



Verified Carbon Standard

YIYANG XIUSHAN HYDROPOWER PROJECT, P.R. CHINA

Document Prepared by Taohuajiang Energy Development Co., Ltd.

Project Title	Yiyang Xiushan Hydropower Project, P.R. China
Version	3
Report ID	NA
Date of Issue	08/08/2022
Project ID	699
Monitoring Period	23/09/2012 to 30/09/2017
Prepared By	Zou Musu
Contact	No.1 Yingbin Road, Taohuajing Street, Taojinag County, Hunan Province, China 3143248609@qq.com

CONTENT

1 PROJECT DETAILS	4
1.1 Summary Description of the Implementation Status of the Project.....	4
1.2 Sectoral Scope and Project Type.....	4
1.3 Project Proponent.....	5
1.4 Other Entities Involved in the Project	5
1.5 Project Start Date	5
1.6 Project Crediting Period.....	5
1.7 Project Location.....	6
1.8 Title and Reference of Methodology.....	7
1.9 Participation under other GHG Programs	7
1.10 Other Forms of Credit.....	7
1.11 Sustainable Development	8
2 SAFEGUARDS.....	10
2.1 No Net Harm.....	10
2.2 Local Stakeholder Consultation	11
2.3 AFOLU-Specific Safeguards.....	14
3 IMPLEMENTATION STATUS.....	14
3.1 Implementation Status of the Project Activity	14
3.2 Deviations	15
3.2.1 Methodology Deviations	15
3.2.2 Project Description Deviations	15
3.3 Grouped Projects	15
4 DATA AND PARAMETERS	15
4.1 Data and Parameters Available at Validation.....	15
4.2 Data and Parameters Monitored.....	20
4.3 Monitoring Plan	23
5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	26
5.1 Baseline Emissions	26
5.2 Project Emissions	30
5.3 Leakage.....	30
5.4 Net GHG Emission Reductions and Removals	30

APPENDIX 1: <EVIDENCE OF ACHIEVED SD CONTRIBUTIONS>..... 32
APPENDIX 2: <BASELINE INFORMATION> 35

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Yiyang Xiushan Hydropower Project, P.R. China (hereafter refers to "the project"), a newly built hydropower project, is located the lower reaches of Zijiang River, Xiushan Town, Taojiang County, Yiyang City of Hunan Province, P.R.China. The total installed capacity of the project activity is 65MW (5×13MW). The annual electricity generation is expected to be 276,450 MWh and the electricity delivered to grid is expected to be 257,570MWh, with 4235 utilization hours. The surface area at full reservoir level is 6.3 km², with power density 10.3W/m². The electricity generated by the project activity is supplied to Central China Power Grid ("CCPG"), displacing part of electricity generated by CCPG which is dominated by thermal power plants, and thus greenhouse gas (GHG) emission reductions could be achieved.

As a renewable energy project, the project activity produces positive environmental and economic benefits and contributes to the local sustainable development. The implementation of the project achieves CO₂ emission reduction by replacing electricity generated by fossil fuel fired power plants. The estimated annual GHG emission reductions are 243,043 tCO₂e. The implementation of the project activity was:

Date	Key Events
18/08/2005	Construction activities started
10/05/2009	Registered as a CDM project
01/10/2007	Commission starting date
01/10/2007 - 09/05/2009	1 st VCS monitoring period
10/05/2009 - 31/12/2009	1 st CDM monitoring period
01/01/2010 - 30/06/2011	2 nd CDM monitoring period
01/07/2011 - 30/04/2012	3 rd CDM monitoring period
01/05/2012 - 22/09/2012	4 th CDM monitoring period
23/09/2012 - 30/09/2017	2 nd VCS monitoring period (this monitoring period)

During this monitoring period, the net electricity exports by the project is 1,140,708.515 MWh, and the emission reduction achieved is 1,076,341tCO₂.

1.2 Sectoral Scope and Project Type

Sectoral Scope 1: Energy industries (renewable - / nonrenewable sources);

Project type: Hydropower generation project;

The project is not a grouped project.

1.3 Project Proponent

Organization name	Taohuajiang Energy Development Co., Ltd.
Contact person	Zou Musu
Title	Project Manager
Address	No.1 Yingbin Road, Taohuajing Street, Taojinag County, Hunan Province, China
Telephone	+86 15888054926
Email	3143248609@qq.com

1.4 Other Entities Involved in the Project

Organization name	NA
Role in the Project	NA
Contact person	NA
Title	NA
Address	NA
Telephone	NA
Email	NA

1.5 Project Start Date

The project started on 01/10/2007.

1.6 Project Crediting Period

The project is registered under VCS scheme in 2011 and completed validation before 19/03/2020. Thus, it remains eligible to apply the crediting period requirements under VCS scheme in 2011 which shall be a maximum of ten years and may be renewed at most twice, so the first renewable VCS crediting period of the project should be updated from 01/10/2007 - 09/05/2009 to 01/10/2007 - 30/09/2017.

1.7 Project Location

The project is located in the lower reaches of Zijiang River, Xiushan Town, Taojiang County, Yiyang City of Hunan Province, People's Republic of China. The project activity has geographical with the north latitude of 28°51'N and east longitude of 112°11' E as shown in figure 1.



Figure 1. Location of Yiyang Xiushan Hydropower Project, P.R. China

1.8 Title and Reference of Methodology

Methodology:

ACM0002 "Grid-connected electricity generation from renewable sources" (version 06)

Reference:

<https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>

And corresponding Tools of Meth ACM0002 (version 06):

Reference:

<https://cdm.unfccc.int/Reference/tools/index.html>

1.9 Participation under other GHG Programs

The project was registered as a Clean Development Mechanism (CDM) project (reference number: 1744) in UNFCCC with 3*7 years renewable crediting period started from 10/05/2009. Please refer to the following link for details:

<https://cdm.unfccc.int/Projects/DB/DNV-CUK1205730913.74/view?cp=1>

The GHG emission reductions issued under CDM scheme were:

CDM monitoring period	GHG emission reductions (tCO ₂ e)
10/05/2009 - 31/12/2009	130,335
01/01/2010 - 30/06/2011	341,723
01/07/2011 - 30/04/2012	159,645
01/05/2012 - 22/09/2012	109,665

1.10 Other Forms of Credit

The project is a registered CDM project with reference No. 1744. GHG emission reductions for the period 10/05/2009 - 31/12/2009, 01/01/2010 - 30/06/2011, 01/07/2011 - 30/04/2012, 01/05/2012 - 22/09/2012 of the project has been issued as CERs under CDM program, the detailed information can be found at <https://cdm.unfccc.int/Projects/DB/DNV-CUK1205730913.74/view?cp=1>.

All emission reductions during 23/09/2012 to 30/09/2017 have not and will not seek CDM CER issuance. Emission reductions during this monitoring period will only seek issuance under VCS program. The GHG emission reductions of 353,256 tCO₂e generated from 01/10/2007 to 09/05/2009 by the project has been issued as VCU's under VCS program.

1.11 Sustainable Development

The contributions of this project to the sustainable development of the host country and project site are summarized as follows:

Because the hydropower plants of the project will generate electricity without GHG emission, the project can help the local areas reduce GHG emissions by replacing some part of the electricity from coal-fired power plants. And the project also helps decrease the local environmental pollution caused by coal burning, which has remarkable environmental benefits. Thus, the project achieved SDG 13 Climate Action¹.

Electricity from renewable sources has been exported to the power grid. And the project makes good use of the local water resource to solve the difficulties of lack of power and unstable voltage, which help improve local life quality. Thus, the project achieved SDG 7 Affordable and Clean Energy².

During the construction, operation, and maintenance of this project, the project, directly and indirectly, generates more job opportunities, which helps improve local employment and reduce local poverty. Thus, the project achieved SDG 8 Decent Work and Economic Growth³. Refer to table 1 for detail. The evidence of the project's SD contributions have been provided in the Appendix of this report.

¹ <https://sdgs.un.org/goals/goal13>

² <https://sdgs.un.org/goals/goal7>

³ <https://sdgs.un.org/goals/goal8>

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	During this monitoring period, 1,140,708.515 MWh of electricity from renewable sources has been exported to the power grid.	From the operation start date of this project activity to the end of this monitoring period, 1,999,284.322MWh of electricity from renewable sources has been exported to the power grid.
2)	8.3	8.3.1 Proportion of informal employment in non- agriculture employment, by sex	Implemented activities to increase	During this monitoring period, 38 people including 6 females were employed for operation, and maintenance of this project.	The project activity generates temporary working opportunities during the construction period. From the operation start date of this project activity to the end of this monitoring period, 38 people were employed including 6 female.
3)	13	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	During this monitoring period, the project has achieved GHG emission reductions of 1,076,341tCO _{2e} .	From the operation start date of this project activity to the end of this monitoring period, the project has achieved GHG emission reductions of 2,170,965tCO _{2e} .

2 SAFEGUARDS

2.1 No Net Harm

A complete Environmental Impact Assessment (EIA) for the Yiyang Xiushan Hydropower Project was done by Hunan Province Design & Research Institute of Water Resources and Hydropower as entrusted by the project owners. The EIA has been approved by Hunan Environmental Protection Bureau. The EIA is available for reference, and the main conclusions of the EIA are as follows:

1. Ecological Impacts

No significant negative impacts are expected to take place on the terrestrial animals and plants because detailed analysis shows that there are no rare and endangered propagation species in the area of the project impact.

For the aquatic creatures, no rare and endangered aquatic species were found in reservoir inundation area and construction area. With the dam rising, the water surface will broaden and benefit the aquatic creatures' existence and fish culture.

