------------------|------|---------|
| Construction start                                                                      | 2003 | Jul. 28 |
| Main Equipment Purchasing Contract of turbines and generators                           | 2003 | Nov. 4  |
| The first generator was put into operation<br>(Starting date of reducing GHG emissions) | 2005 | Sep. 23 |
| The second generator was put into operation                                             | 2005 | Oct. 14 |
| The third generators was put into operation                                             | 2005 | Dec. 22 |
| Starting date of the first Crediting Period                                             | 2006 | Apr. 1  |
| Ending date of the first Crediting Period                                               | 2016 | Mar. 31 |

|                                                                                         |      |         |
|-----------------------------------------------------------------------------------------|------|---------|
| Date of terminating operation of the Houqiao Hydropower Station(estimated based on FSR) | 2036 | Dec. 31 |
|-----------------------------------------------------------------------------------------|------|---------|

## 3.2 Deviations

### 3.2.1 Methodology Deviations

- *There is no methodology deviation*

### 3.2.2 Project Description Deviations

Deviation 1: Chinese standard for the calibration

> Registered PD: The main meters are supposed to be calibrated based on the Chinese national standard, JJG597-2005.

> Revision: The main meters are supposed to be calibrated based on the Chinese national standard, JJG596-1999.

> Reason: According to the advice from Yunnan Provincial Bureau of Quality and Technical Supervision, the electric meters installed to the project site are need to be calibrated following to JJG596-1999, not JJG597-2005; therefore the original monitoring plan is required to be revised accordingly.

Accordingly, the deviation does not impact on the applicability of the methodology, the additionality or appropriateness of the baseline scenario.

This deviation has been raised in the 1st monitoring period, but not new one in this monitoring period and the deviation has been approved with the approval of the 1st verification.

## 3.3 Grouped Projects

This is not a grouped project.

# 4 DATA AND PARAMETERS

## 4.1 Data and Parameters Available at Validation

|                  |                        |
|------------------|------------------------|
| Data / Parameter | EF <sub>y</sub>        |
| Data unit        | tCO <sub>2</sub> e/MWh |

|                                                                                              |                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description                                                                                  | Emission factor of the Grid                                                                                                                                             |
| Source of data                                                                               | Registered PD                                                                                                                                                           |
| Value applied                                                                                | 0.8712                                                                                                                                                                  |
| Justification of choice of data or description of measurement methods and procedures applied | According to registered PD, the project chooses ex-ante for the calculation of the grid emission factor, therefore no need to monitor during the first crediting period |
| Purpose of Data                                                                              | Calculation of baseline emissions                                                                                                                                       |
| Comments                                                                                     | The value of $EF_y$ calculated is determined ex-ante and is fixed during the first crediting period.                                                                    |

## 4.2 Data and Parameters Monitored

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | $EG_{ex}$                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Data unit                                                       | MWh                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Description                                                     | Electricity supplied by the project activity to the grid                                                                                                                                                                                                                                                                                                                                                                                                         |
| Source of data                                                  | Directly measured by electricity meter at hydropower station                                                                                                                                                                                                                                                                                                                                                                                                     |
| Description of measurement methods and procedures to be applied | Electricity delivered to the Grid by the project activity is measured by electricity meter(s) according to the relevant national electric industry standard and regulations. Technical administrative code of electric energy metering DL/T 448-2000. Verification regulation of electric energy metering appliance JJG596-2012, "Electricity Law", "Metrology law of the PR China". The meters have been calibrated once in five years. Meter type is ION 8300. |
| Frequency of monitoring/recording                               | Continuous Monitoring and Monthly Recording                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Value monitored                                                 | 694,429.156                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Monitoring equipment                                            | Electric meters                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| QA/QC procedures to be applied                                  | Readings on electricity meters. Check whether the reading is the same as that is shown on power sales invoice provided by the grid company to which the project is connected. Please refer to Monitoring Plan for detailed information.                                                                                                                                                                                                                          |

|                                                                                               |                                   |                  |             |                |                                                                 |        |                       |  |
|-----------------------------------------------------------------------------------------------|-----------------------------------|------------------|-------------|----------------|-----------------------------------------------------------------|--------|-----------------------|--|
|                                                                                               | No.                               | Item             | SN          | Accuracy Class | Calibration Date & Validity                                     | Result | On-line Period        |  |
|                                                                                               | M3                                | EG <sub>ex</sub> | 0502A023-01 | 0.2s           | Calibration date: 11/08/2010<br>Validity: 11/08/2010-10/08/2015 | Pass   | 01/01/2012-31/03/2016 |  |
|                                                                                               |                                   |                  |             |                | Calibration date: 11/08/2015<br>Validity: 11/08/2015-10/08/2020 | Pass   |                       |  |
|                                                                                               | M5                                | EG <sub>ex</sub> | 0502A025-01 | 0.2s           | Calibration date: 11/08/2010<br>Validity: 11/08/2010-10/08/2015 | Pass   | 01/01/2012-31/03/2016 |  |
|                                                                                               |                                   |                  |             |                | Calibration date: 11/08/2015<br>Validity: 11/08/2015-10/08/2020 | Pass   |                       |  |
|                                                                                               | M7                                | EG <sub>ex</sub> | 0502A024-01 | 0.2s           | Calibration date: 11/08/2010<br>Validity: 11/08/2010-10/08/2015 | Pass   | 01/01/2012-31/03/2016 |  |
|                                                                                               |                                   |                  |             |                | Calibration date: 11/08/2015<br>Validity: 11/08/2015-10/08/2020 | Pass   |                       |  |
|                                                                                               | Purpose of the data               |                  |             |                |                                                                 |        |                       |  |
|                                                                                               | Calculation of baseline emissions |                  |             |                |                                                                 |        |                       |  |
| Calculation method                                                                            |                                   |                  |             |                |                                                                 |        |                       |  |
| EG <sub>ex</sub> = M3+M5+M7                                                                   |                                   |                  |             |                |                                                                 |        |                       |  |
| Comments                                                                                      |                                   |                  |             |                |                                                                 |        |                       |  |
| Copies in electronic format and paper documents. Keep 2 years after the project is completed. |                                   |                  |             |                |                                                                 |        |                       |  |

