CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	The Board agreed to revise the CDM project design Document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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The title of the project: China Tuanjie Small Rundle Hydropower Project
Document version: 04
Date: 21/08/2008

Gelöscht: 3
Gelöscht: 19
Gelöscht: 3

Version number	Date	Reason
Version 01	20/04/2007	GSP
Version 02	19/09/2007	Revised according to the Draft Validation Report
Version 03	19/03/2008	Revised according to the opinions of DOE
Version 04	21/08/2008	Revised according to the request for review from EB

A.2. Description of the small-scale project activity:

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Description of the projects activity:

China Tuanjie Small Rundle Hydropower Project (hereinafter referred to as "the project") is a small bundled run-of-river hydropower project located in the Baiguo Town, which is one of the poorest places in Qiyang County, Yongzhou City, Hunan Province. It belongs to Xiaohuangsi Water System. The bundle project constitutes of three power stations, the main information of them is shown in Table 1. The Second Level of Tuanjie Power Station generated electricity by using the tail water of the Attached Station of the Second Level of Tuanjie Power Station. The Lengshuiyuan Power Station is unattached with the other two stations. The total installed capacity is 6.6MW (1MW+4MW+1.6MW), with the whole net electricity generation per year is 25357.8MWh. The electricity will be transmitted to Renchong Substation by 35kV lines with the length of 19.142km, then to the Central China Power Grid (CCPG for short), which is dominated by coal-fired power plants. It is estimated the annual emission reductions will be 24,725 tCO_2e in the first crediting period.

Table 1 Detailed information of the project

	the Attached Station of the Second Level of Tuanjie Power Station	the Second Level of Tuanjie Power Station	the Lengshuiyuan Power Station	Total
Installed Ccapacity	1MW(2*0.5MW)	4MW(2*2MW)	1.6MW(2*0.8MW)	6.6MW
Annual Utilization Hour(h)	4210	4147	4014	
Annual Electricity Generation(MWh)	4,210	16,588	6,422	27,220
Annual Net Electricity Generation(MWh)	3,921.99	15,453.18	5,982.66	25,357.8
Annual Estimation of Emission Reductions in tonnes of CO_2e	3,824	15,067	5,834	24,725

The project contributes to the local sustainable development in the following aspects:
1. Providing the clean electric power. The project fits for the Chinese energy development goal. It can provide the clean electric power for the local residents to reduce the demand of fossil fuel and achieve greenhouse gas (GHG) emission reductions.

2. And promoting the local economic development. The project is in the remote mountain area with poor traffic condition. The project activity can create about 50 job opportunities during the construction period, and more than 15 job positions will be provided for the local residents after the project is put into operation. The project will promote the local development greatly in the agriculture and service trade.

3. And improving the local infrastructure. The project owner would build roads and the electric transmission facilities, which will be helpful to improve the living condition of the local residents.

A.3. Project participants:

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Table 2 Name of Party involved

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	Qiyang Haojie Hydroelectric Co., Ltd.	No
Sweden	Carbon Asset Management Sweden AB	No

Both of the project participants listed above are private entity.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party (ies):

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People's Republic of China

A.4.1.2. Region/State/Province etc.:

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Hunan Province

A.4.1.3. City/Town/Community etc:

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Yongzhou City, Qiyang County, Baiguo Town

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity:

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The project is located in Baiguo Town, Qiyang County, Yongzhou City, Hunan Province, P. R. C which is 80 km away from Qiyang County.

The Longitude and Latitude of the three power stations shown in the table below:

	the Attached Station of the Second Level of Tuanjie Power Station	the Second Level of Tuanjie Power Station	Lengshuiyuan Power Station
Longitude(E)	112° 02′ 44″	112° 03′ 16″	112° 04′ 28″
Latitude(N)	26° 09′ 51″	26° 09′ 58″	26° 10′ 18″

See Fig 1.

Fig. 1 Location of the Project

A.4.2. Type and category (ies) and technology/measure of the small-scale project activity:

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The proposed project activity falls into:

Project Type: I. Renewable energy project

Project Category: I D Grid connected renewable electricity generation

The technique of the project activity comprises:
The project activity is a bundled run-of-river hydropower project with the total installed capacity of 6.6MW.

The main construction works include diversion tunnels, penstocks, power houses, etc. The water pressure drive the turbines to rotate through diverting water from the intake of the penstocks of the powerhouses, the turbines drive the generators to rotate, and thus the water energy is changed into electric energy. The electricity will be transmitted to Renchong Substation by 35kV lines with the length of 19.142km, then to the CCPG.

The staff of the project would be trained before the start of the construction of the station.

Major technical parameters of the project are as follows:

Table 3 Design features and characteristics of the project

	the Attached Station of the Second Level of Tuanjie Power Station	the Second Level of Tuanjie Power Station	the Lengshuiyuan Power Station
Total Installed Capacity	1MW	4MW	1.6MW
Turbine			
Type	CJA237-W-60/1×7.5	HLA444-WJ-64	CJA237-W-70/1×7.5
Quantity	2units	2units	2units
Designed Head	230m	88m	320m
Designed Flow Rate (m^3/s)	$0.267m^3/s$	2.682	0.305
Single-Unit Capacity	500kw	2000kw	800kw
Generator			
Type	SFW500-6/850	SFW2000-6/1430	SFW800-6/1180
Quantity	2units	2units	2units
Single-Unit Capacity	500kw	2000kw	800kw

Environmentally Safe Technology
The project is a bundled run-of-river project with no submerged area, the technology which is widely used in the similar projects and has been proved to have no negative influence on environment.

Technology transfer:
The main equipments, such as the turbines and electricity generators, are made in the host country. No international technology is transferred from other countries to the bundle project.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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The project chooses the renewable crediting period. The first crediting period is from 01/05/2008-30/04/2015. The estimated amount of emission reductions of each power station in the chosen crediting period is shown in Table 4- Table 6.

Table 4 Estimated amount of emission reductions of the Attached Station of the Second Level of Tuanjie Power Station

Year	Annual estimation of emission reductions in tonnes of CO_2e
01/05/2008-30/04/2009	3,824
01/05/2009-30/04/2010	3,824
01/05/2010-30/04/2011	3,824
01/05/2011-30/04/2012	3,824
01/05/2012-30/04/2013	3,824
01/05/2013-30/04/2014	3,824
01/05/2014-30/04/2015	3,824
Total estimated reductions (tonnes of CO_2e)	26,768
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	3,824

Table 5 Estimated amount of emission reductions of the Second Level of Tuanjie Power Station

Year	Annual estimation of emission reductions in tonnes of CO_2e
01/05/2008-30/04/2009	15,067
01/05/2009-30/04/2010	15,067
01/05/2010-30/04/2011	15,067
01/05/2011-30/04/2012	15,067
01/05/2012-30/04/2013	15,067
01/05/2013-30/04/2014	15,067
01/05/2014-30/04/2015	15,067
Total estimated reductions (tonnes of CO_2e)	105,469
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	15,067

Table 6 Estimated amount of emission reductions of the Lengshuiyuan Power Station

Year	Annual estimation of emission reductions in tonnes of CO_2e
01/05/2008-30/04/2009	5,834
01/05/2009-30/04/2010	5,834
01/05/2010-30/04/2011	5,834
01/05/2011-30/04/2012	5,834
01/05/2012-30/04/2013	5,834
01/05/2013-30/04/2014	5,834
01/05/2014-30/04/2015	5,834
Total estimated reductions (tonnes of CO_2e)	40,838

Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	5,834

A.4.4. public funding of the small-scale project activity:

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There is no public funding from Annex I Parties for the project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

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According to paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities, a small-scale project is considered a debundled component of a large project activity if there is a registered small-scale activity or an application to register another small-scale activity:

1. With the same project participants;
2. In the same project category and technology;
3. Registered within the previous two years;
4. Whose project boundary is within 1 km of the project boundary of the proposed small scale activity.

The project is not a debundled component of a large scale project activity.The project participants have not registered any small scale CDM project activity or applied to register another small scale CDM project activity within 1 km of the project boundary of the proposed small scale activity, in the same project category and technology.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

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Title of the approved baseline and monitoring methodology: AMS-I.D.-Grid connected renewable electricity generation (Version 11, May 18, 2007)

Title of methodology for baseline emission factor calculation: ACM0002-Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 06, May 19, 2006)

B.2 Justification of the choice of the project category:

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1. The total installed capacity is 6.6MW, which is less than the maximum qualifying capacity of 15MW;
2. All of the 3 small projects are run-of-river hydropower stations;
3. The project makes use of renewable water resources to generate and supply electricity to regional power grid, i.e. CCPG, which is dominated by fossil fuel-fired power plants;
4. The CCPG has a clear boundary; the related information can be obtained publicly.

Therefore, all applicability conditions for the use of simplified baseline methodology AMS I.D are met.

B.3. Description of the project boundary:

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According to methodology AMS I.D (Version 11), the project boundary encompasses the physical, geographical site of the renewable generation source. The generated electricity of the project will be delivered to CCPG[1], which include Jiangxi Province, Henan Province, Hubei Province, Hunan Province, Sichuan Province and Chongqing Municipality Power Grid.