2. Water Environment

During the construction period, it is anticipated that there will be four types of pollutants: suspended substances (SS), alkaline water, petroleum and COD. The wastewater containing SS are mainly coming from sand flushing and concrete curing wastewater, which will have slight impact on water quality. Wastewater discharge during construction period will have neglectably slight impact on water PH and petroleum concentration. The COD concentration in the wastewater discharged into the Zijiang River will have insignificant change.

During the project construction period, measures will be taken to reduce the impact of construction wastewater and domestic wastewater on the water quality of the lower reaches of the dam. The sedimentation treatment for construction wastewater will be applied. Oil separation treatment for equipment flushing wastewater will be used. These measures can reduce the impact of construction wastewater to be nearly neglectable.

When the project is put into operation, the main pollutions are the domestic pollution of the local residents and agriculture. The water in the reservoir will be qualified to the level of Type III standard of the Environmental Quality Standard for Surface Water (GB3838-2002) .

3. Atmospheric Environment

During construction, the main impacts on the atmospheric environment will come from flying dust from construction and transportation. The main pollutants are TSP and NOx .

To control atmospheric pollution, intensified management will be adopted to ensure all of the equipment will comply with automobile emission standards.

4. Noise

The noise impact will mainly come from construction machines and transportation during construction period.

To minimize these impacts, the project developer will strengthen the construction management and limit the operation time of construction machines with high noise. In addition, the workers will be protected by noise protecting devices such as earplugs and helmets.

5. Solid Wastes

The solid wastes will mainly come from construction wastes and domestic wastes. The project developer will build a dumping site to store the solid wastes.

6. Water loss and soil erosion

On the basis of investigation, a Report on Scheme of Water and Soil Conservation for Xiushan Hydropower Project, with detailed protection measures of soil erosion, was formulated, and was approved by Hunan Province Water Conservancy Department.

It is concluded that with the implementation of the scheme the soil erosion will be under effective control.

The environmental impacts of this project activity are considered insignificant by the project participants and the Chinese government, even though, the EIA of this project activity has been done, and has been approved by the local environmental protection authority.

2.2 Local Stakeholder Consultation

Local Stakeholder Consultation during the project preparation stage:

At project proposal stage, the project developer invited comments by issuing questionnaires and holding consultation meeting of the potential stakeholders for this project activity. The comments were collected from the regions which are directly connected with the project activity, covering Santangjie Town, Xiushan Town, Zhanxi Township and Fuqiushan Township.

Total 140 questionnaires were distributed and 126 were collected. All of the opinions from the local stakeholders had been collected and considered.

All of the comments received were summarized in Table 8. It is obvious that most of people uphold Yiyang Xiushan Hydropower Project; they think that the project will benefit the local traffic situation and flood control. In the meantime, the project will accelerate the local economic development, most of the inhabitants will benefit from the project directly or indirectly. And most

of the people consulted are care of the influence to the environment. More than 90% of the consulted people wish the project can start early;

The stakeholders at the meeting expressed their views on emigration, transportation and electricity supply, and fully supported the project activity. The stakeholders also raised three issues to the project developer, and hoped these three issues can be addressed, as follows:

1. It is their hope that the traffic infrastructure of reservoir area can be further improved.
2. The Project activity may lead to soil salinization for part of the land, the project developer was expected to take actions to address this issue.
3. To avoid the flood risk, the Project developer should take actions to reinforce the embankment.

Table 2 Summary of the comments received

Item	Number of people consulted	Percentage (%)	
Which kind of influences will be brought to you from the project?	Preparing period	21	17.5
	Construction period	63	52.5
	Running period	36	30
The degree of influence on your life from the project?	Severely	27	22.5
	Lightly	66	55
	No	27	22.5
Which aspect do you pay attention to about the project?	Economic	63	52.5
	Environment	51	42.5
	Others	6	5
Is the project benefiting the local natural environment?	Advantage	102	85
	Disadvantage	9	7.5
	No influence	9	7.5
Would you like to move and resettle?	Yes	75	62.5
	No	9	7.5
	With some terms	36	30

Which kind of environmental pollution affects you most severely?	Noise	21	17.5
	Ecological destroy	42	35
	Water pollution	36	30
	Others	21	17.5
Do you uphold this project to be implemented?	Yes	108	90
	Unconcern	12	10
	No	0	0

All in all, the local government and inhabitants are supportive of the Project activities. According to the comments received, further protective measurements will be taken for alleviating environmental impacts. Response measures to the issues raised at the meeting are as follows:

1. As to the local traffic infrastructure, the Project developer will increase investment to build road, bridge and ferry;

2. The Project developer will increase irrigation and drainage machines, and build drainage ditches to minimize soil salinization, the EIA and relevant environmental protection plan have been approved by local government.

3. The Project owner will increase the flood control standard of the embankments by strengthening the banks.

4. The resettlement plan report have been carried out by Hunan Province Design & Research Institute of Water Resources and Hydropower in May 2005, in which the compensation for resettlement is detailed as per state regulation and the plan has been approved by Hunan provincial Government in June 2005.

All the measures will be carried out under the supervision of construction supervisors and relevant departments.

Local Stakeholder Consultation during the project implementation stage:

A grievance book is kept at the project owner office. Anyone can go there and record their grievance or comment in the book. The project owner personnel will review and respond to the comments and record the response in the book as well. Meanwhile, the local authority has also conducted spot checks on the implementation of the project from time to time as per the request from the local governments' regulations. There are no negative comments received for the project. In line with VCS requirements all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

2.3 AFOLU-Specific Safeguards

NA.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The main contractures of the project include dam, outlet structure, water inlet structure, power house and switching station, and etc, and the powerhouse is built right after the dam. The project employs 5 units of GZTF08-wp-625 turbines, and 5 units of SFWG13-80/6630 generators. Water would drive the turbines and generators to produce electricity (refer to table 3 for details). The electricity would be delivered to Hunan Provincial Grid through two transmission line, which is “Xiuguan” line and “Xiuxiao” line. Correspondingly the two substations are Niutanhe substation and Xiaojiashan substation.

Table 3 Technical Parameters for Key Equipments

Quantity of turbines	Type	Rated water head	Rated flow	Rated output	Manufacturer
5	GZTF08-wp-625	5.1m	297.6m ³ /s	13.4MW	Tianjin Tianfa Heavy Equipment Plant
Quantity of generators	Type	Rated voltage	Rated power	Power factor	Manufacturer
5	SFWG13-80/6630	10.5kv	14.9MW	0.9 (hysteresis)	Tianjin Tianfa Heavy Equipment Plant

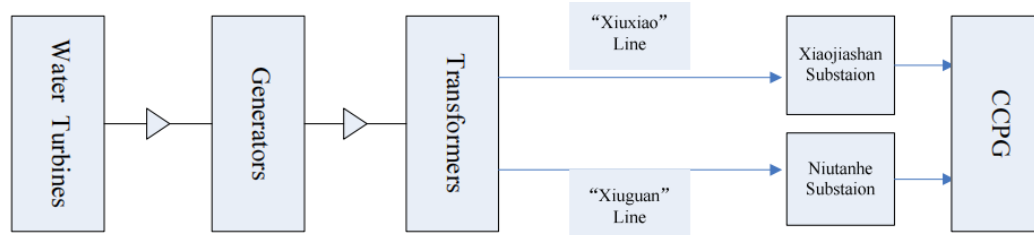


Figure 1: Technical process diagram

During this monitoring period, no special events happened, which could impact the applicability of the applied methodology. The power plant is in normal operation.

3.2 Deviations

3.2.1 Methodology Deviations

There is no methodology deviation applied to this monitoring period.

3.2.2 Project Description Deviations

The project is registered under VCS scheme in 2011 and completed validation before 19/03/2020, thus it remains eligible to apply the crediting period requirements under VCS scheme in 2011, the project VCS crediting period is applicable to a maximum of 10 years which may be renewed at most two times. Therefore, the first VCS crediting period of the project should be updated from 01/10/2007 -09/05/2009 to 01/10/2007 - 30/09/2017. Accordingly, the total VCS crediting period should be 01/10/2007 - 30/09/2037. However, as the project is also registered as a CDM project with a seven year twice renewable project crediting period, which is from 10/05/2009 to 09/05/2030. Therefore, the total length of VCS crediting period should be no more than 21 years which is from 01/10/2007 to 30/09/2028.

The deviation for the crediting period is applicable to this monitoring period (23/09/2012 to 30/09/2017) and it has no impacts on the applicability, additionality or baseline of the project. There are no other project description deviations occurred in this monitoring period or a previous monitoring period.

3.3 Grouped Projects

NA.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _y
Data unit	tCO ₂ e/MWh
Description	The baseline grid emission factor
Source of data	registered CDM PDD
Value applied	0.9436
Justification of choice of data or description of measurement methods and procedures applied	As per registered CDM PDD

Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

Data / Parameter	GEN _{j,y}
Data unit	MWh
Description	Power generation of source j in year y (2002-2004, Chongqing City, Sichuan Province, Henan Province, Jiangxi Province, Hubei Province and Hunan Province)
Source of data	China Electric Power Yearbook (2003-2005)
Value applied	2002: 183,733,384.7 2003: 225,987,719.2 2004: 249,074,186.3 Refer to Annex 2 (Table A1, A2, A3)
Justification of choice of data or description of measurement methods and procedures applied	Official Statistics
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

Data / Parameter	PR _{m,y}
Data unit	%
Description	Utilization rate of thermal plant m in year y (2002-2004, Chongqing City, Sichuan Province, Henan Province, Jiangxi Province, Hubei Province and Hunan Province)
Source of data	China Electric Power Yearbook (2003-2005)

Value applied		2002	2003	2004
	Jiangxi	7.67	6.43	7.04
	Henan	8.03	7.68	8.19
	Hubei	7.73	3.81	6.58
	Hunan	7.73	4.58	7.47
	Chongqing	10.21	8.97	11.06
	Sichuan	9.59	4.41	9.41
	Refer to Annex 2 (Table A1, A2, A3)			
Justification of choice of data or description of measurement methods and procedures applied	Official Statistics			
Purpose of Data	Calculation of baseline emissions			
Comments	Calculated ex ante and fixed for the first crediting period.			