All data collected as part of monitoring should be archived **electronically** and be kept **at least** for 2 years **after the end of the last crediting period**.

|                                                                 |                                                                                                                                                                                                                                                        |                  |             |                       |                       |        |                       |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|-----------------------|-----------------------|--------|-----------------------|
| Data / Parameter                                                | EG <sub>im</sub>                                                                                                                                                                                                                                       |                  |             |                       |                       |        |                       |
| Data unit                                                       | MWh                                                                                                                                                                                                                                                    |                  |             |                       |                       |        |                       |
| Description                                                     | Electricity supplied by the grid to project activity                                                                                                                                                                                                   |                  |             |                       |                       |        |                       |
| Source of data                                                  | Directly measured by electricity meter at hydropower station.                                                                                                                                                                                          |                  |             |                       |                       |        |                       |
| Description of measurement methods and procedures to be applied | Electricity supplied by the grid to project activity will be measured by electricity meter(s) according to the relevant national electric industry standard and regulations.                                                                           |                  |             |                       |                       |        |                       |
| Frequency of monitoring/recording                               | Once in five years.                                                                                                                                                                                                                                    |                  |             |                       |                       |        |                       |
| Value monitored                                                 | 9,198.956                                                                                                                                                                                                                                              |                  |             |                       |                       |        |                       |
| Monitoring equipment                                            | Electric meters                                                                                                                                                                                                                                        |                  |             |                       |                       |        |                       |
| QA/QC procedures to be applied                                  | Readings on bi-directional electricity meters. Check whether the reading is the same as that is shown on power sales invoice provided by the grid company to which the project is connected. Please refer to Monitoring Plan for detailed information. |                  |             |                       |                       |        |                       |
|                                                                 | No.                                                                                                                                                                                                                                                    | Item             | SN          | Accuracy Class        | Date of Calibration   | Result | On-line Period        |
|                                                                 | M3                                                                                                                                                                                                                                                     | EG <sub>im</sub> | 0502A023-01 | 0.2s                  | 11/08/2010-10/08/2015 | Pass   | 01/01/2012-31/03/2016 |
|                                                                 |                                                                                                                                                                                                                                                        |                  |             | 11/08/2015-10/08/2020 | Pass                  |        |                       |
| Purpose of the data                                             | Calculation of baseline emissions                                                                                                                                                                                                                      |                  |             |                       |                       |        |                       |
| Calculation method                                              | EG <sub>im</sub> = M3                                                                                                                                                                                                                                  |                  |             |                       |                       |        |                       |
| Comments                                                        | All data collected as part of monitoring should be archived <b>electronically</b> and be kept <b>at least</b> for 2 years <b>after the end of the last crediting period</b> .                                                                          |                  |             |                       |                       |        |                       |

|                                                                 |                                                                                               |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Data / Parameter                                                | Cap <sub>PJ</sub>                                                                             |
| 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 | Verified on site                                                                              |
| Frequency of monitoring/recording                               | Every onsite verification                                                                     |
| Value monitored                                                 | 16MW*3 units, 48MW in total                                                                   |
| Monitoring equipment                                            | -                                                                                             |
| QA/QC procedures to be applied                                  | -                                                                                             |
| Purpose of the data                                             | -                                                                                             |
| Calculation method                                              | -                                                                                             |
| Comments                                                        | -                                                                                             |

| Data / Parameter                                                | A <sub>PJ</sub>                                                                                                                           |      |        |      |      |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------|--------|------|------|
| Data unit                                                       | km <sup>2</sup>                                                                                                                           |      |        |      |      |
| 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 is measured yearly by professional design institute.                                                                             |      |        |      |      |
| Frequency of monitoring/recording                               | Every year                                                                                                                                |      |        |      |      |
| Value monitored                                                 | <table border="1"> <thead> <tr> <th>Year</th><th>Values</th></tr> </thead> <tbody> <tr> <td>2011</td><td>0.17</td></tr> </tbody> </table> | Year | Values | 2011 | 0.17 |
| Year                                                            | Values                                                                                                                                    |      |        |      |      |
| 2011                                                            | 0.17                                                                                                                                      |      |        |      |      |

|                                |      |        |
|--------------------------------|------|--------|
|                                | 2012 | 0.17   |
|                                | 2013 | 0.17   |
|                                | 2014 | 0.17   |
|                                | 2015 | 0.17   |
|                                | 2016 | 0.17   |
|                                | Year | Values |
|                                | 2011 | 0.17   |
|                                | 2012 | 0.17   |
|                                | 2013 | 0.17   |
|                                | 2014 | 0.17   |
|                                | 2015 | 0.17   |
|                                | 2016 | 0.17   |
|                                | Year | Values |
|                                | 2011 | 0.17   |
|                                | 2012 | 0.17   |
|                                | 2013 | 0.17   |
|                                | 2014 | 0.17   |
|                                | 2015 | 0.17   |
|                                | 2016 | 0.17   |
| Monitoring equipment           | -    |        |
| QA/QC procedures to be applied | -    |        |
| Purpose of the data            | -    |        |
| Calculation method             | -    |        |
| Comments                       |      |        |

### 4.3 Monitoring Plan

The monitoring plan ensures the accuracy of monitoring activity and its result to acquire the credible amount of emission reductions during the crediting period of the project.