B.4. Description of baseline and its development:

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There are four plausible scenarios to provide the equivalent electricity service.

Scenario 1: **The project activity not undertaken as CDM project activity**

In this scenario the project activity will generate zero-emission power with renewable hydraulic energy source and cause the emission reduction by displacing equivalent power supply from CCPG. However, the IRRs of the project are less than benchmark IRR of 10% (see B.5 for details).

Therefore, the scenario 1 is not a possible baseline scenario.

Scenario 2: **Construct a fossil fuel based power plant with equivalent annual electricity supply**

This scenario is to construct a fossil fuel-fired power plant with equivalent annual electricity supply to CCPG. The average annual utilization time of thermal power plants in China is 5,633 h[2] in 2006. Consequently, the fossil fuel-fired power plant with equivalent annual electricity supply has less installed

[1] Chinese DNA's Guideline of Emission Factors of Chinese Grids, August 9, 2007

[2] Association of Chinese Power Industry, Statistics for Electricity Generation of China in 2006.

capacity than the project (6.6MW). However, to construct a fossil fuel-fired power plant with the installed capacity of below 135 MW is forbidden by Chinese government [3].

Therefore, the scenario 2 is not a possible baseline scenario.

Scenario 3—Construction of other renewable energy based power plant with equivalent annual electricity supply

This scenario is to construct renewable power plants, which can supply equivalent electricity annually as the project. However, those kinds of renewable power plants, such as photovoltaics, tidal/wave, wind, geothermal etc., are strongly depended on climate and natural resources. They can not provide equivalent power supply quality and services as hydropower plants. And limited by technology development and high costs, constructing an alternative renewable power plant is not financially attractive compared to the proposed project. Furthermore, there is not enough such kind of renewable resources and biomass at project site.

Therefore, the scenario 3 is not a possible baseline scenario.

Scenario 4: **Equivalent annual electricity supplied by CCPG**

This scenario is complied with national and local laws and regulations, and there is no obstacle in economical, technical or any other aspects to realize this scenario. Meanwhile, the CCPG is increasing its installed capacity through expansion of existing power plants and construction new power plants for decades, the installed capacity of which from 2000 to 2006 are 68,502.4MW, 72,966.2MW, 74,337.9MW, 83,450.5MW, 88,386.7MW, 98,596.4MW[4], 100,879.1MW[5], respectively.

From the data above, the scenario 4 is realistic and credible baseline scenario.

From the analysis above, the only realistic and credible baseline scenario of the project is:

Scenario 4- Equivalent annual electricity supplied by CCPG.

According to the small scale methodology AMS I.D (Version 11), there are two options to calculate the baseline emission factor:

(a) The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh), the baseline emission factor is calculated as either "a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002"

(b) "Weighted average emissions (in tCO2/MWh of the current generation mix)".

The option (a) is applied in this PDD for baseline emission factor calculation, and according to ACM0002, baseline emissions are equal to the power generated by the project that is delivered to the Central China Power Grid, multiplied by the baseline emission factor. The baseline emission factor (EF_y) is calculated as a Combined Margin (CM), which consists of the weighted average of Operating Margin (OM)

[3] Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or Below issued by the General Office of the State Council, decree no. June, 2002.

[4] China Electric Power Yearbook 2001-2006

[5] http://sgsj.ccpg.com.cn/

emission factor and Build Margin (BM) factor. An ex-ante 3 years data vintage for the Central China Power Grid is used. The key parameters used for emission reductions calculation are as follow:

Parameter	Unit	Value
EF_{OM}	tCO_2e/MWh	1.29086
EF_{BM}	tCO_2e/MWh	0.65923
EF_y	tCO_2e/MWh	0.97504

The details are provided in Section B.6 and Annex 3.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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According to the Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The faced prohibitive barriers such as:

- Investment barrier
- Technical barrier
- Barrier due to prevailing practice
- Other barrier

The insurmountable barrier for the implementation of the project is investment barrier. There are three analysis methods recommended to conduct investment analysis, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

Option I: Simple cost analysis. This analysis method can be used if the project activity produces no economic benefits other than CDM related income. However, this option is not applicable to the project because the project activity generates the revenue from the sale of generated electricity.

Option II: Investment comparison analysis. This analysis method can be only used if the alternatives to the project are similar investment projects. However, this option is not applicable to the project because the alternative to the proposed project is equivalent annual electricity supplied by CCPG which isn't a new investment project.

Option III: Benchmark analysis. According to the analysis above, the only applicable analysis method to the project is benchmark analysis (Option III). According to *Economic Evaluation Code for Small Hydropower Projects*[6] (SL16-95) approved by Ministry of Water Resources of P. R. China, the financial benchmark rate of return (after tax) for Chinese small hydropower projects (with installed capacity below 25 MW) is 10%., a project will be financially acceptable when its IRR of the total investment is better than the benchmark IRR of 10%.

The key assumptions are summarized in the following Table7:

[6] http://apps.lib.whu.edu.cn/12/test/gfbz/2/j/xsdpj.html

Table 7 Basic parameters for calculation of financial indicators of the project

Project	Unit	Data			Data Resources
		the Attached Station of the Second Level of Tuanjie Power Station	the Second Level of Tuanjie Power Station	the Lengshuiyuan Power Station	
Installed Capacity	MW	1	4	1.6	Supplementary Feasibility Study Report
Total Investment	10^4 Yuan	510.22	2025.81	848.8	Supplementary Feasibility Study Report
Net Power Generation	MWh	3921.99	15453.18	5982.66	Supplementary Feasibility Study Report
Electricity Price (Incl. VAT)	Yuan/kWh	0.25	0.25	0.25	Supplementary Feasibility Study Report
O & M Costs	10^4 Yuan	24.20	60.69	28.87	Supplementary Feasibility Study Report
Value Added Tax	/	17%	17%	17%	Supplementary Feasibility Study Report
Urban Construct &Maintenance tax	/	5%	5%	5%	Supplementary Feasibility Study Report
Additional Education Fees	/	3%	3%	3%	Supplementary Feasibility Study Report
Income Tax Rate	/	33%	33%	33%	Supplementary Feasibility Study Report

The IRR with and without CERs sale revenue refers to as follows:

Table 8 Comparative table of the financial indicators with or without CERs income

<table>
<tr><th colspan="2">Parameter</th><th>Benchmark IRR</th><th>Without CERs</th><th>With CERs</th></tr>
<tr><td rowspan="3">IRR</td><td>the Attached Station of the Second Level of Tuanjie Power Station</td><td>10%</td><td>7.29%</td><td>14.81%</td></tr>
<tr><td>the Second Level of Tuanjie Power Station</td><td>10%</td><td>8.41%</td><td>14.95%</td></tr>
<tr><td>Lengshuiyuan Power Station</td><td>10%</td><td>7.70%</td><td>14.68%</td></tr>
</table>

According to the benchmark analysis, IRR of the three power stations were obviously below the benchmark of 10%. The project was not financially attractive. It is found that the financial situation is obviously improved with CERs income.

2. Sensitivity analysis

In order to check the stability and credibility of the results obtained above, the financial sensitivity analysis is shown in Table 9-Table 11 and Fig2-Fig5:

Table 9 Sensitivity Analysis (IRR) of the Attached Station of the Second Level of Tuanjie Power Station

Parameter	Variation rate（%）		
	+10%	0%	-10%
Total Investment	6.24	7.29	8.53
Electricity Price	8.74	7.29	5.77
O & M Costs	6.63	7.29	7.94

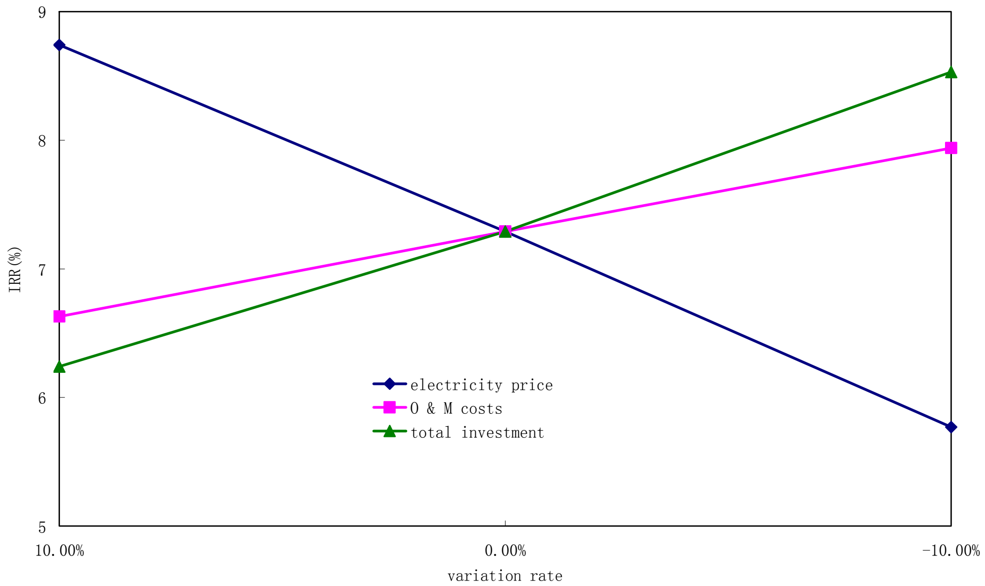

Fig. 2 Sensitivity analysis of the Attached Station of the Second Level of Tuanjie Power Station