Data / Parameter	$F_{i,j,y}$
Data unit	Mt/10 ¹⁰ m ³
Description	Fuel i consumed in year y for electric power j (2002-2004, Chongqing City, Sichuan Province, Henan Province, Jiangxi Province, Hubei Province and Hunan Province)
Source of data	China Energy Statistical Yearbook (200-2005)
Value applied	Refer to Annex 2 (Table A4, A5, A6)
Justification of choice of data or description of measurement methods and procedures applied	Official Statistics
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

Data / Parameter	NCV _i
Data unit	TJ/fuel mass or volume
Description	Net calorific value per ton or m ³ of fuel i
Source of data	China Energy Statistical Yearbook (200-2005)

Value applied	Refer to Annex 2 (Table A10)
Justification of choice of data or description of measurement methods and procedures applied	country-specific values
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

Data / Parameter	EF _{CO₂,i}
Data unit	tC/TJ
Description	Emission factor of fuel i per specific energy
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories (revised in 1996)
Value applied	Refer to Annex 2 (Table A10)
Justification of choice of data or description of measurement methods and procedures applied	IPCC Default Values
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

Data / Parameter	OXID _i
Data unit	%
Description	Oxidation factor of fuel i
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories (revised in 1996)
Value applied	Refer to Annex 2 (Table A10)
Justification of choice of data or description of measurement methods and procedures applied	IPCC Default Values

Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

Data / Parameter	$GENE_{best,coal}$
Data unit	%
Description	Power supply efficiency of commercially-optimized coal-fired thermal power plant
Source of data	Notification on Determining Baseline Emission Factor of China--Calculation of the Baseline BM of Electric Power Grid in China, published at China CDM website, by Chinese DNA
Value applied	36.53% Refer to Annex 2 (Table A11)
Justification of choice of data or description of measurement methods and procedures applied	country-specific values
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

Data / Parameter	$GENE_{best,oil/gas}$
Data unit	%
Description	Power supply efficiency of commercially-optimized thermal power plant (including oil-firing and gas-firing)
Source of data	Notification on Determining Baseline Emission Factor of China--Calculation of the Baseline BM of Electric Power Grid in China, published at China CDM website, by Chinese DNA
Value applied	45.87% Refer to Annex 2 (Table A11)
Justification of choice of data or description of measurement methods and procedures applied	country-specific values

Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

Data / Parameter	$CAP_{m,y,j}$
Data unit	MW
Description	Installed capacity of hydropower resources i in province(s) m in year y (2000-2004, Chongqing City, Sichuan Province, Henan Province, Jiangxi Province, Hubei Province and Hunan Province)
Source of data	China Electric Power Yearbook (2001-2005)
Value applied	2000: 36,637 2001: 50,395 2004: 34,642 Refer to Annex 2 (Table A12, A13, A14)
Justification of choice of data or description of measurement methods and procedures applied	Official Statistics
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the first crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG_y
Data unit	MWh
Description	Electricity supplied to CCPG
Source of data	Meter reading records
Description of measurement methods and procedures to be applied	<p>This parameter is monitored through 2 meters (M1 and M2) with accuracy of 0.2s. M1 is installed at Niutanhe substation while M2 is installed at Xiaojiasha substation.</p> <p>At 24:00 on the last day of every month, a third part group (Hunan Grid Company, local substations, and the project owner) would record the monthly meter readings of M1 and M2 and also confirm jointly. After that, the electricity transaction would be done based on the confirmed monthly data.</p>

Frequency of monitoring/recording	Measured continuously and recorded monthly																																						
Value monitored	1,140,715.225																																						
Monitoring equipment	<p>The information of the electricity meters are shown in the following table. The main information of the meters is shown below:</p> <table border="1"> <thead> <tr> <th>Meter No.</th> <th>Type</th> <th>Serial No.</th> <th>Accuracy</th> <th>Calibration Date</th> <th>Valid Date</th> </tr> </thead> <tbody> <tr> <td rowspan="6">M1</td> <td rowspan="6">EDMI Mk6E</td> <td rowspan="6">211297903</td> <td rowspan="6">0.2s</td> <td>24/11/2011</td> <td>23/11/2012</td> </tr> <tr> <td>24/11/2012</td> <td>23/11/2013</td> </tr> <tr> <td>24/11/2013</td> <td>23/11/2014</td> </tr> <tr> <td>24/11/2014</td> <td>23/11/2015</td> </tr> <tr> <td>24/11/2015</td> <td>23/11/2016</td> </tr> <tr> <td>24/11/2016</td> <td>23/11/2017</td> </tr> <tr> <td rowspan="6">M2</td> <td rowspan="6">EDMI Mk6E</td> <td rowspan="6">211297905</td> <td rowspan="6">0.2s</td> <td>24/11/2011</td> <td>23/11/2012</td> </tr> <tr> <td>24/11/2012</td> <td>23/11/2013</td> </tr> <tr> <td>24/11/2013</td> <td>23/11/2014</td> </tr> <tr> <td>24/11/2014</td> <td>23/11/2015</td> </tr> <tr> <td>24/11/2015</td> <td>23/11/2016</td> </tr> <tr> <td>24/11/2016</td> <td>23/11/2017</td> </tr> </tbody> </table>	Meter No.	Type	Serial No.	Accuracy	Calibration Date	Valid Date	M1	EDMI Mk6E	211297903	0.2s	24/11/2011	23/11/2012	24/11/2012	23/11/2013	24/11/2013	23/11/2014	24/11/2014	23/11/2015	24/11/2015	23/11/2016	24/11/2016	23/11/2017	M2	EDMI Mk6E	211297905	0.2s	24/11/2011	23/11/2012	24/11/2012	23/11/2013	24/11/2013	23/11/2014	24/11/2014	23/11/2015	24/11/2015	23/11/2016	24/11/2016	23/11/2017
Meter No.	Type	Serial No.	Accuracy	Calibration Date	Valid Date																																		
M1	EDMI Mk6E	211297903	0.2s	24/11/2011	23/11/2012																																		
				24/11/2012	23/11/2013																																		
				24/11/2013	23/11/2014																																		
				24/11/2014	23/11/2015																																		
				24/11/2015	23/11/2016																																		
				24/11/2016	23/11/2017																																		
M2	EDMI Mk6E	211297905	0.2s	24/11/2011	23/11/2012																																		
				24/11/2012	23/11/2013																																		
				24/11/2013	23/11/2014																																		
				24/11/2014	23/11/2015																																		
				24/11/2015	23/11/2016																																		
				24/11/2016	23/11/2017																																		
QA/QC procedures to be applied	<p>Meters in the two substations are calibrated annually for accuracy. Calibration record shows that the meters fulfil the requirement of National Regulation.</p> <p>Meter reading records are double checked with Electricity transaction notes (ETNs)..</p> <p>Record and relevant documents are archived for a period of 2 years after the end of the total credit period of the VCS Project.</p>																																						
Purpose of the data	Calculation of baseline emissions																																						
Calculation method	Measured directly by electricity meters.																																						
Comments	NA																																						

Data / Parameter	EG _{aux}
Data unit	MWh
Description	Electricity supplied from CCPG
Source of data	Meter reading records
Description of measurement methods and procedures to be applied	<p>This parameter is monitored through 2 meters (M3 and M4) with accuracy of 0.2s. M3 and M4 are installed at the project site.</p> <p>At 24:00 on the last day of every month, Hunan Grid Company and the project owner would record the monthly meter readings of M3</p>

	and M4 and also confirm jointly. After that, the electricity transaction would be done based on the confirmed monthly data.																																						
Frequency of monitoring/recording	Measured continuously and recorded monthly																																						
Value monitored	6.710																																						
Monitoring equipment	<p>The information of the electricity meters are shown in the following table. The main information of the meters is shown below:</p> <table border="1"> <thead> <tr> <th>Meter No.</th> <th>Type</th> <th>Serial No.</th> <th>Accuracy</th> <th>Calibration Date</th> <th>Valid Date</th> </tr> </thead> <tbody> <tr> <td rowspan="6">M3</td> <td rowspan="6">DTSD341</td> <td rowspan="6">20050947 020005</td> <td rowspan="6">0.2s</td> <td>11/04/2012</td> <td>10/04/2013</td> </tr> <tr> <td>11/04/2013</td> <td>10/04/2014</td> </tr> <tr> <td>11/04/2014</td> <td>10/04/2015</td> </tr> <tr> <td>11/04/2015</td> <td>10/04/2016</td> </tr> <tr> <td>11/04/2016</td> <td>10/04/2017</td> </tr> <tr> <td>11/04/2017</td> <td>10/04/2018</td> </tr> <tr> <td rowspan="6">M4</td> <td rowspan="6">DTSD341</td> <td rowspan="6">20050947 020009</td> <td rowspan="6">0.2s</td> <td>11/04/2012</td> <td>10/04/2013</td> </tr> <tr> <td>11/04/2013</td> <td>10/04/2014</td> </tr> <tr> <td>11/04/2014</td> <td>10/04/2015</td> </tr> <tr> <td>11/04/2015</td> <td>10/04/2016</td> </tr> <tr> <td>11/04/2016</td> <td>10/04/2017</td> </tr> <tr> <td>11/04/2017</td> <td>10/04/2018</td> </tr> </tbody> </table>	Meter No.	Type	Serial No.	Accuracy	Calibration Date	Valid Date	M3	DTSD341	20050947 020005	0.2s	11/04/2012	10/04/2013	11/04/2013	10/04/2014	11/04/2014	10/04/2015	11/04/2015	10/04/2016	11/04/2016	10/04/2017	11/04/2017	10/04/2018	M4	DTSD341	20050947 020009	0.2s	11/04/2012	10/04/2013	11/04/2013	10/04/2014	11/04/2014	10/04/2015	11/04/2015	10/04/2016	11/04/2016	10/04/2017	11/04/2017	10/04/2018
Meter No.	Type	Serial No.	Accuracy	Calibration Date	Valid Date																																		
M3	DTSD341	20050947 020005	0.2s	11/04/2012	10/04/2013																																		
				11/04/2013	10/04/2014																																		
				11/04/2014	10/04/2015																																		
				11/04/2015	10/04/2016																																		
				11/04/2016	10/04/2017																																		
				11/04/2017	10/04/2018																																		
M4	DTSD341	20050947 020009	0.2s	11/04/2012	10/04/2013																																		
				11/04/2013	10/04/2014																																		
				11/04/2014	10/04/2015																																		
				11/04/2015	10/04/2016																																		
				11/04/2016	10/04/2017																																		
				11/04/2017	10/04/2018																																		
QA/QC procedures to be applied	<p>Meters in the two substations are calibrated annually for accuracy. Calibration record shows that the meters fulfil the requirement of National Regulation.</p> <p>Meter reading records are double checked with Electricity transaction notes (ETNs).</p> <p>Record and relevant documents are archived for a period of 2 years after the end of the total credit period of the VCS Project.</p>																																						
Purpose of the data	Calculation of baseline emissions																																						
Calculation method	Measured directly by electricity meters.																																						
Comments	NA																																						