Only one relevant factor to determining the baseline emission are set ex-ante, which have been validated previously. One data is listed in the section 4.1 of this document. Therefore, the monitoring activity is conducted for measuring the amount of total electricity supplied to the grid

from the project activity and electricity supplied by the grid to the project activity, installed capacity of the power plant and the area of the reservoir surface.

### 1. Organizational and monitoring structure

The following figure shows the operating and managing structure of the project of the project owner. The daily operation and the recording activity at the power station are carried out by the Recording team and the Operating team. The data recorded is checked and compiled as the monthly and yearly data by the Administration and Power sales team, and then the compiled data is passed to the Power station manager, who reports the data to the VCS section manager. After that, the amount of the emission reduction is calculated by the manager then the result is reported to the accounting team at last.

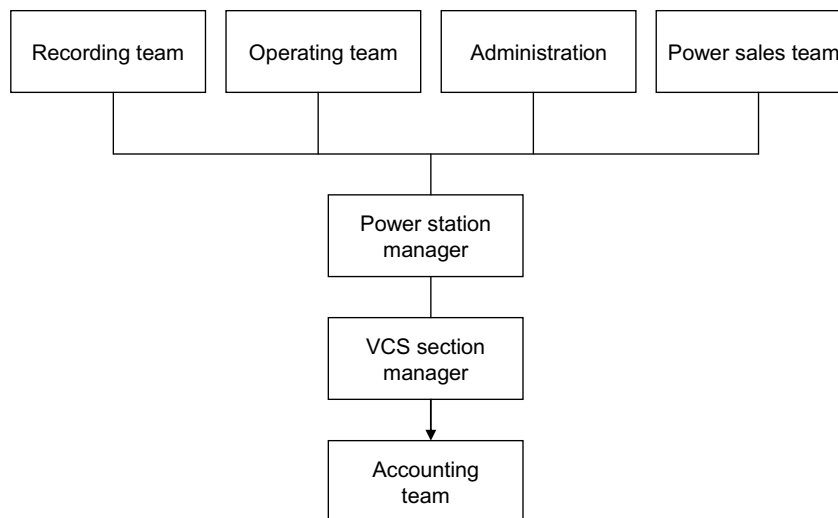


Figure3: Organizational Structure

### 2. Monitoring system and data collection

The project is connected to the grid through the first on-site substation which increases the voltage of the generated electricity to 110kV monitored by meter M3, then transferred to the Guyong transformer substation owned to the grid company. Otherwise, through the second on-site substation, the project is connected to the grid which increases to two 35kV power lines, thereinto one 35kV power line is connected to the simple transformer substation owned to the grid company measured by meter M7, the other 35kV power line is connected to the grid monitored by meter M5.

Main meters M3, M5 and M7 are grid-connected meters; only meter M2 is installed and recorded by the grid company in Guyong substation which used as cross check meter, other meters are installed in the Houqiao Hydropower Station used to measure the amount of power sales and they are regularly calibrated following to the Chinese standard (JJ596-1999) which was replaced

by JJG596-2012. In case there is some trouble on the 3 main meters, the data sent from the grid company is applied for calculating emission reduction.

The other cross check meters M1a, b, c, M4 and M6 are installed, operated, and maintained by the project owner to enable the use of the data as a cross check or back up in the case of a failure of the main meter M3, M5, M7. The cross-check meter data is used in VCS calculation only where accurate main meter data is unavailable due to not calibrated in time. Also in this monitoring period, the data from main meters were only used to calculate the emission reduction

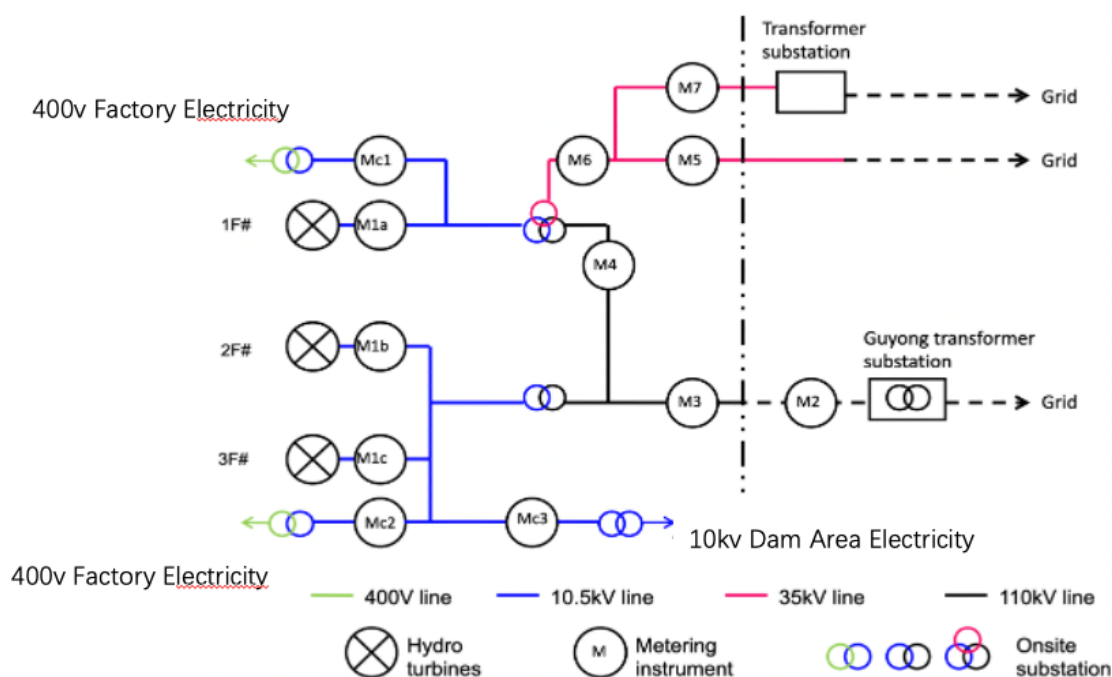


Figure 4. Scheme of grid connection of Houqiao Hydropower Project

Grid-connected meter M3 and M2 are bidirectional meters which can monitor both electricity output generated from the proposed project and electricity input provided by the grid at the substation, on the other hand, other meters aren't bidirectional. The accuracy of all the meters is 0.2s.