Table 10 Sensitivity Analysis (IRR) of the Second Level of Tuanjie Power Station

Parameter	**Variation rate（%）**		
	+10%	0%	-10%
Total Investment	7.35	8.41	9.64
Electricity Price	9.67	8.41	7.08
O &M Costs	8.04	8.41	8.77

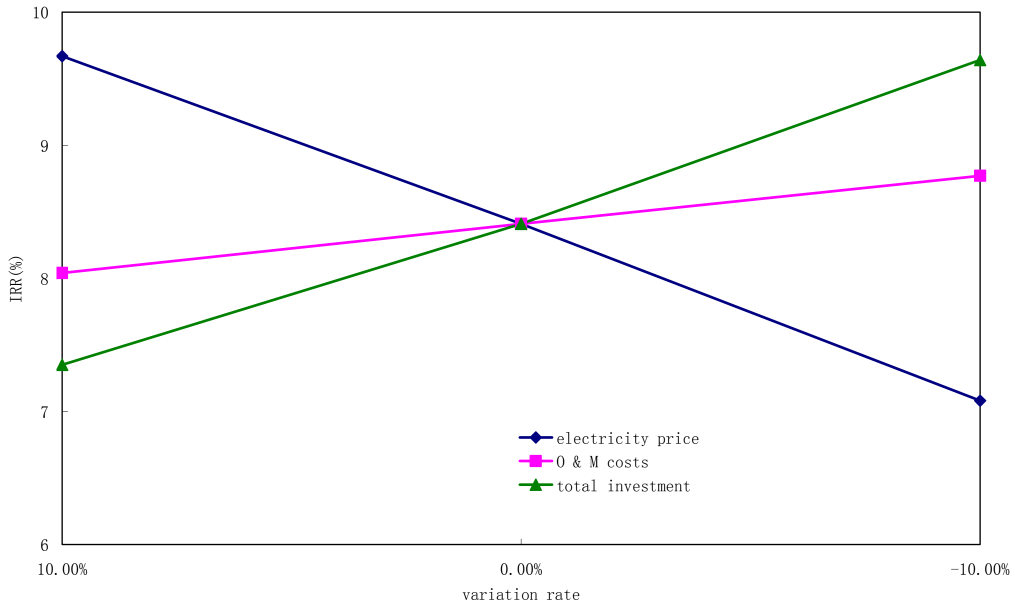

Fig. 3 Sensitivity analysis of the Second Level of Tuanjie Power Station

Table 11 Sensitivity Analysis (IRR) of the Lengshuiyuan Power Station

Parameter	**Variation rate（%）**		
	+10%	0%	-10%
Total Investment	6.67	7.70	8.93
Electricity Price	9.02	7.70	6.34
O &M Costs	7.23	7.70	8.17

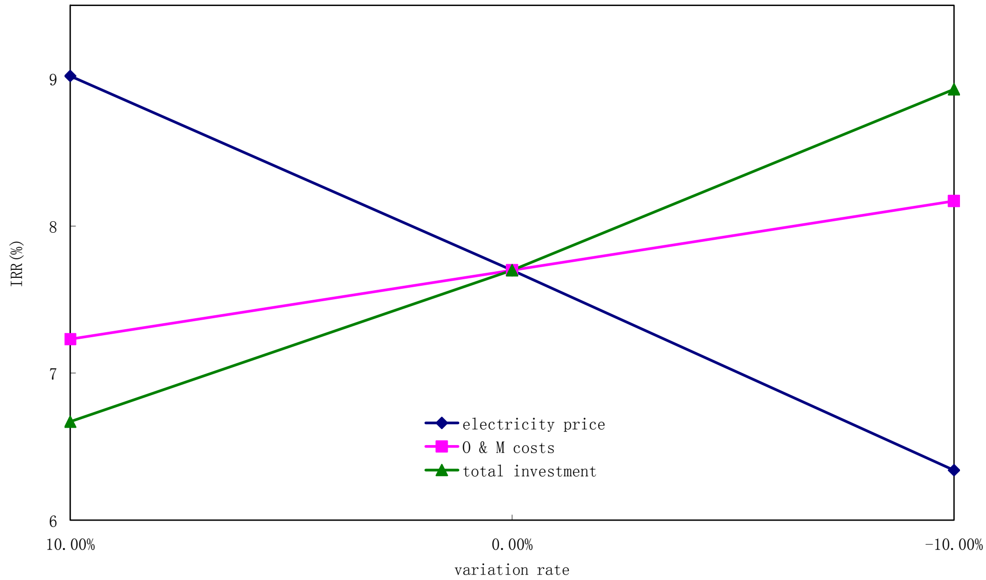

Fig. 4 Sensitivity analysis of the Lengshuiyuan Power Station

Sensitivity analysis of the project shows: Within the reasonable variation scope of the total investment, electricity price and O & M costs, the IRR has a remarkable change, but all IRRs are lower than the benchmark. Besides the electricity-sales income, the project has not any other additional income. Therefore, the project isn't financially attractive without CERs revenue.

Further discussion of sensitivity analysis:

The electricity tariff used for IRR calculation in the Supplementary FSR is 0.25RMB yuan/kwh, which is in line with Notice of the Hunan Qiyang Price Bureau on December 28, 2004. The electricity tariff is also the one regulated in the Power Purchase Agreement (PPA) signed between project owner and Hunan Qiyang Power Grid Company on December 6, 2005. In addition, from 2003 to 2008, the electricity tariff in the same area is 0.25yuan/kwh, which is confirmed by Hunan Qiyang Price Bureau. Thus the value of the tariff is reasonable and credible. The electricity generation of the project is mainly determined by the water resource condition of the region. The data in the FSR is calculated based on 41 years hydrology data from 1949 to 1999, which is credible and reasonable.

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From the IRR calculation forms, the IRRs of the three power stations will exceed the benchmark IRR when the O & M costs decrease by 42.9%, 44.7% and 50.1%, respectively. The O & M costs include salary, repair fee, water resource fee and other costs. The salary is the key component to influence the O & M costs. According to the notices publicized by the Statistical Information of Hunan, the average laborage in Yongzhou City is 19.705 Thousand RMB ￥in 2007 with the increase rate of 12.4%[7], 14%[8] and 20.6%[9], respectively from 2005 to 2007, and which shows an increasing trend. When the salary decreases to 0, the IRRs of the Attached Station of the Second Level of Tuanjie Power Station and the Lengshuiyuan Power Station are still lower than the benchmark IRR, while the IRR of the second Level of Tuanjie Power Station is 10.14%. The above analysis indicates that the salary standard for the workers is reasonable, and it is unlikely for the O & M costs to decrease to the critical point, at which the IRR can reach to the benchmark IRR.

According to the official statistics (Price Bureau of Chinese DNA), the material cost for production has increased 3.5% in 2006 and estimated to increase about 2% in 2007[10]. Therefore, it is impossible to decrease the total investment of the project. Furthermore, the project faced following unexpected additional investment:

(1) The project is located in a remote place with inconvenient transportation condition. In July, 2006, the road and other infrastructure were destroyed by the BILIS typhoon. In order to transport the materials smoothly, the project owner had to increase investment to build and maintain the roads[11].

(2) The length of the power transmission line was prolonged from 15km to 19.142km while the transmission voltage was improved from 10.5kv to 35kv correspondingly by the requirement of the local government[12]. This caused the increase of the total investment.

From above analysis, it can be found that the assumptions of fixed amounts over the 20-year period of the IRR calculation are appropriate.

In Feb, 2005, the project owner signed Letter of Intention with Hunan Sci & Tech. Information Research Institute for the application for the CDM project[13] due to the weak financial indicator in draft Feasibility Study Report.

There are 4 generators and 3 generators supposed to be installed for the Second Level of Tuanjie Power

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[7] Statistical Information of Hunan, the Statistical Information of the laborage of each city in Hunan Province in 2005, March 27, 2006

http://www.hntj.gov.cn/fxbg/2006fxbg/2006tjxx/200603270064.htm

[8] Statistical Information of Hunan, the Statistical Information of the laborage of each city in Hunan Province in 2006, March 21, 2007

http://www.hntj.gov.cn/fxbg/2007fxbg/2007tjxx/200703210067.htm

[9] Statistical Information of Hunan, the Statistical Information of the laborage of each city in Hunan Province in 2007, March 27, 2008

http://www.hntj.gov.cn/fxbg/2008fxbg/2008tjxx/200803260040.htm

[10] The price of production materials in 2006 and expected trend in 2007:

http://news.xinhuanet.com/fortune/2007-01/17/content_5615147.htm

[11] Yongzhou Jindong Forestry Centre, Testimonial Document for the Impact of BILIS on the Road Construction, September 30, 2007

[12] Hunan Qiyang Power Supply Company, Notice about Changing the Electricity Transmition Line of Tuanjie Rundle Hydropower Station, June, 2005

[13] Letter of Intention for CDM Project Design, Feb, 2005

Station and the Lengshuiyuan Power Station respectively in Feasibility Study Report[14]. Due to the actual geological structure of power house location, the instalment was changed into 2 generators for both the Second Level of Tuanjie Power Station and the Lengshuiyuan Power Station[15]。 Thus, the project owner entrusted the Hunan Yongzhou Hydropower and Conservancy Design Institute to conduct the Supplementary Feasibility Study Report of the design change in May 2005.