Data / Parameter	Area
Data unit	m ²
Description	Surface area at full reservoir level
Source of data	Measurement result provided by third party

Description of measurement methods and procedures to be applied	As per MR of previous CDM monitoring period, this parameter has been measured by an engineering survey by Hunan Investigation and Design Institute of Water Conservancy and Electric Power. Thus the data measured is reliable and creditable.
Frequency of monitoring/recording	As per registered CDM PDD, this parameter is measured once at the start of the operation of the project.
Value monitored	6,300,000
Monitoring equipment	As per MR and FVeR of previous CDM monitoring period that approved by CDM EB, this parameter has been measured by an engineering survey by Hunan Investigation and Design Institute of Water Conservancy and Electric Power.
QA/QC procedures to be applied	/
Purpose of the data	Calculation of project emissions
Calculation method	/
Comments	Calculated ex ante and fixed for the first crediting period.

4.3 Monitoring Plan

1. Monitoring system

As described in monitoring plan in the registered CDM PDD and Power Purchase Agreement, the electricity generated by the proposed project is connected into the CCPG through Niutanhe Substation and Xiaojiashan Substation, which in correspondingly the transmission line are named as “Xiuguan” line and “Xiuxiao” line.

M1 and M2 are the main meters, which are installed at the substations. They are used for transaction and monitoring the electricity supplied to CCPG. M3 and M4 are the auxiliary meters, which are installed at the project site. They are used to monitoring electricity drawn from the CCPG, as described by the PDD.

Figure 2 is the monitoring system diagram of the proposed project.

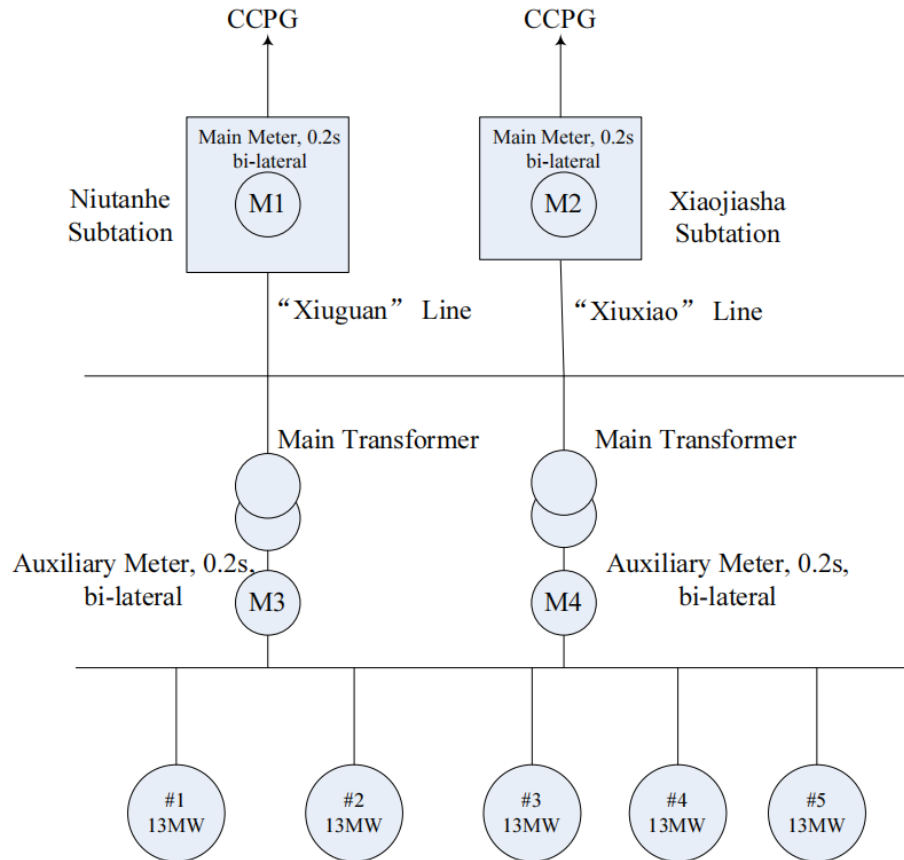


Figure 2: the monitoring system diagram of the proposed project

2. Operational and Management Structure

The operational and management structure of the project is shown in Fig 3. The respective responsibilities of each department are as follows:

General Manager: Leader of the VCS monitoring team. Take in charge of issues related to the VCS affairs, such as track and control the development VCS; Perform Final examination of VCS related documents.

Chief Engineer: Support General Manager's work in VCS monitoring. Temporarily take the responsibility of VCS monitoring leader when General Manager is not available.

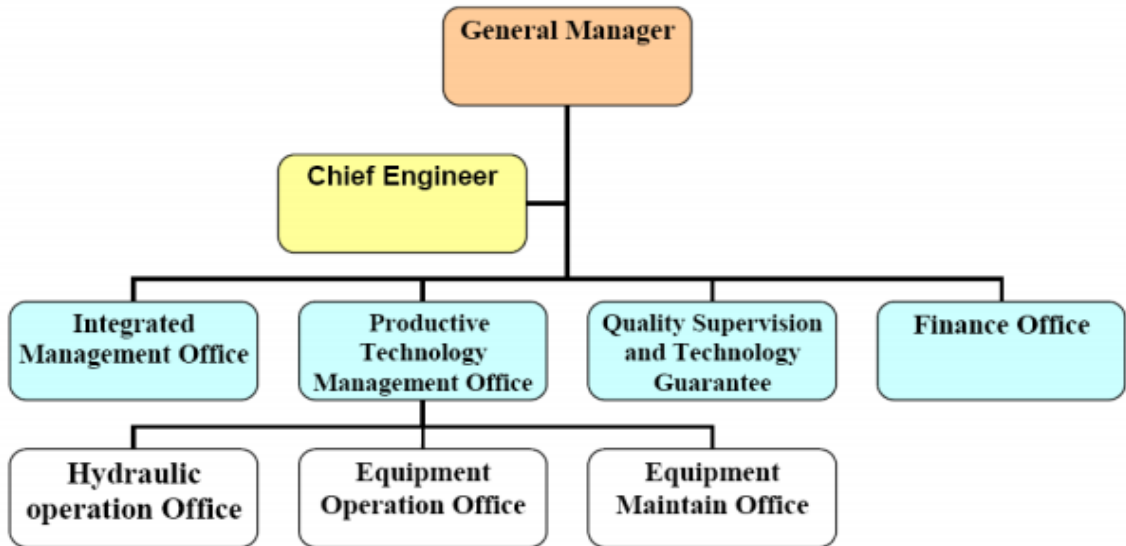
Integrated Management Office: Archive the VCS related documents; Coordinate parallel departments when there is dispute.

Productive Technology Management Office: Meter calibration and equipment maintenance; Record meter readings every month.

Quality Supervision and Technology Guarantee: Perform double-check to documents or statistics before archiving.

Finance Office: Collect and Provide finance related documents, such as sales receipts, for doublechecking.

All the people involved would be trained before they take the position in monitoring team.



3. Data collection

Electricity supplied to the Grid (EG_y) and Electricity drawn from the Grid (EG_{aux}) are continuously measured by the meters installed. At 24:00 on the last day of every month, a three part group (Hunan Grid Company, local substations, and the project owner) would record the monthly meter readings of M1 and M2 and also confirm jointly. After that, the electricity transaction would be done based on the confirmed monthly data. In addition, Project owner would record the monthly meter readings of M3 and M4, which used for calculation of the electricity drawn from CCPG, and the data would be crossed check with main meter readings and sales receipts.

4 . Emergency procedures

If the malfunction happened to the meters, the related records would be made and problems should be reported and settled quickly jointly by Grid Company and the Project owner, and the emissions reduction during this malfunction period would not be claimed.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The emission reduction by the project is calculated according to approved consolidated methodology ACM0002 (Version 06). The equation is showed below:

$$ER_y = BE_y - PE_y$$

Where:

ER_y is the emission reductions in year y (tCO₂e/yr)

BE_y is baseline emissions in year y (tCO₂e/yr)

PE_y is project emissions in year y (tCO₂e/yr)

To calculate BE_y :

$$BE_y = (EG_y - EG_{aux}) \times EF_y$$

Where:

BE_y is Baseline emissions in year y (tCO₂e/yr);

EF_y is the emission factor in year y, calculated according to the registered CDM PDD;

EG_y is Electricity supplied to CCPG (MWh).