Since the baseline emission factor is determined ex-ante, the monitored data is carried out only for determining net electricity supplied to grid by the project ( $EG_y$ ).  $EG_y$  is calculated on a monthly as:

$$EG_y = EG_{ex} - EG_{im}$$

where:

EG<sub>ex</sub>        the amount of electricity proposed project supplied to grid

EG<sub>im</sub>        the amount of electricity received from the grid

So that both amounts of electricity supplied to the grid and imported from the grid are monitored; the amount of electricity supplied to the grid is measured with M3+M5+M7, on the other hand, the amount of electricity imported from the grid is measured with M3. The formula for calculating the net electricity supplied to the grid is as follows:

$$EG_y = EG_{ex} (M3+M5+M7) - EG_{im} (M3)$$

### 3. Quality Assurance and Quality Control

QA/QC is to ensure the accuracy of data collected through measures including periodic calibration of monitoring meters, corrective actions, and internal audits.

#### 3.1 Data quality monitoring

QA/QC unit is responsible for comparing monthly data reports from Grid company with on-site original data, crosschecking receipts with data reports to ensure data consistency and accuracy before transferring data to the data management unit. If problems occur, QA/QC operations team will report to the Power station manager immediately.

#### 3.2 Calibration

Calibrations are carried out by the grid company or by a certified company appointed by the grid company. If there are any substantial discrepancies between the readings of the metering instruments throughout the year, both instruments will be recalibrated.

During this monitoring period, the metering equipment worked very well, and there was no emergency occurred. There were no discrepancies in the metering instruments during this monitoring period.

If the metering equipment (M3, M5, M7) fail, no emission reductions shall be counted.

#### 3.3 Corrective actions

In terms of failure QA/QC team will initiate and supervise the implementation of corrective actions. For instance, metering equipment installed shall be inspected by an accredited inspection agency after the repair of all or part of meter caused by the failure of one or more parts to operate in accordance with the specifications.

#### 3.4 Internal audits

Internal audit procedure will be initiated under any of the below circumstances:

Modification of the monitoring system

Two months prior to verification

Firstly, the monitoring system will be checked on if the system functions properly and if the monitored results are correct. Secondly, spot check of daily/monthly data report will be undertaken. Internal audit report will be submitted upon completion of the procedure.

#### 4. Emergency procedures

If problems which can affect the quality of data occur, the QA/QC unit manager will initiate and supervise the implementation of corrective actions. For instance, metering equipment installed shall be inspected by an accredited inspection agency after the repair of all or part of meter caused by the failure of one or more parts to operate in accordance with the specifications. Should the metering equipment (M3, M5, M7) fail, no emission reductions shall be counted.

During this monitoring period, the metering equipment worked very well, and there was no emergency occurred.

# 5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

## 5.1 Baseline Emissions

According to the approved methodology ACM0002 (Ver.10): consolidated baseline methodology for grid-connected electricity generation from renewable resources, the emission reduction (ER<sub>y</sub>) of the project activity during a given year y is the difference between the baseline emission (BE<sub>y</sub>) and the project emission (PE<sub>y</sub>) and emission from the leakage (LE<sub>y</sub>). The emission reduction ER<sub>y</sub> during a given year y is calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (1)$$

Where,

ER<sub>y</sub> refers to emission reductions of the project activity during the year „y (tCO<sub>2</sub>e);

BE<sub>y</sub> refers to the baseline emissions due to displacement of fossil fuel-based electricity during the year „y (tCO<sub>2</sub>e);

PE<sub>y</sub> refers to the project emissions during the year „y" (tCO<sub>2</sub>e);

LE<sub>y</sub> refers to the leakage.

The steps to calculate PE<sub>y</sub>, LE<sub>y</sub> and BE<sub>y</sub> to confirm ER<sub>y</sub> are detailed in the following: Project Emission (PE<sub>y</sub>):

According to the consolidated baseline methodology ACM0002, for the uncertainty in science, electric power density (W/m<sup>2</sup>, electric power density = installed capacity/area of the reservoir) is required to decide whether the hydropower project is in line with the requirement of the VCS project.

According to the feasibility study report of the proposed project, the surface area at normal reservoir level is 0.17 km<sup>2</sup>, the power density is 282.4 W/m<sup>2</sup> which is greater than 10W/m<sup>2</sup>. Based on ACM0002, the emission by the proposed project could be omitted, i.e. PE<sub>y</sub>=0.

Leakage (LE<sub>y</sub>):

According to ACM0002, there is no leakage in the newly-built hydropower station, i.e. LE<sub>y</sub>=0

Baseline Emissions (BE<sub>y</sub>)

$$BE_y = EG_y \times EF_{grid,CM,y}$$

Where:

|                  |   |                                                                                                                                                                                                                                         |
|------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $BE_y$           | = | Baseline emissions in year y (t CO <sub>2</sub> /yr)                                                                                                                                                                                    |
| $EG_y$           | = | Electricity supplied by the project to the grid (MWh)                                                                                                                                                                                   |
| $EF_{grid,CM,y}$ | = | Combined margin CO <sub>2</sub> emission factor for grid connected power generation in year y calculated using the latest version of "TOOL07: Tool to calculate the emission factor for an electricity system" (t CO <sub>2</sub> /MWh) |

$$EG_y = EG_{ex,y} - EG_{im,y}$$

Where ,

$EG_y$  = Net electricity supplied by the project activity to the grid (MWh).