The IRR of 3 hydropower stations are lower than benchmark IRR, the project was not financially attractive. However, the project is financial attractive with CERs revenue[16].

The project owner submitted the bank loan application to China Construction Bank Qiyang Branch in October 2004. However, the bank loan was refused due to the low financial indicators of the project and due to the FSR has not been approved yet.

The project owner submitted the bank loan application to China Construction Bank Qiyang Branch in January 2005 second time. The project owner explained the FSR approval assessment meeting would be held in February 2005 to enhance bank's confidences. However, the bank loan was refused again due to high investment, development difficulties, long investment recovery period and financial unattractiveness.

The project owner submitted the bank loan application to China Construction Bank Qiyang Branch in June 2005 third time. It can be found from the bank loan application letter that CDM was strongly recommended by project owner. The CDM revenues can lower the bank loan repayment risks. Furthermore, the CDM Development Agreement has already been signed. Finally, the bank approved the bank loan due to CDM and the bank loan contract was signed in August 2005[17]. The project construction was commenced in October 2005[18]. Thus, the incentives from the CDM have been seriously considered in the decision to proceed with the project activity.

Gelöscht: In August, 2005, the project owner obtained the bank loan from Qiyang Branch of China Construction Bank after the bank considered CDM support would improve the project financial indicators

The above relevant evidences have been provided to DOE during on-site interview.

In summary, without the expected CERs revenue, the project could not be implemented. Therefore, it is concluded that the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project Emissions

Since that no specific guidance is provided in the AMS I.D, we follow the methodology ACM0002 (version 6) for grid-connected electricity generation from renewable sources to calculate the project emissions in this PDD.

[14] Hunan Yongzhou Hydropower and Conservancy Design Institute, Tuanjie Rundle Hydropower Project Feasibility Study Report, June, 2004

[15] Hunan Yongzhou Hydropower and Conservancy Design Institute, Tuanjie Rundle Hydropower Project Supplementary Feasibility Study Report, May 2005

[16] Supplementary Feasibility Study Report (May, 2005) and its Approval Letter (June, 2005)

[17] Qiyang Branch of China Construction Bank, Contract of Bank Loan, August, 2005

[18] Yongzhou Water Conservancy Bureau, Command of the Construction of Attached Station of the Second Level of Tuanjie Power Station/ Command of the Construction of Second Level of Tuanjie Power Station/ Command of the Construction of Lengshuiyuan Power Station, Oct 8, 2005

The project consists by three run-of-river power stations, according to ACM0002, the project emissions PE_y=0.

Baseline Emissions

According to the small scale methodology AMS I.D (Version 11), there are two options to calculate the baseline emission factor:

(a) The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh), the baseline emission factor is calculated as either "a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002"

(b) "Weighted average emissions (in tCO2/MWh of the current generation mix)".

The option (a) is applied in this PDD for baseline emission factor calculation, and according to ACM0002, baseline emissions are equal to the power generated by the project that is delivered to the Central China Power Grid, multiplied by the baseline emission factor. The baseline emission factor (EF_y) is calculated as a Combined Margin (CM), which consists of the weighted average of Operating Margin (OM) emission factor and Build Margin (BM) factor. The data and methods used for grid emission factor calculation have been compiled by Chinese DNA already[19] and the data have been cross checked in this PDD.

$$BE_y=EG_y \cdot EF_y \qquad (1)$$

Where:

EG_y is electricity supplied by the project activity to the grid in year y, in MWh;
EF_y is baseline emission factor in year y, in tCO_2e/MWh.

According to baseline methodology ACM0002, the baseline emission factor (EF_y) is calculated as a combined margin (CM), which is consisting of the weighted average of operating margin (OM) emission factor and build margin (BM) factor by utilizing an ex-ante 3 years data vintage for the CCPG.

The data used for calculation are from an official source (where available) and publicly available. The calculation processes are as follows:

Step 1. Calculating the Operating Margin emission factor （$EF_{OM,y}$）;
Step 2. Calculating the Build Margin emission factor （$EF_{BM,y}$）;
Step 3. Calculating the baseline emission factor （EF_y）.

Step 1: Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$)

According to baseline methodology ACM0002, there are four methods for calculating the $EF_{OM,y}$:

(a) Simple OM, or
(b) Simple adjusted OM, or

[19] Chinese DNA's Guideline of Emission Factors of Chinese grids, August 9, 2007 http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889

(c) Dispatch Data Analysis OM, or
(d) Average OM

Method (c) should be the first methodological choice. However, this method requires the detailed dispatch data of the CCPG, which is confidential information and is not available to be obtained by public. Thus, method (c) is not applicable. Due to the same reasons, the method (b) is not applicable.
Method (a) can be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normal data for hydroelectricity production. It can be found from Table 12 that the low-cost/must run resources constitute less than 50% of CCPG during year 2001 to 2005. Thus, method (a) is applicable to calculate $EF_{OM,y}$.
And method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation, therefore, method (d) is not applicable to calculate $EF_{OM,y}$.

Table 12 Constitution of low-cost/must run resources in CCPG during year 2001～2005[20]

Year	2001	2002	2003	2004	2005
Percentage (%)	36.76	35.95	34.43	38.37	38.56

Due to the detailed data on the individual power plants connected to the power grid is not available, therefore information by type of generating source are used for OM calculation. According to baseline methodology ACM0002, the $EF_{OM,y}$ is calculated by utilizing an *ex-ante* 3 years data vintage for CCPG, the formula as follow:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (2)$$

Where:
$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year (s) *y*;
j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid;
$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year (s) *y*; and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by power sources *j*. The data is not available in *China Electric Power Yearbook,* so the $GEN_{j,y}$ is calculated as follow:

$GEN_{j,y}$ =*Electricity generation of power plants in CCPG ×(1 －Internal use rate of power plants)* (3)

The CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (4)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*;
$OXID_i$ is the oxidation factor of the fuel;

[20] *China Electric Power Yearbook 2002～2006*

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

According to the deviation approach agreed by the 22nd CDM EB meeting for OM and BM calculation for Chinese power grids, if the detailed data at the power plants level of the grids, such as power generation quantity, internal use rate of power plants, fuel types, fuel consumption and fuel emission factors, etc., are not publicly available for the $EF_{OM,y}$ calculation, then as an alternative, the statistical data on collected power generation quantity, the internal use rate of power plants and fuel consumption which publicly available by the fuel types *i* and by province *j* covered by the power grid can be used. So, the average power generation efficiencies (gce/kWh) and average emission factors of fuel *i* can be used. The fuel *I*, power generation and the related fuel consumption data are publicly available in *China Electric Power Yearbook* and *China Energy Statistical Yearbook*. Thus, the data quoted from these two kinds of yearbooks are used for $EF_{OM,y}$ calculation.

There are exports from the CCPG to other power grids, thus the imports are not taken into account.

$EF_{OM,y}$ is calculated according to the statistics information of recent 3 years (from 2003 to 2005), the data are the latest and available at the time of this PDD submission, the detailed calculations are shown in Table A2-Table A7 of Annex 3.

Step 2: Calculating the Build Margin emission factor ($EF_{BM,y}$)

According to baseline methodology ACM0002, the Build Margin emission factor ($EF_{BM,y}$) is calculated by utilizing an *ex-ante* 3 years data vintage for CCPG, the formulae as follow:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (5)$$

Where：

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plants *m* in year (s) *y*;
$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by plants *m* and the percent oxidation of the fuel in year (s) *y*;
$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plants *m*. It equals to power generation minus power plants self power consumption.

ACM0002 provides two following options to calculate BM:

1) Calculate the BM emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission.

2) For the first crediting period, the BM emission factor $EF_{BM,y}$ must be updated annually ex-post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated ex-ante, as described in option 1) above.

Option 1) is chosen by project participants to calculate $EF_{BM,y}$ for this project, and can not be changed during the crediting period.

For the sample group *m*, it includes two options:

1) The five power plants that have been built most recently, or

2) The power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The project participants should use from these two options that sample group that comprises the larger annual generation.

Because of the same reasons as the data unavailability at the power plant level in China, the 22nd CDM EB meeting agreed the following deviation[21] approaches for $EF_{BM,y}$ calculation:

1) Use the efficiency level of the best technologies commercially available in the provincial/regional or national grid of China, as a conservative proxy, for fuel *i* consumption estimation to estimate the $EF_{BM,y}$.

2) Use capacity additions during last several years for estimating the $EF_{BM,y}$, i.e. the capacity addition over last several years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

3) Use installed capacity to replace annual power generation to estimate weights.