EG_{aux} is Electricity supplied from CCPG (MWh).

The emission factor has been determined ex ante as 0.9436tCO₂e/MWh.

Therefore, baseline emission can be calculated with the formula:

$$BE_y = (EG_y - EG_{aux}) \times 0.9436$$

Table 4. The summarization of baseline reductions from 23/09/2012 ~ 30/09/2017⁴

Period		Meter reading records	ETNs	Dta used for calculation of emission reductions	Meter reading records	ETNs	Dta used for calculation of emission reductions	Dta used for calculation of emission reductions (MWh)	EFy (t CO ₂ e/MWh)	Baseline Emission (t CO ₂ e)
from	to	EG _y (MWh)			EG _{aux} (MWh)			EG _y - EG _{aux} (MWh)		
23/09/2012	30/09/2012	2,141.920	2,141.920	2,141.920	0.110	0.110	0.110	2,141.810	0.9436	2,021
01/10/2012	31/10/2012	20,331.338	20,331.338	20,331.338	0.110	0.110	0.110	20,331.228	0.9436	19,184
01/11/2012	30/11/2012	17,996.582	17,996.582	17,996.582	0.110	0.110	0.110	17,996.472	0.9436	16,981
01/12/2012	31/12/2012	17,694.542	17,694.542	17,694.542	0.110	0.110	0.110	17,694.432	0.9436	16,696
2012 subtotal		58,164.382	58,164.382	58,164.382	0.440	0.440	0.440	58,163.942	0.9436	54,882
01/01/2013	31/01/2013	17,996.594	17,996.594	17,996.594	0.110	0.110	0.110	17,996.484	0.9436	16,981
01/02/2013	28/02/2013	18,886.546	18,886.546	18,886.546	0.110	0.110	0.110	18,886.436	0.9436	17,821
01/03/2013	31/03/2013	18,238.765	18,238.765	18,238.765	0.110	0.110	0.110	18,238.655	0.9436	17,209
01/04/2013	30/04/2013	18,637.561	18,637.561	18,637.561	0.110	0.110	0.110	18,637.451	0.9436	17,586
01/05/2013	31/05/2013	19,734.950	19,734.950	19,734.950	0.110	0.110	0.110	19,734.840	0.9436	18,621
01/06/2013	30/06/2013	20,478.425	20,478.425	20,478.425	0.110	0.110	0.110	20,478.315	0.9436	19,323
01/07/2013	31/07/2013	20,896.582	20,896.582	20,896.582	0.110	0.110	0.110	20,896.472	0.9436	19,717
01/08/2013	31/08/2013	19,966.583	19,966.583	19,966.583	0.110	0.110	0.110	19,966.473	0.9436	18,840
01/09/2013	30/09/2013	1,939.562	1,939.562	1,939.562	0.110	0.110	0.110	1,939.452	0.9436	1,830
01/10/2013	31/10/2013	18,945.896	18,945.896	18,945.896	0.110	0.110	0.110	18,945.786	0.9436	17,877
01/11/2013	30/11/2013	18,696.589	18,696.589	18,696.589	0.110	0.110	0.110	18,696.479	0.9436	17,641
01/12/2013	31/12/2013	18,496.597	18,496.597	18,496.597	0.110	0.110	0.110	18,496.487	0.9436	17,453
2013 subtotal		212,914.650	212,914.650	212,914.650	1.320	1.320	1.320	212,913.330	0.9436	200,899
01/01/2014	31/01/2014	18,496.698	18,496.698	18,496.698	0.110	0.110	0.110	18,496.588	0.9436	17,453
01/02/2014	28/02/2014	18,464.215	18,464.215	18,464.215	0.110	0.110	0.110	18,464.105	0.9436	17,422
01/03/2014	31/03/2014	18,796.345	18,796.345	18,796.345	0.110	0.110	0.110	18,796.235	0.9436	17,736
01/04/2014	30/04/2014	18,658.216	18,658.216	18,658.216	0.110	0.110	0.110	18,658.106	0.9436	17,605
01/05/2014	31/05/2014	19,442.803	19,442.803	19,442.803	0.110	0.110	0.110	19,442.693	0.9436	18,346

⁴ According to the approved MR of CDM monitoring period from 01/05/2012 - 22/09/2012, the value of EG_y and EG_{aux} from 01/09/2012 to 22/09/2012 was 17640.480 MWh and 0. According to meter reading records and ETNs, the value of EG_y and EG_{aux} of period from 01/09/2012 to 30/09/2012 was 19782.4MWh and 0.11MWh. Therefore, the value of EG_y and EG_{aux} of period from 23/09/2012 to 30/09/2012 was calculated to be 2,141.920 MWh and 0.11MWh. The value of this period has been confirmed by local power grid company.

01/06/2014	30/06/2014	20,468.542	20,468.542	20,468.542	0.110	0.110	0.110	20,468.432	0.9436	19,314
01/07/2014	31/07/2014	20,836.910	20,836.910	20,836.910	0.110	0.110	0.110	20,836.800	0.9436	19,661
01/08/2014	31/08/2014	20,864.254	20,864.254	20,864.254	0.110	0.110	0.110	20,864.144	0.9436	19,687
01/09/2014	30/09/2014	19,543.268	19,543.268	19,543.268	0.110	0.110	0.110	19,543.158	0.9436	18,440
01/10/2014	31/10/2014	19,036.954	19,036.954	19,036.954	0.110	0.110	0.110	19,036.844	0.9436	17,963
01/11/2014	30/11/2014	18,595.630	18,595.630	18,595.630	0.110	0.110	0.110	18,595.520	0.9436	17,546
01/12/2014	31/12/2014	18,647.821	18,647.821	18,647.821	0.110	0.110	0.110	18,647.711	0.9436	17,595
2014 subtotal		231,851.656	231,851.656	231,851.656	1.320	1.320	1.320	231,850.336	0.9436	218,768
01/01/2015	31/01/2015	18,585.497	18,585.497	18,585.497	0.110	0.110	0.110	18,585.387	0.9436	17,537
01/02/2015	28/02/2015	18,523.674	18,523.674	18,523.674	0.110	0.110	0.110	18,523.564	0.9436	17,478
01/03/2015	31/03/2015	18,742.130	18,742.130	18,742.130	0.110	0.110	0.110	18,742.020	0.9436	17,684
01/04/2015	30/04/2015	18,640.596	18,640.596	18,640.596	0.110	0.110	0.110	18,640.486	0.9436	17,589
01/05/2015	31/05/2015	19,358.214	19,358.214	19,358.214	0.110	0.110	0.110	19,358.104	0.9436	18,266
01/06/2015	30/06/2015	20,232.510	20,232.510	20,232.510	0.110	0.110	0.110	20,232.400	0.9436	19,091
01/07/2015	31/07/2015	20,786.142	20,786.142	20,786.142	0.110	0.110	0.110	20,786.032	0.9436	19,613
01/08/2015	31/08/2015	21,096.570	21,096.570	21,096.570	0.110	0.110	0.110	21,096.460	0.9436	19,906
01/09/2015	30/09/2015	19,756.218	19,756.218	19,756.218	0.110	0.110	0.110	19,756.108	0.9436	18,641
01/10/2015	31/10/2015	18,983.695	18,983.695	18,983.695	0.110	0.110	0.110	18,983.585	0.9436	17,912
01/11/2015	30/11/2015	18,748.963	18,748.963	18,748.963	0.110	0.110	0.110	18,748.853	0.9436	17,691
01/12/2015	31/12/2015	18,724.130	18,724.130	18,724.130	0.110	0.110	0.110	18,724.020	0.9436	17,667
2015 subtotal		232,178.339	232,178.339	232,178.339	1.320	1.320	1.320	232,177.019	0.9436	219,075
01/01/2016	31/01/2016	18,543.264	18,543.264	18,543.264	0.110	0.110	0.110	18,543.154	0.9436	17,497
01/02/2016	29/02/2016	18,497.523	18,497.523	18,497.523	0.110	0.110	0.110	18,497.413	0.9436	17,454
01/03/2016	31/03/2016	18,656.987	18,656.987	18,656.987	0.110	0.110	0.110	18,656.877	0.9436	17,604
01/04/2016	30/04/2016	18,842.105	18,842.105	18,842.105	0.110	0.110	0.110	18,841.995	0.9436	17,779
01/05/2016	31/05/2016	19,087.540	19,087.540	19,087.540	0.110	0.110	0.110	19,087.430	0.9436	18,010
01/06/2016	30/06/2016	20,500.693	20,500.693	20,500.693	0.110	0.110	0.110	20,500.583	0.9436	19,344
01/07/2016	31/07/2016	21,036.554	21,036.554	21,036.554	0.110	0.110	0.110	21,036.444	0.9436	19,849
01/08/2016	31/08/2016	19,874.682	19,874.682	19,874.682	0.110	0.110	0.110	19,874.572	0.9436	18,753
01/09/2016	30/09/2016	19,356.210	19,356.210	19,356.210	0.110	0.110	0.110	19,356.100	0.9436	18,264
01/10/2016	31/10/2016	18,695.436	18,695.436	18,695.436	0.110	0.110	0.110	18,695.326	0.9436	17,640
01/11/2016	30/11/2016	18,800.365	18,800.365	18,800.365	0.110	0.110	0.110	18,800.255	0.9436	17,739
01/12/2016	31/12/2016	18,650.033	18,650.033	18,650.033	0.110	0.110	0.110	18,649.923	0.9436	17,598
2016 subtotal		230,541.392	230,541.392	230,541.392	1.320	1.320	1.320	230,540.072	0.9436	217,531
01/01/2017	31/01/2017	18,398.650	18,398.650	18,398.650	0.110	0.110	0.110	18,398.540	0.9436	17,360
01/02/2017	28/02/2017	18,866.548	18,866.548	18,866.548	0.110	0.110	0.110	18,866.438	0.9436	17,802
01/03/2017	31/03/2017	18,798.963	18,798.963	18,798.963	0.110	0.110	0.110	18,798.853	0.9436	17,738
01/04/2017	30/04/2017	19,012.540	19,012.540	19,012.540	0.110	0.110	0.110	19,012.430	0.9436	17,940