$EG_{ex,y}$  = Electricity supplied by the project activity to the grid (MWh).

$EG_{im,y}$  = Electricity supplied by the grid to project activity (MWh).

The emission factor of CSPG ( $EF_y$ ), 0.8712tCO<sub>2</sub>e/MWh is validated at the validation stage..

| Ye<br>ar | Mo<br>nth | $EG_{ex,y}$ (Export) |               |               |                                | $EG_{im,y}$ (Import)<br>(M3)<br>(kWh) | $EG_y = (EG_{ex,y} - EG_{im,y})$<br>(kWh) | $EG_y = (EG_{ex,y} - EG_{im,y})$<br>(MWh) | $BE_y$<br>(tCO <sub>2</sub> e) |
|----------|-----------|----------------------|---------------|---------------|--------------------------------|---------------------------------------|-------------------------------------------|-------------------------------------------|--------------------------------|
|          |           | (M3)<br>(kWh)        | (M5)<br>(kWh) | (M7)<br>(kWh) | Total<br>M3+M5+<br>M7<br>(kWh) |                                       |                                           |                                           |                                |
| 20<br>11 | Dec       | 6668608              | 121235        | 252152        | 7041995                        | 62159                                 | 6,979,836                                 | 6979.836                                  | 6,081                          |
|          | Sub<br>-  | 6,668,608            | 121,235       | 252,152       | 7,041,995                      | 62,159                                | 6,979,836                                 | 6979.836                                  | 6,081                          |

|      | total |          |        |        |          |        |            |            |        |
|------|-------|----------|--------|--------|----------|--------|------------|------------|--------|
| 2012 | Jan   | 4894960  | 87680  | 231400 | 5214040  | 122453 | 5,091,587  | 5,091.587  | 4,435  |
|      | Feb   | 4148896  | 161758 | 371788 | 4682442  | 316756 | 4,365,686  | 4,365.686  | 3,803  |
|      | Mar   | 4537456  | 181838 | 373700 | 5092994  | 277635 | 4,815,359  | 4,815.359  | 4,195  |
|      | Apr   | 6296672  | 212961 | 367668 | 6877301  | 209901 | 6,667,400  | 6,667.400  | 5,808  |
|      | May   | 5523904  | 230703 | 241996 | 5996603  | 228963 | 5,767,640  | 5,767.640  | 5,024  |
|      | Jun   | 20817056 | 174865 | 337684 | 21329605 | 29242  | 21,300,363 | 21,300.363 | 18,556 |
|      | Jul   | 28893216 | 184404 | 301641 | 29379261 | 0      | 29,379,261 | 29,379.261 | 25,595 |
|      | Aug   | 28637632 | 174588 | 320005 | 29132225 | 2611   | 29,129,614 | 29,129.614 | 25,377 |
|      | Sep   | 28498016 | 184039 | 390330 | 29072385 | 0      | 29,072,385 | 29,072.385 | 25,327 |
|      | Oct   | 27142240 | 175780 | 427481 | 27745501 | 0      | 27,745,501 | 27,745.501 | 24,171 |
|      | Nov   | 13489984 | 248121 | 284007 | 14022112 | 2236   | 14,019,876 | 14,019.876 | 12,214 |

|      |                    |                  |                |                |                  |                  |                    |                |                |
|------|--------------------|------------------|----------------|----------------|------------------|------------------|--------------------|----------------|----------------|
|      | Dec                | 8234816          | 332688         | 289726         | 8857230          | 63024            | 8,794,206          | 8,794.206      | 7,661          |
|      | <b>Sub - total</b> | <b>181114848</b> | <b>2349425</b> | <b>3937426</b> | <b>187401699</b> | <b>1,252,821</b> | <b>186,148,878</b> | <b>186,149</b> | <b>162,166</b> |
| 2013 | Jan                | 4227360          | 290116         | 236481         | 4,753,957.00     | 184467           | 4,569,490          | 4,569.490      | 3,980          |
|      | Feb                | 4454400          | 228618         | 252020         | 4,935,038.00     | 230654           | 4,704,384          | 4,704.384      | 4,098          |
|      | Mar                | 3343328          | 277687         | 453016         | 4,074,031.00     | 388371           | 3,685,660          | 3,685.660      | 3,210          |
|      | Apr                | 4150560          | 327290         | 300285         | 4,778,135.00     | 334287           | 4,443,848          | 4,443.848      | 3,871          |
|      | May                | 12615136         | 291616         | 451508         | 13,358,260.00    | 107211           | 13,251,049         | 13,251.049     | 11,544         |
|      | Jun                | 13314368         | 280925         | 405649         | 14,000,942.00    | 20429            | 13,980,513         | 13,980.513     | 12,179         |
|      | Jul                | 30466400         | 202880         | 453526         | 31,122,806.00    | 0                | 31,122,806         | 31,122.806     | 27,114         |
|      | Aug                | 29166688         | 247916         | 319861         | 29,734,465.00    | 2932             | 29,731,533         | 29,731.533     | 25,902         |
|      | Sep                | 28763488         | 303310         | 462950         | 29,529,748.00    | 0                | 29,529,748         | 29,529.748     | 25,726         |
|      | Oct                | 18725216         | 319749         | 298482         | 19,343,447.00    | 0                | 19,343,447         | 19,343.447     | 16,852         |