Due to the difficulty of separating the coal-fired, gas-fired or oil-fired installed capacity from the total thermal installed capacity, the $EF_{BM,y}$ will be calculated as:

1) Based on the most recent years energy balance of the CCPG, calculating the proportions of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total CO_2 emissions of thermal power plants;

2) Based on the most advanced commercialized technologies which applied by the coal-fired, oil-fired and gas-fired power plants, calculating the emission factor of thermal power plants in CCPG. This approach is more conservative as it assumes all recently built plants have the fuel efficiency as that of the most advanced commercialized technologies;

3) Calculating the $EF_{BM,y}$ through emission factor of thermal power plants times the percentage share of thermal power plants installed capacity addition within all recently built installed capacity. The proper year is selected so that it is the closest time when the last 20% of installed capacity was built.

The above calculation approach has been used by several recently registered China projects. The BM emission factor in this PDD is calculated as following sub-steps.

Sub-Step 2a: Calculating the percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in CO_2 emissions from total thermal power plants

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (6)$$

Where:

[21] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

λ_{Gas}, λ_{Oil} and λ_{Coal} are respectively the percentages of CO_2 emissions from the gas-fired, oil-fired, coal-fired power plants in CO_2 emissions from total thermal power plants;
$F_{i,j,y}$ is the amount of fuel i (tce) consumed by the power sources province j in year y;
$COEF_{i,j}$ is the CO_2 emission coefficient (tCO_2/tce) of fuel i, taking into account the carbon content of the fuels used by the grid and the percent oxidation of the fuel in year y.

Sub-Step 2b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)

$$EF_{Thermal} = \lambda_{coal} \times EF_{coal,adv} + \lambda_{oil} \times EF_{oil,adv} + \lambda_{gas} \times EF_{gas,adv} \qquad (7)$$

Where:

$EF_{Thermal}$ is the emission factor of thermal power plants;
$EF_{Coal,\,Adv}$, $EF_{Oil,\,Adv}$ and $EF_{Gas,\,Adv}$ are corresponding to the emission factors of coal, oil and gas, which are applied by the most advanced commercialized technologies.

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \qquad (8)$$

Where:

$EF_{BM,y}$ is the Build Margin (BM) emission factor with advanced commercialized technologies for year y;
CAP_{Total} is the installed capacity of all recently built power plants;
$CAP_{Thermal}$ is the newly installed capacity of recently built thermal power plants;
$EF_{Thermal}$ is the emission factor of thermal power plants.

$EF_{BM,y}$ is calculated according to the latest and available data at the time of this PDD submission, the detailed calculations are shown in Table A8-Table A11 of Annex 3.

Step 3: Calculating the baseline emission factor (EF_y)

According to baseline methodology ACM0002, baseline emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \qquad (9)$$

Where:

The weighs w_{OM} and w_{BM}, by default, are 50% (i.e., w_{OM}= w_{BM}= 0.5), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2e/MWh.

The EF_y applied in this PDD is fixed for a crediting period and may be revised at the renewal of the crediting period.

Leakage

Leakage (L_y): the energy generating equipment is not transferred from another activity, and the existing equipment is not transferred to another activity, so according to AMS I.D, the leakage of the project is excluded.

Emission Reductions

The annual emission reduction (ER_y) of the project is the difference between baseline emission, project emissions and emissions due to leakage:

$$ER_y\ (tCO_2e/yr) = BE_y - PE_y - L_y \qquad (10)$$

B.6.2. Data and parameters that are available at validation:

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B.6.2. Data and parameters that are available at validation:

Data / Parameter:	NCV_i
Data unit:	kJ/kg or kJ/m^3
Description:	The net calorific value (energy content) per mass or volume unit of fuel *i*
Source of data used:	*China Energy Statistical Yearbook 2006*.
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$OXID_i$
Data unit:	/
Description:	Oxidation factor of the fuel *i*
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$F_{i,j,y}$
Data unit:	10^4 t, 10^8 m^3
Description:	The quantity of fuel *i* (in a mass or volume unit) consumed by the relevant provinces *j* in year(s) *y*
Source of data used:	*China Energy Statistical Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of	Data used are from Chinese authorities.

measurement methods and procedures actually applied :	
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	*Electricity generation in of power plants in CCPG*
Data unit:	MWh
Description:	The electricity generated by province *j* in CCPG in year *y*.
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	*Internal power use rate of power plant*
Data unit:	%
Description:	The internal power consumption rate of power plants in province *j* in CCPG in year *y*.
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$CAP_{i,j,y}$
Data unit:	MW
Description:	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data used:	*China Electric Power Yearbook 2001-2006*

Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$GENE_{best,coal,}$
Data unit:	/
Description:	The power supply efficiency of coal-fired power plants with best technology commercially available
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	35.82%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	/
Description:	The power supply efficiency of oil/gas-fired power plants with best technologies commercially available
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Used for calculation of power grid emission factor

B.6.3 Ex-ante calculation of emission reductions:

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Project emission

According to B 6.1, the project emission is zero,

$$PE_y = 0$$

Baseline emission

As the discussion in Section B 6.1, the baseline emission factor i.e. the Combined Margin emission factor will be calculated as the average of EF_{OM} and EF_{BM} as Equation (9).
For CCPG, the Baseline Emission Factor is given as follows:

Table 13 Calculating result of baseline emission factor of CCPG

EF_{OM} (tCO_2e/MWh)	EF_{BM} (tCO_2e/MWh)	EF_y (tCO_2e/MWh)
1.29086	0.65923	0.97504

The annual baseline emission (BE_y) of the Project is calculated as follow:

Baseline emission of the Attached Station of the Second Level of Tuanjie Power Station:

BE_y = 3,921.99 MWh ×0.97504 tCO_2e /MWh= 3,824 tCO_2 e /yr

Baseline emission of the Second Level of Tuanjie Power Station:

BE_y = 15,453.18 MWh ×0.97504 tCO_2e /MWh= 15,067 tCO_2 e /yr

Baseline emission of the Lengshuiyuan Power Station:

BE_y = 5982.66 MWh ×0.97504 tCO_2e /MWh= 5,834 tCO_2 e /yr

The total baseline emmision is:

BE_y =3,824 tCO_2 e /yr+15,067 tCO_2 e /yr + 5,834 tCO_2 e /yr = 24,725 tCO_2 e /yr

Leakage

As mentioned in Section B.6.1, $L_y = 0$

Emission Reductions

Since both the project emission and leakage of the Project are zero, the estimated CER per year for the Project is obtained as follows:

ER_y=BE_y −PE_y −L_y = 24,725 tCO_2e /yr

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Table 14 Ex-ante estimation of the emission reductions of the Attached Station of the Second Level of Tuanjie Power Station

Year	Estimation of the project activity emission reductions (tonnes of CO_2e)	Estimation of baseline emission reductions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of emission reductions (tonnes of CO_2e)
01/05/2008-30/04/2009	0	3,824	0	3,824
01/05/2009-30/04/2010	0	3,824	0	3,824
01/05/2010-30/04/2011	0	3,824	0	3,824
01/05/2011-30/04/2012	0	3,824	0	3,824
01/05/2012-30/04/2013	0	3,824	0	3,824
01/05/2013-30/04/2014	0	3,824	0	3,824
01/05/2014-30/04/2015	0	3,824	0	3,824
total (tonnes of CO_2e)	0	26,768	0	26,768

Table 15 Ex-ante estimation of the emission reductions of the Second Level of Tuanjie Power Station

Year	Estimation of the project activity emission reductions (tonnes of CO2e)	Estimation of baseline emission reductions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of emission reductions (tonnes of CO2e)
01/05/2008-30/04/2009	0	15,067	0	15,067
01/05/2009-30/04/2010	0	15,067	0	15,067
01/05/2010-30/04/2011	0	15,067	0	15,067
01/05/2011-30/04/2012	0	15,067	0	15,067
01/05/2012-30/04/2013	0	15,067	0	15,067
01/05/2013-30/04/2014	0	15,067	0	15,067
01/05/2014-30/04/2015	0	15,067	0	15,067
total (tonnes of CO2e)	0	105,469	0	105,469

Table 16 Ex-ante estimation of the emission reductions of Lengshuiyuan Power Station

Year	**Estimation of the project activity emission reductions (tonnes of CO_2e)**	**Estimation of baseline emission reductions (tonnes of CO_2e)**	**Estimation of leakage (tonnes of CO_2e)**	**Estimation of emission reductions (tonnes of CO_2e)**
01/05/2008-30/04/2009	0	3,824	0	3,824
01/05/2009-30/04/2010	0	3,824	0	3,824
01/05/2010-30/04/2011	0	3,824	0	3,824
01/05/2011-30/04/2012	0	3,824	0	3,824
01/05/2012-30/04/2013	0	3,824	0	3,824
01/05/2013-30/04/2014	0	3,824	0	3,824
01/05/2014-30/04/2015	0	3,824	0	3,824
total (tonnes of CO_2e)	0	26,768	0	26,768

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{export, y}$
Data unit:	MWh
Description:	Generated electricity delivered to CCPG
Source of data to be used:	Meter at the connection point to CCPG
Value of data	/
Description of measurement methods and procedures to be applied:	The data is measured hourly through bidirectional meter (Main Meter) with accuracy of 0.5s and is recorded monthly.
QA/QC procedures to be applied:	The data is measured by bidirectional Main Meter with accuracy of 0.5s. Sales receipts will be used for double check to ensure the consistency. The meter will be calibrated at least once a year by qualified organization to ensure the accuracy. There is also a Backup Meter with same accuracy and function to ensure the data accuracy. All the electronic and paper monitoring documents will be archived during the crediting period and two years after and also two years after last issuance of CER.
Any comment:	Used for net generated electricity calculation