01/05/2017	31/05/2017	19,466.525	19,466.525	19,466.525	0.110	0.110	0.110	19,466.415	0.9436	18,368
01/06/2017	30/06/2017	19,989.963	19,989.963	19,989.963	0.110	0.110	0.110	19,989.853	0.9436	18,862
01/07/2017	31/07/2017	20,586.302	20,586.302	20,586.302	0.110	0.110	0.110	20,586.192	0.9436	19,425
01/08/2017	31/08/2017	20,066.774	20,066.774	20,066.774	0.110	0.110	0.110	20,066.664	0.9436	18,934
01/09/2017	30/09/2017	19,878.541	19,878.541	19,878.541	0.110	0.110	0.110	19,878.431	0.9436	18,757
2017 subtotal		175,064.806	175,064.806	175,064.806	0.990	0.990	0.990	175,063.816	0.9436	165,186
Total of this monitoring period		1,140,715.225	1,140,715.225	1,140,715.225	6.710	6.710	6.710	1,140,708.515	0.9436	1,076,341

Thus, the baseline emission during this monitoring period is 1,076,341 tCO₂e.

5.2 Project Emissions

The power intensity of this project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = (65 \times 10^6 - 0) / (6.3 \times 10^6 - 0) = 10.3 \text{ (W/m}^2\text{)}, \text{ greater than } 10 \text{ W/m}^2.$$

As per ACM0002 (version 06), when PD is greater than 10W/m², the project emission is 0.

5.3 Leakage

According to methodology ACM0002 (version 06), No leakage emissions should be considered for the project activity.

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
23/09/2012~31/12/2012	54,882	0	0	54,882
01/01/2013~31/12/2013	200,899	0	0	200,899
01/01/2014~31/12/2014	218,768	0	0	218,768
01/01/2015~31/12/2015	219,075	0	0	219,075
01/01/2016~31/12/2016	217,531	0	0	217,531
01/01/2017~30/09/2017	165,186	0	0	165,186
Total	1,076,341	0	0	1,076,341

According to the registered CDM PDD, the estimated value of emission reduction during this monitoring period is 243,043 tCO₂e per year. The total estimated value of the emission reduction of this monitoring period is calculated as:

$$\text{Total Estimated ER}_y = \frac{243,043 \text{ tCO}_2\text{e} \times \text{number of monitored days}}{365}$$

In the monitoring period from 23/09/2012 to 30/09/2017 (1,834 days, both days included), the estimated emission reduction is 1,221,208 tCO_{2e} while the actual emission reduction is 1,076,341 tCO_{2e}.

Table 3. The comparison of emission reductions between the estimated and actual value

Estimated ER _y during Monitoring Period (tCO _{2e})	Actual ER _y during Monitoring Period (tCO _{2e})	Difference Percentage (%)
1,221,208	1,076,341	-11.86%

Thus, the actual emission reduction is -11.86% lower than the estimated emission reduction, which is caused by reasonable fluctuation of the water flow.

APPENDIX 1: <EVIDENCE OF ACHIEVED SD CONTRIBUTIONS>

SDG Target 7.2, SDG Indicator 7.2.1 Renewable energy share in the total final energy consumption

period	Amount of renewable energy (MWh)	Data source
01/10/2007 - 09/05/2009	112,886.964	https://registry.verra.org/app/projectDetail/VCS/699
10/05/2009 - 31/12/2009	138,126.132	https://cdm.unfccc.int/Projects/DB/DN-V-CUK1205730913.74/view?cp=1
01/01/2010 - 30/06/2011	331,457.175	
01/07/2011 - 30/04/2012	169,187.224	
01/05/2012 - 22/09/2012	106,918.312	
23/09/2012 - 30/09/2017 (this monitoring period)	1,140,708.515	Section 5 of this report
Cumulative amount since operation start	1,999,284.322	/

SDG Target 8.3, SDG Indicator 8.3.1 Proportion of informal employment in non- agriculture employment, by sex
Staff Roster
益阳修山水电站员工花名册 (2017)

编号	姓名	性别	学历	职务	身份证号码	户籍地址
1	郭磷	男	Male	总经理	432424196304297619	湖南省益阳市
2	陈正军	男	本科	总工程师	432321196812065633	湖南益阳赫山区
3	姚飞	男	本科	综合办主任	43090319780925361X	湖南益阳赫山区
4	卢兴刚	男	本科	生产部主任	43232619720903453X	湖南省桃江县
5	龙雅妮	女	Female	部主任	430923199204254921	湖南省桃江县
6	徐海元	女	本科	财务室会计	430903197203264525	湖南省桃江县
7	汤尚军	男	专科	水工班班长	432321197011231536	湖南省桃江县
8	张国军	男	专科	机电运行班班长	432321197610143597	湖南省桃江县
9	许胜贤	男	专科	机电维修班班长	430903196407104211	湖南省桃江县
10	熊爱中	男	专科	水工班员工	432326194802192412	湖南安化梅城镇
11	陈庆丰	男	高中	水工班员工	43232119750809563X	湖南益阳赫山区
12	余建军	男	高中	水工班员工	432321196909207474	湖南益阳赫山区
13	曾凡军	男	高中	水工班员工	43242419680904641X	湖南澧县甘溪滩镇
14	陈朝辉	男	高中	水工班员工	432301196412122031	湖南省桃江县
15	周世冬	女	高中	水工班员工	43090319971124364X	湖南省桃江县
16	梁梦兰	女	高中	水工班员工	432326195509192426	湖南省桃江县
17	马雪姣	女	高中	水工班员工	430321198512049022	湖南省桃江县
18	周建华	女	高中	机电运行班员工	432326197011211983	湖南省桃江县
19	胡庆年	男	高中	机电运行班员工	430321196801288514	湖南省桃江县
20	尹宏伟	男	初中	机电运行班员工	43232119741228097X	湖南益阳赫山区欧江岔
21	段友良	男	高中	机电运行班员工	430321196312148537	湖南湘潭县中路铺
22	吴永庆	男	高中	机电运行班员工	43232619650403751X	湖南安化县苍场乡
23	杨金玉	男	高中	机电运行班员工	511124198805205112	四川井研县高凤乡建国村10组26号
24	卢顺梨	男	高中	机电运行班员工	432326196307294533	湖南省桃江县
25	曹克冬	男	初中	机电运行班员工	432321196311025633	湖南省桃江县
26	吴米秋	男	初中	机电运行班员工	432326196810057519	湖南省桃江县
27	赖育林	男	高中	机电运行班员工	430321197201278739	湖南省桃江县
28	曹建春	男	高中	机电维修班员工	432321196901155630	湖南省桃江县
29	罗武明	男	高中	机电维修班员工	432321197007095631	湖南省桃江县
30	曹毛立	男	初中	机电维修班员工	432321196812085650	湖南益阳赫山区
31	刘必胜	男	高中	机电维修班员工	430221196509065633	湖南株洲县仙井乡檀木桥村
32	邓翠焜	男	高中	机电维修班员工	430923199410020018	湖南安化县东坪镇煤建路2号
33	陈正秋	男	高中	机电维修班员工	432321196608065636	湖南益阳赫山区石笋乡茶盘山村
34	王伯高	男	专科	财务室出纳	432321196408191531	湖南益阳赫山区笔架山乡辛田村
35	周清明	男	初中	保安	432321196804030933	湖南益阳赫山区
36	袁长生	男	高中	保安	432326197106021699	湖南省桃江县
37	袁飞强	男	初中	食堂	432326195610011672	湖南省桃江县
38	陈依明	男	初中	食堂	430723200101267636	湖南省桃江县

SDG Target 13, SDG Indicator Tonnes of greenhouse gas emissions avoided or removed

period	Amount of emission reductions (tCO₂e)	Data source
01/10/2007 - 09/05/2009 (VER)	353,256	https://registry.verra.org/app/projectDetail/VCS/699
10/05/2009 - 31/12/2009 (CER)	130,335	https://cdm.unfccc.int/Projects/DB/DNV-CUK1205730913.74/view?cp=1
01/01/2010 - 30/06/2011 (CER)	341,723	
01/07/2011 - 30/04/2012 (CER)	159,645	
01/05/2012 - 22/09/2012 (CER)	109,665	
23/09/2012 - 30/09/2017 (this VCS monitoring period)	1,076,341	Section 5 of this report
Cumulative amount since operation start	2,170,965	/

APPENDIX 2: <BASELINE INFORMATION>

Table A1. Calculation of thermal power in Central China Power Grid in 2002

Province	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Generation from thermal plants (MWh)	18,648,000	84,734,000	34,301,000	20,058,000	14,727,000	27,879,000	
plant consumption rate (%)	7.67	8.03	7.73	7.73	10.21	9.59	
Thermal power in CCPG (MWh)	17,217,698.4	77,929,859.8	31,649,532.7	18,507,516.6	13,223,373.3	25,205,403.9	183,733,384.7