|          |                            |                            |                          |                          |                            |                          |                         |                     |                     |
|----------|----------------------------|----------------------------|--------------------------|--------------------------|----------------------------|--------------------------|-------------------------|---------------------|---------------------|
|          | Nov                        | 10290016                   | 463021                   | 280015                   | 11,033,052<br>.00          | 46725                    | 10,986,32<br>7          | 10,986.<br>327      | 9,571               |
|          | Dec                        | 6126816                    | 581232                   | 305057                   | 7,013,105.<br>00           | 290628                   | 6,722,477               | 6,722.4<br>77       | 5,856               |
|          | <b>Sub<br/>-<br/>total</b> | <b>165,643,7<br/>76.00</b> | <b>3,814,36<br/>0.00</b> | <b>4,218,85<br/>0.00</b> | <b>173,676,9<br/>86.00</b> | <b>1,605,70<br/>4.00</b> | <b>172,071,<br/>282</b> | <b>172,07<br/>1</b> | <b>149,9<br/>03</b> |
| 20<br>14 | Jan                        | 4706336                    | 653313                   | 315313                   | 5,674,962.<br>00           | 410308                   | 5,264,654               | 5,264.6<br>54       | 4,586               |
|          | Feb                        | 4366464                    | 507644                   | 234834                   | 5,108,942.<br>00           | 369972                   | 4,738,970               | 4,738.9<br>70       | 4,128               |
|          | Mar                        | 3334816                    | 711556                   | 302668                   | 4,349,040.<br>00           | 525084                   | 3,823,956               | 3,823.9<br>56       | 3,331               |
|          | Apr                        | 3332544                    | 788543                   | 341769                   | 4,462,856.<br>00           | 626490                   | 3,836,366               | 3,836.3<br>66       | 3,342               |
|          | May                        | 9098304                    | 735831                   | 242769                   | 10,076,904<br>.00          | 311425                   | 9,765,479               | 9,765.4<br>79       | 8,507               |
|          | Jun                        | 13452032                   | 735567                   | 314819                   | 14,502,418<br>.00          | 138876                   | 14,363,54<br>2          | 14,363.<br>542      | 12,51<br>3          |
|          | Jul                        | 26477148                   | 778964                   | 342532                   | 27,598,644<br>.00          | 0                        | 27,598,64<br>4          | 27,598.<br>644      | 24,04<br>3          |
|          | Aug                        | 27281700                   | 891857                   | 271228                   | 28,444,785<br>.00          | 20821                    | 28,423,96<br>4          | 28,423.<br>964      | 24,76<br>2          |
|          | Sep                        | 23515520                   | 871588                   | 145908                   | 24,533,016<br>.00          | 0                        | 24,533,01<br>6          | 24,533.<br>016      | 21,37<br>3          |

|      |                    |                       |                     |                     |                       |                     |                    |                |                |
|------|--------------------|-----------------------|---------------------|---------------------|-----------------------|---------------------|--------------------|----------------|----------------|
|      | Oct                | 13260352              | 871483              | 126657              | 14,258,492.00         | 0                   | 14,258,492         | 14,258.492     | 12,422         |
|      | Nov                | 7728512               | 913592              | 149733              | 8,791,837.00          | 95263               | 8,696,574          | 8,696.574      | 7,576          |
|      | Dec                | 4811200               | 964458              | 159700              | 5,935,358.00          | 472186              | 5,463,172          | 5,463.172      | 4,759          |
|      | <b>Sub - total</b> | <b>141,364,928.00</b> | <b>9,424,396.00</b> | <b>2,947,930.00</b> | <b>153,737,254.00</b> | <b>2,970,425.00</b> | <b>150,766,829</b> | <b>150,767</b> | <b>131,342</b> |
| 2015 | Jan                | 4470208               | 940196              | 169266              | 5,579,670.00          | 496524              | 5,083,146          | 5,083.146      | 4,428          |
|      | Feb                | 3620928               | 571520              | 156268              | 4,348,716.00          | 434501              | 3,914,215          | 3,914.215      | 3,410          |
|      | Mar                | 2654080               | 485818              | 120420              | 3,260,318.00          | 393913              | 2,866,405          | 2,866.405      | 2,497          |
|      | Apr                | 6186560               | 697552              | 137951              | 7,022,063.00          | 372116              | 6,649,947          | 6,649.947      | 5,793          |
|      | May                | 5902144               | 610404              | 129005              | 6,641,553.00          | 242329              | 6,399,224          | 6,399.224      | 5,575          |
|      | Jun                | 18390528              | 530412              | 121007              | 19,041,947.00         | 56615               | 18,985,332         | 18,985.332     | 16,540         |
|      | Jul                | 23489664              | 440624              | 126247              | 24,056,535.00         | 1282                | 24,055,253         | 24,055.253     | 20,956         |
|      | Aug                | 25571328              | 414166              | 130524              | 26,116,018.00         | 10635               | 26,105,383         | 26,105.383     | 22,743         |