Data / Parameter:	$EG_{import, y}$
Data unit:	MWh
Description:	Electricity imported from CCPG to the project
Source of data to be used:	Meter at the connection point to CCPG
Value of data	/
Description of measurement methods and procedures to be applied:	The data is measured hourly through bidirectional meter (Main Meter) with accuracy of 0.5s and is recorded monthly.
QA/QC procedures to be applied:	The data is measured by bidirectional Main Meter with accuracy of 0.5s. Records provided by power grid company will be used for double check to ensure the consistency. The meters will be calibrated at least once a year by qualified organization to ensure the accuracy. There is also a Backup Meter with same accuracy and function to ensure the data accuracy. All the electronic and paper monitoring documents will be archived during the crediting period and two years after and also two years after last issuance of CER.
Any comment:	Used for net generated electricity calculation

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net generated electricity delivered to CCPG
Source of data to be used:	Calculated
Value of data	Expected net electricity quantity of the Attached Station of the Second Level of Tuanjie Power Station is 3,921.99MWh Expected net electricity quantity of the Second Level of Tuanjie Power Station is 15,453.18MWh Expected net electricity quantity of Lengshuiyuan Power Station is 5982.66MWh The total expected net electricity quantity is 25,357.8MWh

Description of measurement methods and procedures to be applied:	The data is difference of $EG_{export, y}$ and $EG_{import, y}$.
QA/QC procedures to be applied:	Please refer to parameter table $EG_{export, y}$ and $EG_{import, y}$.
Any comment:	Used for emission reductions calculation

B.7.2 Description of the monitoring plan:

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1. Monitoring subject

The main data to be monitored are $EG_{Export,y}$ and $EG_{Import,y}$, the EG_y is calculated as difference of $EG_{Export,y}$ and $EG_{Import,y}$.

2. Monitoring management structure

In order to insure the monitoring plan work effectively and efficiently, the project owner has established the management structure as shown in Fig. 5, which identified the related staffs and institution for data collection and archiving. In addition, the project owner will designate a monitoring director to take charge of supervising the measuring and recording tasks, such as collecting data (meter readings, sale receipts), calculating emission reductions and preparing monitoring report etc.

The director will receive technical supports from the Hunan CDM Project Service Centre.

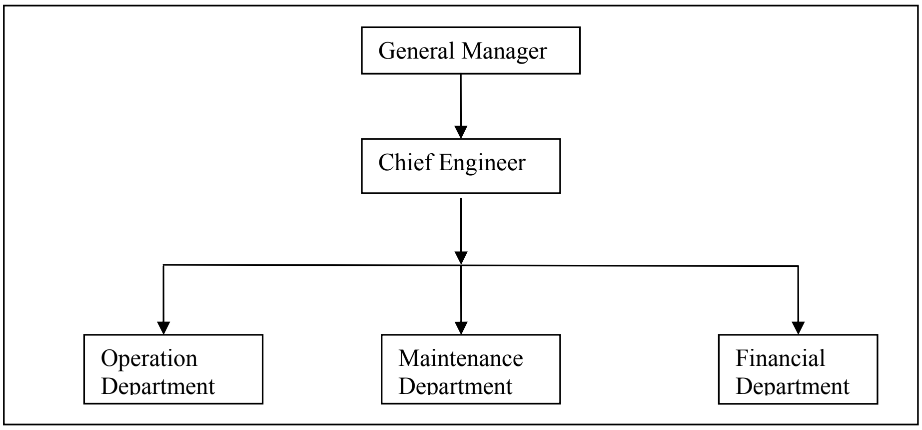

Fig. 5 Operational and Management Structure

The main responsibility of each apartment:

General Manager: check and submit the electricity monitor data to DOE and Hunan CDM Service Center.

Chief Engineer: check the insistence of the sales receipts from power grid and the electricity monitor data recorded by the hydropower station.

Operation Department: take charge the operation condition of turbines and generators, record and keep the electricity monitor data.

Maintenance Department: with responsibility for maintenance of the facilities and tools of the hydropower station, taking charge of the hardware and software of the computer monitor system, ensuring the turbines and generators work in order.

Finance Department: set up the financial system according to the regulations, calculate and validate the capital management and implement measures, record the increase and decrease status of the capital flow.

3. Monitoring apparatus and installment:
The electronic meters will be installed according to Technology & Management Regulations for Power Metering Devices (DL/T448-2000), the accuracy of the meters are in line with national regulations. The meters should be examined and accepted by the project owner and the grid before the project is put into operation. The principal diagram of the meters position is as follows:

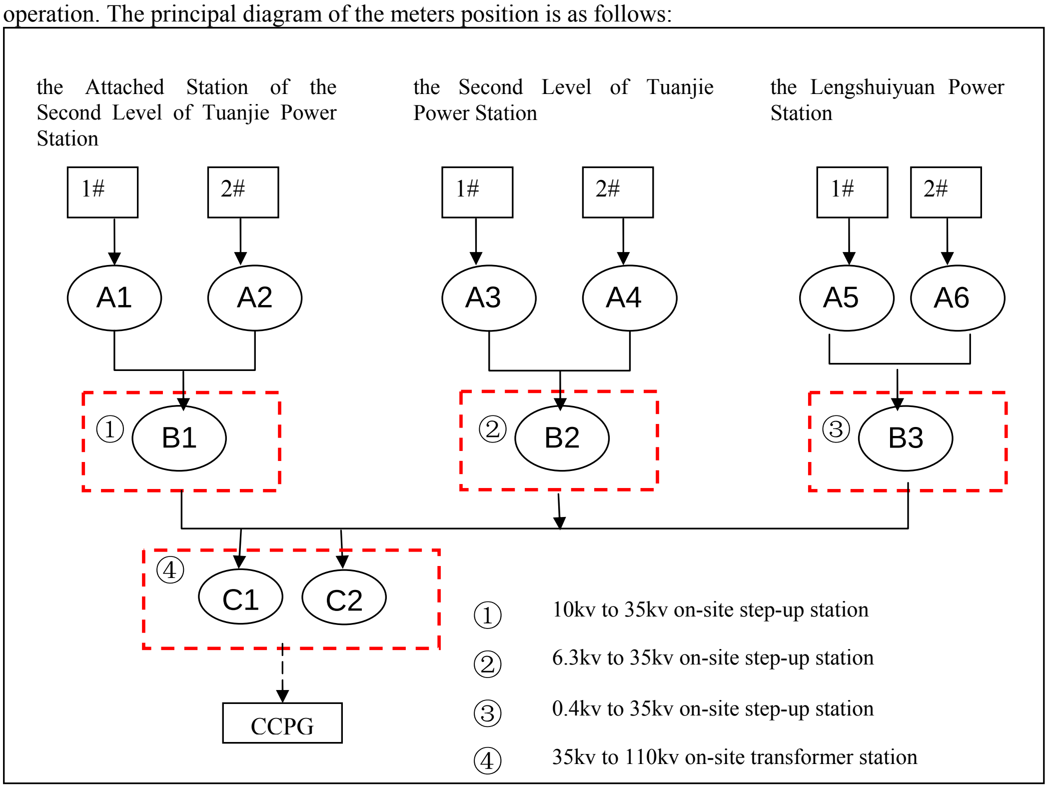

Fig. 6 Meter positions of the project

Where: A1-A6 represent the meter for monitoring electricity generation at the exist of each generator
B1-B3 represent the meter at the high voltage of step-up station of each power station
C1 and C2 represent the Main Meter (C1) and Backup Meter (C2) respectively.

4. Data monitoring
The readings of the main meter are used for calculating the emission reductions when the main meter is in normal operation state. The monitoring processes are as follows:

(1) The $EG_{export, y}$ and $EG_{import, y}$ are measured hourly through bidirectional Main Meter with accuracy of 0.5s and are recorded monthly;

(2) The project developer provides the power grid company with sales receipt and preserves the copy of the sale receipt; The power grid company provide the project owner with records of $EG_{import, y}$ data and net power generation data.

(3) The project developer provides the DOE with the readings of the meters at the connection point or the settling accounts sheets and the copy of sale receipt.

5. Quality control
(1) Calibration of meters
The calibration of meters conducted by a qualified organization must comply with national standard and sectional regulations to ensure the accuracy. The meters will be calibrated once per year. The meters must be sealed after calibration. The calibration records must be archived together with other monitoring records.

When the main meter or back-up meter have a breakdown, the party finding the breakdown should tell another party and inform the qualified calibration organization to check, calibrate, test and treat the meter so as to recover the normal monitoring state.

(2) Emergency treatment
When the Main Meter have a breakdown, the monitored data will be treated as follows:

a. Backup Meter will be adopted for monitoring;
b. If both of the Main Meter and Backup meter have breakdown, the project owner should notice the power grid company immediately and solve the problem with a conservative method.

After handling of the emergency, the project owner must prepare a report regarding the emergency to explain to DOE that the handling method is reasonable.