Data Source: China Electric Power Yearbook 2003

Table A2. Calculation of thermal power in Central China Power Grid in 2003

Province	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Generation from thermal plants (MWh)	27,165,000	95,518,000	39,532,000	29,501,000	16,341,000	32,782,000	
plant consumption rate (%)	6.43	7.68	3.81	4.58	8.97	4.41	
Thermal power in CCPG (MWh)	25,418,290.5	88,182,217.6	38,025,830.8	28,149,854.2	14,875,212.3	31,336,313.8	225,987,719.2

Data Source: China Electric Power Yearbook 2004

Table A3. Calculation of thermal power in Central China Power Grid in 2004

Province	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal Power Generation (MWh)	30,127,000	109,352,000	43,034,000	37,186,000	16,520,000	34,627,000	
plant consumption rate (%)	7.04	8.19	6.58	7.47	11.06	9.41	
Thermal power in CCPG (MWh)	28,006,059.2	100,396,071.2	40,202,362.8	34,408,205.8	14,692,888.0	31,368,599.3	249,074,186.3

Data Source: China Electric Power Yearbook 2005

Table A4. Statistics of energy consumption for power generation in Central China Power Grid in 2002

Fuel Type	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total G=A+B+C+D+E+F
Raw Coal	10 ⁴ Tons	1,062.63	4,679.02	1,710.00	1,113.78	398.57	1,964.32	10,928.32
Clean Coal	10 ⁴ Tons	2.72	0.00	0.00	0.00	0.00	0.00	2.72
Other washed	10 ⁴ Tons	3.66	26.49	0.00	0.00	249.99	0.00	280.14
Coke	10 ⁴ Tons	0.00	1.15	0.00	0.00	0.00	0.00	1.15
Coke Oven Gas	10 ⁸ m ³	0.00	0.00	1.11	0.00	0.00	0.00	1.11
Other Coal Gas	10 ⁸ m ³	0.00	2.16	0.00	0.00	0.00	0.00	2.16
Crude Oil	10 ⁴ Tons	0.00	0.67	1.17	0.00	0.00	0.81	2.65
Diesel	10 ⁴ Tons	1.00	1.34	1.08	2.19	0.51	0.51	6.63
Fuel Oil	10 ⁴ Tons	0.33	0.16	0.34	0.69	0.00	1.51	3.03
LPG	10 ⁴ Tons	0.00	0.02	0.00	0.00	0.00	0.00	0.02
Refinery Gas	10 ⁴ Tons	0.49	0.00	0.00	1.90	0.00	0.00	2.39
Natural Gas	10 ⁸ m ³	0.00	0.00	0.00	0.00	0.00	1.75	1.75
Other Petroleum Products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Coking Products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy Sources (standard coal)	10 ⁴ Tce	0.00	3.38	0.00	0.00	0.00	0.00	3.38

Data Source: China Energy Statistics Year Book 2000-2002

Table A5. Statistics of energy consumption for power generation in Central China Power Grid in 2003

Fuel Type	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total G=A+B+C+D+E+F
Raw Coal	10 ⁴ Tons	1,427.41	5,504.94	2,072.44	1,646.47	769.47	2,430.93	13,851.66
Clean Coal	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other washed	10 ⁴ Tons	2.03	39.63	0.00	0.00	106.12	0.00	147.78
Coke	10 ⁴ Tons	0.00	0.00	0.00	1.22	0.00	0.00	1.22
Coke Oven Gas	10 ⁸ m ³	0.00	0.00	0.93	0.00	0.00	0.00	0.93
Other Coal Gas	10 ⁸ m ³	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crude Oil	10 ⁴ Tons	0.00	0.50	0.24	0.00	0.00	1.20	1.94
Diesel	10 ⁴ Tons	0.52	2.54	0.69	1.21	0.77	0.00	5.73
Fuel Oil	10 ⁴ Tons	0.42	0.25	2.17	0.54	0.28	1.20	4.86
LPG	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery Gas	10 ⁴ Tons	1.76	6.53	0.00	0.66	0.00	0.00	8.95
Natural Gas	10 ⁸ m ³	0.00	0.00	0.00	0.00	0.04	2.20	2.24
Other Petroleum Products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Coking Products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy Sources (standard coal)	10 ⁴ Tce	0.00	11.04	0.00	0.00	16.20	0.00	27.24

Data Source: China Energy Statistics Year Book 2004

Table A6. Statistics of energy consumption for power generation in Central China Power Grid 2004

Fuel Type	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total G=A+B+C+D+E+F
Raw Coal	10 ⁴ Tons	1,863.80	6,948.50	2,510.50	2,197.90	875.50	2,747.90	17,144.10
Clean Coal	10 ⁴ Tons	0.00	2.34	0.00	0.00	0.00	0.00	2.34
Other washed	10 ⁴ Tons	48.93	104.22	0.00	0.00	89.72	0.00	242.87
Coke	10 ⁴ Tons	0.00	109.61	0.00	0.00	0.00	0.00	109.61
Coke Oven Gas	10 ⁸ m ³	0.00	0.00	1.68	0.00	0.34	0.00	2.02
Other Coal Gas	10 ⁸ m ³	0.00	0.00	0.00	0.00	2.61	0.00	2.61
Crude Oil	10 ⁴ Tons	0.00	0.86	0.22	0.00	0.00	0.00	1.08
Gasoline	10 ⁴ Tons	0.00	0.06	0.00	0.00	0.01	0.00	0.07
Diesel	10 ⁴ Tons	0.02	3.86	1.70	1.72	1.14	0.00	8.44
Fuel Oil	10 ⁴ Tons	1.09	0.19	9.55	1.38	0.48	1.68	14.37
LPG	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery Gas	10 ⁴ Tons	3.52	2.27	0.00	0.00	0.00	0.00	5.79
Natural Gas	10 ⁸ m ³	0.00	0.00	0.00	0.00	0.00	2.27	2.27
Other Petroleum Products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Coking Products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy Sources (standard coal)	10 ⁴ Tce	0.00	16.92	0.00	15.20	20.95	0.00	53.07

Data Source: China Energy Statistics Year Book 2005

Table A7. Calculation of the Simple OM of Central China Power Grid in 2002

Fuel Type	Unit	Total fuel in CCPG in 2002	EF (tc/TJ)	OXID (%)	Mean low heat value (MJ/t,km ³)	CO ₂ Emission (tCO ₂ e)
		G	H	I	J	K=G*H*I*J*44/12/10000 (Mass Unit) K=G*H*I*J*44/12/1000 (Cubage Unit)
Raw Coal	10 ⁴ Tons	10,928.32	0.258	98.0	20,908	211,827,873.70
Clean Coal	10 ⁴ Tons	2.72	0.258	98.0	26,344	66,430.55
Other washed	10 ⁴ Tons	280.14	0.258	98.0	8,363	2,171,973.06
Coke	10 ⁴ Tons	1.15	0.295	98.0	28,435	34,663.36
Coke Oven Gas	10 ⁸ m ³	1.11	13.0	99.5	16,726	88,054.79
Other Coal Gas	10 ⁸ m ³	2.16	13.0	99.5	5,227	53,548.11
Crude Oil	10 ⁴ Tons	2.65	20.0	99.0	41,816	80,449.80
Diesel	10 ⁴ Tons	6.63	20.2	99.0	42,652	207,353.29
Fuel Oil	10 ⁴ Tons	3.03	21.1	99.0	41,816	97,045.23
LPG	10 ⁴ Tons	0.02	17.2	99.5	50,179	629.76
Refinery Gas	10 ⁴ Tons	2.39	18.2	99.5	46,055	73,087.08
Natural Gas	10 ⁸ m ³	1.75	15.3	99.5	38,931	380,294.07
Other Petroleum Products	10 ⁴ Tons	0.00	20.0	99.0	38,369	0.00
Other Coking Products	10 ⁴ Tons	0.00	25.8	98.0	28,435	0.00
Other Energy Sources(standard coal)	10 ⁴ Tce	3.38	0.0	0.0	0.00	0.00
Total Emission Q		215,081,402.80tCO ₂ e				
Total thermal power in CCPG (P)		183,733,384.70MWh				
OM emission factor in 2002 [=Q/ P]		1.17062tCO ₂ e/MWh				

Data Source: the calorific values of the fuels are from China Energy Statistics Year Book 2005, p365. the potential emission factors are from " Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook", in chapter 1, pages 1. 6, Table 1-2.OXID Data are from " Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook", Chapter 1, page 1.8, Table 1-4.

Table A8. Calculation of the Simple OM of Central China Power Grid in 2003

Fuel Type	Unit	Total fuel in CCPG in 2002	EF (tc/TJ)	OXID (%)	Mean low heat value (MJ/t,km ³)	CO ₂ Emission (tCO ₂ e)
		G	H	I	J	$K=G*H*I*J*44/12710000$ (Mass Unit) $K=G*H*I*J*44/12/1000$ (Cubage Unit)
Raw Coal	10 ⁴ Tons	13,851.66	25.8	98.0	20,908	268,492,109.10
Clean Coal	10 ⁴ Tons	0.00	25.8	98.0	263,44	0.00
Other washed	10 ⁴ Tons	147.78	25.8	98.0	8,363	1,145,763.47
Coke	10 ⁴ Tons	1.22	29.5	98.0	28,435	36,773.30
Coke Oven Gas	10 ⁸ m ³	0.93	13.0	99.5	16,726	73,775.63
Other Coal Gas	10 ⁸ m ³	0.00	13.0	99.5	5,227	0.00
Crude Oil	10 ⁴ Tons	1.94	20.0	99.0	41,816	58,895.33
Diesel	10 ⁴ Tons	5.73	20.2	99.0	42,652	179,205.78
Fuel Oil	10 ⁴ Tons	4.86	21.1	99.0	41,816	155,656.71
LPG	10 ⁴ Tons	0.00	17.2	99.5	50,179	0.00
Refinery Gas	10 ⁴ Tons	8.95	18.2	99.5	46,055	273,694.28
Natural Gas	10 ⁸ m ³	2.24	15.3	99.5	38,931	486,776.41
Other Petroleum Products	10 ⁴ Tons	0.00	20.0	99.0	38,369	0.00
Other Coking Products	10 ⁴ Tons	0.00	25.8	98.0	28,435	0.00
Other Energy Sources(standard coal)	10 ⁴ Tce	27.24	0.0	0.0	0	0.00
Total Emission Q		270,902,650.00tCO ₂ e				
Total thermal power in CCPG (P)		225,987,719.20MWh				
OM emission factor in 2003 [= Q/ P]		1.19875tCO ₂ e/MWh				

Data Source: the calorific values of the fuels are from China Energy Statistics Year Book 2005, p365. the potential emission factors are from " Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook", in chapter 1 ,pages 1. 6, Table 1-2. OXID Data are from " Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook", Chapter 1, page 1.8, Table1-4.