|              |                    |                       |                     |                     |                       |                     |                    |                  |                |
|--------------|--------------------|-----------------------|---------------------|---------------------|-----------------------|---------------------|--------------------|------------------|----------------|
|              | Sep                | 27003200              | 431914              | 117293              | 27,552,407.00         | 0                   | 27,552,407         | 27,552.407       | 24,003         |
|              | Oct                | 19329088              | 443078              | 110185              | 19,882,351.00         | 0                   | 19,882,351         | 19,882.351       | 17,321         |
|              | Nov                | 8828352               | 353482              | 126040              | 9,307,874.00          | 91352               | 9,216,522          | 9,216.522        | 8,029          |
|              | Dec                | 1536896               | 265628              | 129065              | 1,931,589.00          | 404922              | 1,526,667          | 1,526.667        | 1,330          |
|              | <b>Sub - total</b> | <b>146,982,976.00</b> | <b>6,184,794.00</b> | <b>1,573,271.00</b> | <b>154,741,041.00</b> | <b>2,504,189.00</b> | <b>152,236,852</b> | <b>152,237</b>   | <b>132,625</b> |
| 2016         | Jan                | 5836672               | 280532              | 149833              | 6,267,037.00          | 250962              | 6,016,075          | 6,016.075        | 5,241          |
|              | Feb                | 9176512               | 267388              | 148076              | 9,591,976.00          | 70986               | 9,520,990          | 9,520.990        | 8,294          |
|              | Mar                | 1496448               | 350474              | 124246              | 1,971,168.00          | 481710              | 1,489,458          | 1,489.458        | 1,297          |
|              | <b>Sub - total</b> | <b>16,509,632.00</b>  | <b>898,394.00</b>   | <b>422,155.00</b>   | <b>17,830,181.00</b>  | <b>803,658.00</b>   | <b>17,026,523</b>  | <b>17,027</b>    | <b>14,832</b>  |
| <b>Total</b> |                    | <b>658,284,768</b>    | <b>22,792,604</b>   | <b>13,351,784</b>   | <b>694,429,156</b>    | <b>9,198,956</b>    | <b>685,230,200</b> | <b>685,230.2</b> | <b>596,949</b> |

## 5.2 Project Emissions

The project uses renewable sources and there are no project emissions; Therefore there is no project emissions included in this project activity, i.e.

$$PE_y = 0$$

However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

|             |   |                                                                                                                               |
|-------------|---|-------------------------------------------------------------------------------------------------------------------------------|
| $PE_y$      | = | Project emissions during the year 'y' (t CO <sub>2</sub> e)                                                                   |
| $PE_{FF,y}$ | = | Project emissions from fossil fuel consumption in year y (t CO <sub>2</sub> /yr)                                              |
| $PE_{GP,y}$ | = | Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO <sub>2</sub> e/yr) |
| $PE_{HP,y}$ | = | Project emissions from water reservoirs of hydro power plants in year y (t CO <sub>2</sub> e/yr)                              |

Both  $PE_{FF,y}$  and  $PE_{GP,y}$  are irrelevant for the project as it is a new renewable hydro energy power plant. The only relevant project emission from the project could be the  $PE_{HP,y}$ , which is calculated based on the power density. As per PD and ACM0002 ver. 10.0, project emissions from the reservoir have to be considered if the power density (PD) of the power plant is greater than 4 W/m<sup>2</sup> and less than or equal to 10 W/m<sup>2</sup>. The power density (PD) of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

|            |   |                                                                                                                                                                                |
|------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PD         | = | Power density of the project activity (W/m <sup>2</sup> )                                                                                                                      |
| $Cap_{PJ}$ | = | Installed capacity of the hydro power plant after the project activity (W)                                                                                                     |
| $Cap_{BL}$ | = | Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero                              |
| $A_{PJ}$   | = | Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m <sup>2</sup> ) |

$A_{BL}$  = Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full ( $m^2$ ). For new reservoirs, this value is zero

According to the feasibility study report of the proposed project, the surface area at normal reservoir level is 0.17  $km^2$ , also the power density of the project activity is 282.4  $W/m^2$  that is greater than 10  $W/m^2$ . Therefore, project emission due to reservoir area is not considered.

According to the values in the section 4.2 for  $Cap_{PJ}$  and  $A_{PJ}$ , PD is calculated seen from the following table. the power density is 282.4  $W/m^2$  which is greater than 10 $W/m^2$ . Based on ACM0002, the emission by the proposed project could be omitted, i.e.  $PE_y=0$ .

| Year       | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  |
|------------|-------|-------|-------|-------|-------|-------|
| $Cap_{PJ}$ | 48    | 48    | 48    | 48    | 48    | 48    |
| $A_{PJ}$   | 0.17  | 0.17  | 0.17  | 0.17  | 0.17  | 0.17  |
| PD         | 282.4 | 282.4 | 282.4 | 282.4 | 282.4 | 282.4 |

### 5.3 Leakage

Considering the ACM0002, no leakage emission is expected in this project activity as the hydropower station is newly built, i.e.

$LE_y = 0$ .

### 5.4 Net GHG Emission Reductions and Removals

$BE_y = 596,949 \text{ tCO}_2e$ ;

$PE_y = 0 \text{ tCO}_2e$ ;

$LE_y = 0 \text{ tCO}_2e$ ;

Therefore,  $ER_y = BE_y - PE_y - LE_y = 596,949 \text{ tCO}_2e$

| Year                  | Baseline emissions or removals (tCO <sub>2</sub> e) | Project emissions or removals (tCO <sub>2</sub> e) | Leakage emissions (tCO <sub>2</sub> e) | Net GHG emission reductions or removals (tCO <sub>2</sub> e) |
|-----------------------|-----------------------------------------------------|----------------------------------------------------|----------------------------------------|--------------------------------------------------------------|
| 01/12/2011~31/12/2011 | 6,081                                               | 0                                                  | 0                                      | 6,081                                                        |
| 01/01/2012~31/12/2012 | 162,166                                             | 0                                                  | 0                                      | 162,166                                                      |
| 01/01/2013~31/12/2013 | 149,903                                             | 0                                                  | 0                                      | 149,903                                                      |
| 01/01/2014~31/12/2014 | 131,342                                             | 0                                                  | 0                                      | 131,342                                                      |
| 01/01/2015~31/12/2015 | 132,625                                             | 0                                                  | 0                                      | 132,625                                                      |
| 01/01/2016~31/03/2016 | 14,832                                              | 0                                                  | 0                                      | 14,832                                                       |
| <b>Total</b>          | <b>596,949</b>                                      | <b>0</b>                                           | <b>0</b>                               | <b>596,949</b>                                               |