6. Data management
All monitoring data and records will be archived in electronic documents as well as in paper. The electronic documents will be backed up in compact disc or hard disc form. The project developer will also keep the copies of sale receipts and prepare a monitoring report at the end of each year, which includes the net electricity generation, the monitoring data summary, the calibration records, and the emission reductions calculation.
All the electronic and paper documents will be archived during the crediting period and two years after.

7. Training program
Firstly, the project owner should train all the related staff. The whole training program contains the CDM knowledge, the operational regulations, the quality control (QC) standard flows, the data recording requirements and the management rules.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Final Date of completion of the application of the baseline and monitoring methodology

19/03/2008

Name of person/entity of completion of the application of the baseline and monitoring methodology

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Above individuals / entities are not as project participants.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
08/10/2005[22] (Construction permission of the project)

C.1.2. Expected operational lifetime of the project activity:

>>
20 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

>>

C.2.1.1. Starting date of the first crediting period:

>>
01/05/2008 (or the registration date, which is later)

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>

[22] Yongzhou Water Conservancy Bureau, Command of the Construction of Attached Station of the Second Level of Tuanjie Power Station/ Command of the Construction of Second Level of Tuanjie Power Station/ Command of the Construction of Lengshuiyuan Power Station, Oct 8, 2005

Not applicable

SECTION D. Environmental impacts

>>

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>

In 2005, the project developer obtained the approval (Yonghuanguanhan [2005] No.16) from Yongzhou Environmental Protection Bureau. The main comments of the EIA report are as follows: "The construction of the project will be helpful to the local society and economy. The suggestion and measures are feasible in technology. The waste water produced during the construction should be disposed properly. The project developer should meet that the water demands of the residents' downstream and biological environment."[23]

The main contents of the EIA report are as follows[24]:

Impact items	Assessment and Views on environmental impacts	Measures for environmental protection
Construction period		
Water quality	During the project construction period, the waste water mainly come from the sand process system, concrete mixer and oil waste water, however, the impact is not seriously.	（1）Set up the sediment detention pool in constructing place; （2）Set up the special washing district to dispose waste oil; （3）Living sewage will be used as fertilizer by the local peasants.
Air quality	The dust influencing area generally includes concrete mixer, drilling and transportation area.	Sprinkle water in the construction area to prevent the fly-ash;
Noise	The impact of noise from the construction and transportation is slight because there are little residents but workers.	(1) Forbid the trucks' whistling loudly; (2) Adopt the advanced low-noisy technology;
Solid waste	The solid garbage mainly includes the earth and stone caused by the construction and living rubbish.	(1) Collect and transport the solid garbage to the fixed deposit place; (2) Take related soil & water conservation measures;
Human health	There will be garbage and sewage with the increase of the population density. The living condition and health epidemic	Set up the health & epidemic prevention institute, register the health condition of the workers，provide the medicine and

[23] Yongzhou Environment Protection Bureau, Approval of Qiyang County Tuanjie Small Rundle Hydropower Project Environment Impact Assessment Report(Yonghuanguanhan(2005)No.16), June 8, 2005

[24] Changsha Environment Protection College, Environment Impact Assessment of Lengshuiyuan Power Station, Environment Impact Assessment of the Second Level of Tuanjie Power Station of Tuanjie Power Station, Environment Impact Assessment of the Second Level of Tuanjie Power Station Attached Station of Tuanjie Power Station, May 20, 2005

	prevention will not very perfect, so the diseases are easily happen if the workers do not care about the diet and living habits.	take examinations termly for the workers. （2）Appoint special people to take charge of the sanitation of the construction site to ensure the water safety.
ecosystem	There is no obvious impact on the ecosystem for the project is bundled run-of-river power stations with no submerge.	Keep the Roadside planting

There will be no negative impact on the environment during the operation period.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

Both of the Host Party and the project owner regard that the proposed project will not bring significant impacts on the environment.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

The project owner put up the bulletins all around the project site and held a symposium for stakeholders[25]. The participants were mainly the persons who had direct relationships with the project, including people of different age, sexes, occupations and educational backgrounds. All participants had wide representativeness. More details are showed in Section E.2.

The questions mainly discussed in symposium are as follows:

Main contents:

1. Is the effect of the project helpful to local economic development?
2. What is your attitude towards this project?
3. What is your opinion about the effect on local residents' economic incomes?
4. What is your opinion about the effect on the local natural landscape?
5. What is your opinion about the effect on the local residents' health?
6. What is your opinion about the effect on local ecological environment after the project was fulfilled?
7. Road maintenance problem after the project was completed
8. Other advices on the project.

E.2. Summary of the comments received:

>>

In the symposium, project owner gave a simple introduction about Tuanjie Small Rundle Hydropower Station, while local government officials introduced the necessity and meaning of the project. Representatives expressed their opinions in the symposium. They considered the project would bring active effect on local economy, but there were some problems need to be resolved.

The main advices are as follows:

1. Whether they could participate in the development of tour area of hydropower station?
2. Whether project owner could construct some infrastructure for local residents?
3. Hope that more work opportunities could be provided for local residents;
4. Part of Representatives worried about the effect of project on environment, especially water quality;
5. The project developer should maintain the road.

E.3. Report on how due account was taken of any comments received:

>>

According to the comments of the stakeholders above, the project owner will take the following measures:

[25] Qiyang Haojie Hydroelectric Co., Ltd , Summary of symposium of Stakeholders related to Tuanjie Small Rundle Hydropower Station, April 27, 2005

1. The project owner will support local residents to develop tourism business, furthermore, the project owner will build and maintain the traffic infrastructure around the village;
2. The project owner will employ local residents participate to operate and manage the hydropower station;
3. The project owner will reduce dust, noise, and water pollution to the best of their abilities, and they will plant trees and grasses to recover vegetation after the completion of the project construction;
4. The project owner will take the environment protection measures according to the suggestion in the EIA;
5. The project owner will take charge of the maintenance of the road.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from parties included in Annex I is available to the project activity.

Annex 3

BASELINE INFORMATION

The installed capacity, fuel consumption data used for OM and BM calculation are derived from <China Energy Statistical Yearbook>, <China Electric Power Yearbook>.

The low calorific value, CO_2 emission factor and oxidation factor of fuels are listed in Table A1 below.

Table A1 Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific Value	Emission Factor (tC/TJ)	Oxidation Factor
Raw Coal	20908 kJ/kg	25.8	100%
Cleaned Coal	26344 kJ/kg	25.8	100%
Other Washed Coal	8363 kJ/kg	25.8	100%
Coke	28435 kJ/kg	29.2*	100%
Crude Oil	41816 kJ/kg	20.0	100%
Gasoline	43070 kJ/kg	18.9	100%
Diesel Oil	42652 kJ/kg	20.2	100%
Fuel Oil	41816 kJ/kg	21.1	100%
Natural Gas	38931 kJ/m^3	15.3	100%
Coke Oven Gas	16726 kJ/m^3	12.1	100%
Other Gas	5227 kJ/m^3	12.1	100%
LPG	50179 kJ/kg	17.2	100%
Refinery Dry Gas	46055 kJ/kg	15.7*	100%

Data Source:

The net calorific values are quoted from <China Energy Statistical Yearbook 2006>, Page 287.

The emission factors and oxidation factors are quoted from <Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories >, Table 1.4, Page 1.24, Chapter 1, Volume 2.

Step 1: Calculating the Operating Margin emission factor (*$EF_{OM,y}$*)

Table A2 Simple OM Emission Factors Calculation of CCPG for Year 2003

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	(MJ/t,km^3)	K=G*H*I*J*44 /12/10000 (for mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J	K=G*H*I*J*44 /12 /1000 (for volume unit)
Raw Coal	10^4 t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13851.66	25.8	100	20908	273971539.89
Cleaned Coal	10^4 t							0	25.8	100	26344	0
Other Washed Coal	10^4 t	2.03	39.63			106.12		147.78	25.8	100	8363	1169146.40
Coke	10^4 t				1.22			1.22	29.2	100	28435	37142.18
Coke Oven Gas	10^8 m^3			0.93				0.93	12.1	100	16726	69013.15
Other Gas	10^8 m^3							0	12.1	100	5227	0
Crude Oil	10^4 t		0.5	0.24			1.2	1.94	20	100	41816	59490.23
Diesel Oil	10^4 t	0.52	2.54	0.69	1.21	0.77		5.73	20.2	100	42652	181015.94
Fuel Oil	10^4 t	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.1	100	41816	157229.00
LPG	10^4 t							0	17.2	100	50179	0
Refinery Dry Gas	10^4 t	1.76	6.53		0.66			8.95	15.7	100	46055	237285.34
Natural Gas	10^8 m^3					0.04	2.2	2.24	15.3	100	38931	489222.52
											Total	**276371084.63**

Data Source: <China Energy Statistical Yearbook 2004>

Table A3 Fuel-fired Electricity Generation of CCPG for Year 2003

Province	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Jiangxi	271.65	27165000	6.43	25418291
Henan	955.18	95518000	7.68	88182218
Hubei	395.32	39532000	3.81	38025831
Hunan	295.01	29501000	4.58	28149854
Chongqing	163.41	16341000	8.97	14875212
Sichuan	327.82	32782000	4.41	31336314
Total				225987719

Data Source: <China Electric Power Yearbook 2004>

According to Table A2, the total CO_2 emissions of CCPG is **276371084.63** tCO_2e in year 2003. According to Table A3, the total supplied electricity of CCPG is 225987719.2 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2003}$ is 1.2229 tCO_2e/MWh.