Table A9. Calculation of the Simple OM of Central China Power Grid in 2004

Fuel Type	Unit	Total fuel in CCPG in 2002	EF (tc/TJ)	OXID (%)	Mean low heat value (MJ/t,km ³)	CO ₂ Emission (tCO ₂ e)
		G	H	I	J	K=G*H*I*J*44/12 (Mass Unit) K=G*H*I*J*44/12/1000 (Cubage Unit)
Raw Coal	10 ⁴ Tons	17,144.10	25.8	98.0	20,908	332,310,753.20
Clean Coal	10 ⁴ Tons	2.34	25.8	98.0	26,344	57,149.81
Other washed	10 ⁴ Tons	242.87	25.8	98.0	8,363	1,883,012.41
Coke	10 ⁴ Tons	109.61	29.5	98.0	28,435	3,303,869.86
Coke Oven Gas	10 ⁸ m ³	2.02	13.0	99.5	16,726	160,243.83
Other Coal Gas	10 ⁸ m ³	2.61	13.0	99.5	5,227	64,703.96
Crude Oil	10 ⁴ Tons	1.08	20.0	99.0	41,816	32,787.09
Gasoline	10 ⁴ Tons	0.07	18.9	99.0	43,070	2,068.43
Diesel	10 ⁴ Tons	8.44	20.2	99.0	42,652	263,961.05
Fuel Oil	10 ⁴ Tons	14.37	21.1	99.0	41,816	460,244.21
LPG	10 ⁴ Tons	0.00	17.2	99.5	50,179	0.00
Refinery Gas	10 ⁴ Tons	5.79	18.2	99.5	46,055	177,060.32
Natural Gas	10 ⁸ m ³	2.27	15.3	99.5	38,931	493,295.73
Other Petroleum Products	10 ⁴ Tons	0.00	20.0	99.0	38,369	0.00
Other Coking Products	10 ⁴ Tons	0.00	25.8	98.0	28,435	0.00
Other Energy Sources(standard coal)	10 ⁴ Tce	53.07	0.0	0.0	0	0.00
Total Emission Q		339,209,149.90tCO ₂ e				
Total thermal power in CCPG (P)		249,074,186.30MWh				
OM emission factor in 2004 [=Q/ P]		1.36188tCO ₂ e/MWh				

Data Source: the calorific values of the fuels are from China Energy Statistics Year Book 2005, p365. the potential emission factors are from " Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook", in chapter 1 ,pages 1. 6, Table 1-2. OXID Data are from " Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook", Chapter 1, page 1.8, Table 1-4.

The weighted average for Simple Operating Margin (OM) in the three years 2002-2004 is:

$$EF_{OM,y} = \frac{(215,081,402.80 + 270,902,650.00 + 339,209,149.90)}{(183,733,384.70 + 225,987,719.20 + 249,074,186.30)} = 1.2526tCO_2e / MWh$$

Table A10 Calculation of the CO₂ emissions corresponding to solid, liquid and gas fuels for power generation

Fuel Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Calorific value (kJ/kg kJ/m ³)	Emission factor	OXID	CO ₂ Emission (tCO ₂ e)
Raw Coal	10 ⁴ Tons	1,863.80	6,948.50	2,510.50	2,197.9	875.50	2,747.90	1324,2650	20,908	25.80	0.980	332,310,753
Clean Coal	10 ⁴ Tons	0.00	2.34	0.00	0.00	0.00	0.00	140	26,344	25.80	0.980	57,150
Other washed	10 ⁴ Tons	48.93	104.22	0.00	0.00	89.72	0.00	532	8,363	25.80	0.980	1,883,012
Coke	10 ⁴ Tons	0	109.61	0.00	0.00	0.00	0.00	170	28,435	29.50	0.980	3,303,870
Total coal												337,554,785
Crude Oil	10 ⁴ Tons	0.00	0.86	0.22	0.00	0.00	0.00	212	41,816	20.00	0.990	32,787
Gasoline	10 ⁴ Tons	0.00	0.06	0.00	0.00	0.01	0.00	111	43,070	18.90	0.990	2,068
Coal Oil	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43,070	19.60	0.990	0
Diesel	10 ⁴ Tons	0.02	3.86	1.70	1.72	1.14	0.00	354	42,652	20.20	0.990	263,961
Fuel Oil	10 ⁴ Tons	1.09	0.19	9.55	1.38	0.48	1.68	353	41,816	21.10	0.990	460,244
Other Oil Products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38,369	20.00	0.990	0
Total Fuel												759,060
Natural Gas	10 ⁷ m ³	0.00	0.00	0.00	0.00	0.00	22.7	1360	38,931	15.30	0.995	493,296
Coke Oven Gas	10 ⁷ m ³	0.00	0.00	16.8	0.00	3.40	0.00	1740	16,726	13.00	0.995	160,244
Other Coal Gas	10 ⁷ m ³	0.00	0.00	0.00	0.00	26.10	0.00	1430	5,227	13.00	0.995	64,704
LPG	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50,179	17.20	0.995	0
Refinery Gas	10 ⁴ Tons	3.52	2.27	0.00	0.00	0.00	0.00	188	46,055	18.20	0.995	177,060
Total gas												895,304
Total												339,209,149

Calculate: $\lambda_{Coal}=99.51\%$, $\lambda_{Oil}=0.22\%$, $\lambda_{Gas}=0.27\%$.

Table A11. Calculation of emission factor for different types of fuels

	Variable	Power supply efficiency	Fuel emission factor (tc/TJ)	OXID	Emission factor (tCO ₂ e /MWh)
		M	N	X	$Y=3.6/M/1000*N*X*44/12$
Coal-fired plant	$EF_{Coal,Adv}$	36.53%	25.8	0.980	0.9136
gas-fired plant	$EF_{Gas,Adv}$	45.87%	15.3	0.995	0.4381
oil-fired plant	$EF_{Oil,Adv}$	45.87%	21.1	0.990	0.6011

Calculate the emission factor for thermal power plant:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.909 \text{ tCO}_2\text{e/MWh.}$$

Table A12. Installed Capacity of CCPG in 2004

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal Capacity	MW	5,496.0	21,788.5	9,509.3	6,779.5	3,271.1	6,900.3	70,743
Hydro Capacity	MW	2,549.9	2,438.0	7,415.1	7,448.2	1,407.9	13,382.9	34,642.0
Nuclear Capacity	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Capacity and Other	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	MW	8,045.9	24,226.5	16,924.4	14,227.8	4,679	20,283.2	88,386.8

Data Source: China Electric Power Yearbook 2001, among which the power generation of the Three Gorges is not included in Hubei Province

Table A13. Installed Capacity of CCPG in 2001

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal Capacity	MW	4,869.8	15,349.0	8,077.3	4,997.8	2,898.3	6,377.0	64,567
Hydro Capacity	MW	2,067.8	2,438.0	7,125.6	5,966.1	1,268.0	11,531.5	50,395.0
Nuclear Capacity	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Capacity and Other	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	MW	6,937.6	17,787.0	15,202.9	10,963.8	4,166.3	17,908.5	103,963

Data Source: China Electric Power Yearbook 2002

Table A14. Installed Capacity of CCPG in 2000

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal Capacity	MW	4,474.3	13,789.0	8,038.8	4,477.4	2,995.0	6,090.1	55,863
Hydro Capacity	MW	1,846.0	1,528.0	7,070.5	5,858.0	1,327.0	11,008.3	36,637
Nuclear Capacity	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Capacity and Other	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	MW	6,320.3	15,317.0	15,109.3	10,335.4	4,322	17,098.4	25,42

Data Source: China Electric Power Yearbook 2001

Table A15. Calculation of BM in Central China Power Grid

	Installation in 2000	Installation in 2001	Installation in 2004	Newly added installation in 2000-2004	Ratio in newly added installation
	A	B	C	D=C-A	
Thermal Capacity (MW)	39,864.6	42,569.2	53,744.7	13,880.1	69.80%
Hydro Capacity (MW)	28,637.8	30,397	34,642	6,004.2	30.20%
Nuclear Capacity (MW)	0.0	0.0	0.0	0.0	0.00%
Wind Capacity (MW)	0.0	0.0	0.0	0.0	0.00%
Total (MW)	2082,501	30,397	34,642	18,884	100.00%
Ratio in 2004 installation	77.50%	82.55%	100.00%		

Therefore it can be obtained that :

$$EF_{BM_3} = 0.9091 \times 69.80\% = 0.6346 \text{ tCO}_2\text{e/MWh}$$

The operating marginal (OM) emission factor is 1.2526tCO₂e/MWh and the build marginal (BM) emission factor is 0.6346 tCO₂e/MWh.

For OM emission factor and BM emission factor, the default weights in ACM0002 (V6) is applicable.

$$w_{OM} = 0.5$$

$$w_{BM} = 0.5$$

By weighted average, the baseline emission factor is obtained as 0.9436tCO₂e/MWh.