For this monitoring period are the ex-ante emission reduction is 796,618 tCO<sub>2</sub>e and achieved emission reduction 596,949 tCO<sub>2</sub>e. There is a decrease of 25.06% emission reduction from the ex-ante emission reductions during this monitoring period.

| Year                  | <u>Ex-ante emissions reduction s/removals</u> | <u>Achieved emissions reduction s/removals</u> | <u>Percent difference</u> | <u>Justification for the difference</u> |
|-----------------------|-----------------------------------------------|------------------------------------------------|---------------------------|-----------------------------------------|
| 01/12/2011~31/12/2011 | 15,324                                        | 6,081                                          | -60.32%                   |                                         |

|                               |         |         |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------|---------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01/01/2012<br>~<br>31/12/2012 | 183,893 | 162,166 | -11.82% | During this monitoring period the achieved emission is comparatively less than what has been estimated in ex-ante reductions. This is due to the nature of the hydro power project water source. The power generation during the ex-ante was better than this monitoring period because of good source of water. But now it is not the same scenario. So, the power generation has decreased which in turn affected the achieved emission reductions. This decrease could not be controlled by project activity, and it is the act of nature. |
| 01/01/2013<br>~<br>31/12/2013 | 183,893 | 149,903 | -18.48% |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 01/01/2014<br>~<br>31/12/2014 | 183,893 | 131,342 | -28.58% |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 01/01/2015<br>~<br>31/12/2015 | 183,893 | 132,625 | -27.88% |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 01/01/2016<br>~<br>31/03/2016 | 45,722  | 14,832  | -67.56% |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Total                         | 796,618 | 596,949 | -25.06% |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

# APPENDIX 1: PROOF OF EMPLOYMENT FOR SDG 8

Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.

The project has contributed to the SDG goals by creating employment opportunities for 25 people and 4 of them were female employees during this monitoring period. PP has provided employees for the year 2012 and 2016.

Employment list in the year August 2012

云南保山槟榔江水电开发公司 2012 年 8 月工资表



| 编号 | 姓名  | 性别 | 当月工资<br>(元) |
|----|-----|----|-------------|
| 1  | 高学品 | 男  | 8215.16     |
| 2  | 顾海峰 | 男  | 5060.98     |
| 3  | 孙海敏 | 男  | 4174.4      |
| 4  | 敖志杰 | 男  | 4096.04     |
| 5  | 南晓青 | 男  | 4223.51     |
| 6  | 秦松峰 | 男  | 4135.70     |
| 7  | 范文勇 | 男  | 3676.91     |
| 8  | 刘桂强 | 男  | 3851.72     |
| 9  | 张华  | 男  | 2161.84     |
| 10 | 陈子真 | 男  | 3842.68     |
| 11 | 李开祥 | 男  | 3149.75     |
| 12 | 徐升茂 | 男  | 3115.53     |
| 13 | 杨国良 | 男  | 3570.35     |
| 14 | 纳智  | 男  | 1800.69     |
| 15 | 金岩  | 男  | 2931.10     |
| 16 | 胡志泽 | 男  | 2910.09     |
| 17 | 彭自强 | 男  | 2942.63     |
| 18 | 王从贵 | 男  | 1796.00     |
| 19 | 苏家顺 | 男  | 1170.00     |
| 20 | 何建  | 男  | 1989.56     |
| 21 | 吴艳华 | 女  | 4102.35     |
| 22 | 吴林  | 女  | 4403.68     |
| 23 | 吴丽华 | 女  | 3913.54     |
| 24 | 吴艳  | 女  | 1710.00     |
| 25 | 蒋丽洋 | 女  | 1770.00     |

Employment list in the year February 2016


 云南保山槟榔江水电开发公司 2016 年 2 月工资表

| 编号 | 姓名   | 性别 | 当月工资<br>(元) |
|----|------|----|-------------|
| 1  | 孟常品  | 男  | 7412.16     |
| 2  | 欧俊伟  | 男  | 6485.95     |
| 3  | 孙润敏  | 男  | 4028.96     |
| 4  | 赵志杰  | 男  | 3603.81     |
| 5  | 陈文高  | 男  | 3842.68     |
| 6  | 张华   | 男  | 3731.84     |
| 7  | 王振峰  | 男  | 4913.38     |
| 8  | 杨国良  | 男  | 3570.35     |
| 9  | 谭强   | 男  | 3208.89     |
| 10 | 叶鹏   | 男  | 1150.09     |
| 11 | 王品文  | 男  | 1034.74     |
| 12 | 李书晓  | 男  | 3727.86     |
| 13 | 丁耀旺  | 男  | 5642.76     |
| 14 | 崔同旺  | 男  | 2783.64     |
| 15 | 杨峰   | 男  | 3253.64     |
| 16 | 徐乾   | 男  | 3208.89     |
| 17 | 李发文  | 男  | 1457.00     |
| 18 | 杨海波  | 男  | 1417.00     |
| 19 | 张德富  | 男  | 870.67      |
| 20 | 朱个家荣 | 男  | 1240.84     |
| 21 | 宋琳   | 女  | 6616.27     |
| 22 | 侯艳华  | 女  | 3710.15     |
| 23 | 罗丽萍  | 女  | 3715.53     |
| 24 | 李发仙  | 女  | 1619.00     |
| 25 | 李丽萍  | 女  | 1707.00     |

## APPENDIX 2: PROOF OF ELECTRICITY BILL FOR SDG 7

A Summary of monthly electricity bill that includes meter reading and invoice are provided as supportive evidence for SDG 7 in separate files.

## APPENDIX 3: PROOF OF EMISSION REDUCUTION FOR SDG13

A table 5.4 Net GHG Emission Reduction and Removals includes the evidence for SDG 13