Table A4 Simple OM Emission Factors Calculation of CCPG for Year 2004

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	(MJ/t,km^3)	K=G*H*I*J* 44/12/10000 (for mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J	K=G*H*I*J*4 4/12 /1000 (for volume unit)
Raw Coal	10^4 t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20908	339092605.29
Cleaned Coal	10^4 t		2.34					2.34	25.8	100	26344	58316.13
Other Washed Coal	10^4 t	48.93	104.22			89.72		242.87	25.8	100	8363	1921441.23
Coke	10^4 t		109.61					109.61	29.2	100	28435	3337011.41
Coke Oven Gas	10^8 m^3			1.68		0.34		2.02	12.1	100	16726	149899.53
Other Gas	10^8 m^3					2.61		2.61	12.1	100	5227	60527.09
Crude Oil	10^4 t		0.86	0.22				1.08	20	100	41816	33118.27
Gasoline	10^4 t		0.06			0.01		0.07	20	100	43070	2089.33
Diesel Oil	10^4 t	0.02	3.86	1.7	1.72	1.14		8.44	18.9	100	42652	266627.32
Fuel Oil	10^4 t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	20.2	100	41816	464893.14
LPG	10^4 t							0	21.1	100	50179	0
Refinery Dry Gas	10^4 t	3.52	2.27					5.79	17.2	100	46055	153506.38
Natural Gas	10^8 m^3						2.27	2.27	15.7	100	38931	495774.61
											Total	**346035809.73**

Data Source: <China Energy Statistical Yearbook 2005>

Table A5 Fuel-fired Electricity Generation of CCPG for Year 2004

Province	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Jiangxi	301.27	30127000	7.04	28006059
Henan	1093.52	109352000	8.19	100396071
Hubei	430.34	43034000	6.58	40202363
Hunan	371.86	37186000	7.47	34408206
Chongqing	165.2	16520000	11.06	14692888
Sichuan	346.27	34627000	9.41	31368599
Total				249074186

Data Source: <China Electric Power Yearbook 2005>

According to Table A4, the total CO_2 emissions of CCPG is 346035809.73 tCO_2e in year 2004. According to Table A5, the total supplied electricity of CCPG is 249074186 MWh. According to formula (2) in section B.6.1, the $EF_{OM,\ Simple,\ 2004}$ is 1.3893 tCO_2e/MWh.

Table A6 Simple OM Emission Factors Calculation of CCPG for Year 2005

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	($MJ/t,km^3$)	K=G*H*I*J*44 /12/10000 (for mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J	K=G*H*I*J *44/12/1000 (for volume unit)
Raw Coal	10^4 t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100	20908	352614496.76
Cleaned Coal	10^4 t	0.02	0					0.02	25.8	100	26344	498.43
Other Washed Coal	10^4 t		138.12			89.99		228.11	25.8	100	8363	1804669.00
Coke	10^4 t		25.95		105			130.95	29.2	100	28435	3986695.05
Coke Oven Gas	10^8 m^3			1.15		0.36		1.51	12.1	100	16726	112053.61
Other Gas	10^8 m^3		10.2			3.12		13.32	12.1	100	5227	308896.88
Crude Oil	10^4 t		0.82	0.36				1.18	20	100	41816	36184.78
Gasoline			0.02			0.02		0.04	18.9	100	43070	1193.90
Diesel Oil	10^4 t	1.3	3.03	2.39	1.39	1.38		9.49	20.2	100	42652	299797.78
Fuel Oil	10^4 t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41816	286959.09
LPG	10^4 t							0	17.2	100	50179	0.00
Refinery Dry Gas	10^4 t	0.71	3.41	1.76	0.78			6.66	15.7	100	46055	176572.11
Natural Gas	10^8 m^3						3	3	15.3	100	38931	655208.73
											Total	**360283226.12**

Data Source: <China Energy Statistical Yearbook 2006>

Table A7 Fuel-fired Electricity Generation of CCPG for Year 2005

Province	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Jiangxi	300	30000000	6.48	28056000
Henan	1315.9	131590000	7.32	121957612
Hubei	477	47700000	2.51	46502730
Hunan	399	39900000	5.00	37905000
Chongqing	175.84	17584000	8.05	16168488
Sichuan	372.02	37202000	4.27	35613474.6
Total				286203304.6

Data Source: <China Electric Power Yearbook 2006>

According to Table A6, the total CO_2 emissions of CCPG is 360283226.12 tCO_2e in year 2005. According to Table A7, the total supplied electricity of CCPG is 286203304.6 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2005}$ is 1.2588 tCO_2e/MWh.

The Operating Margin (OM) emission factor is the weighted average emission factors of year 2003-2005, as follow:

$$EF_{OM} = 1.29086\ tCO_2e/MWh$$

Step 2: Calculating the Build Margin emission factor ($EF_{BM,y}$)

Sub-Step 2a: Calculating of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

Table A8 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

		Jiangxi	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total**	**Average Low Calorific Value**	**Emission Factor (tC/TJ)**	**Oxidation**	**CO_2 Emission (tCO_2e)**
Fuel	Unit	A	B	C	D	E	F	G=A+…+F	H	I	J	K=G*H*I*J*44 /12/100
Raw Coal	10^4 t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	20908 kJ/kg	25.8	100%	352614496.76
Cleaned Coal	10^4 t	0.02	0					0.02	26344 kJ/kg	25.8	100%	498.43
Other Washed Coal	10^4 t		138.12			89.99		228.11	8363 kJ/kg	25.8	100%	1804669.00
Coke	10^4 t		25.95		105			130.95	28435 kJ/kg	29.2	100%	3986695.05
Subtotal												**358406359.24**
Crude Oil	10^4 t		0.82	0.36				1.18	41816 kJ/kg	20	100%	36184.78
Gasoline	10^4 t		0.02			0.02		0.04	43070 kJ/kg	18.9	100%	1193.90
Diesel Oil	10^4 t	1.3	3.03	2.39	1.39	1.38		9.49	42652 kJ/kg	20.2	100%	299797.78
Fuel Oil	10^4 t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	41816 kJ/kg	21.1	100%	286959.09
Subtotal												**624135.55**
Natural Gas	10^7 m^3						30	30	38931 kJ/m^3	15.3	100%	655208.73
Coke Oven Gas	10^7 m^3			11.5		3.6		15.1	16726 kJ/m^3	12.1	100%	112053.61
Other Gas	10^7 m^3		102			31.2		133.2	5227 kJ/m^3	12.1	100%	308896.88
LPG	10^4 t							0	50179 kJ/kg	17.2	100%	0.00
Refinery Dry Gas	10^4 t	0.71	3.41	1.76	0.78			6.66	46055 kJ/kg	15.7	100%	176572.11
Subtotal												**1252731.33**
Total												**360283226.12**

Data Source: <China Energy Statistical Yearbook 2006>

According to Table A8 and formula (6) in section B.6.1, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$$\lambda_{Coal} = 99.48\%,\quad \lambda_{Oil} = 0.17\%,\quad \lambda_{Gas} = 0.35\%$$

Sub-Step 2b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)

The most advanced commercialized technologies for coal-fired power plants in China are domestic 600 MW sub-critical generators, with the standard coal consumption of power supply of 343.33 gce/kWh. For gas-fired and oil-fired power plants in China, the most advanced commercialized technologies are 200 MW combined cycle generators. The standard coal consumption (equivalent) for power supply of oil-fired and gas-fired power plants are 258 gce/kWh.

Parameters used for calculating fuel-fired emission factor are shown in Table A9 below:

Table A9 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Suppy	Emission Factor of Fuel (tc/TJ)	Oxidation Factor	Emission Factor (tCO2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coar-fired Power Plant	$EF_{Coal,Adv}$	35.82%	25.8	100%	0.9508
Gas-fired Power Plant	$EF_{Gas,Adv}$	47.67%	15.3	100%	0.4237
Oil-fired Power Plant	$EF_{Oil,Adv}$	47.67%	21.1	100%	0.5843

According to Table A9 and formula (7) in section B.6.1, the $EF_{Thermal}$ is 0.94828 tCO_2e/MWh

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

Table A10 Installed Capacities of CCPG

Installed Capacity	**Unit**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Fuel-fired	MW	39864.6	42569.2	43303.2	46893.5	53744.7	60167.3
Hydro	MW	28637.8	30397	31034.7	36557	34642	38405.1
Nuclear	MW	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	0	24
Total	MW	**68502.4**	**72966.2**	**74337.9**	**83450.5**	**88386.7**	**98596.4**

Data Source: <China Electric Power Yearbook 2001-2006>

Table A11 Newly Added Installed Capacity from Year 2000-2005

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**F-C**
	A	**B**	**C**	**D**	**E**	**F**	
Fuel-fired (MW)	39864.6	42569.2	43303.2	46893.5	53744.7	60167.3	16864.1
Hydro (MW)	28637.8	30397	31034.7	36557	34642	38405.1	7370.4
Nuclear	MW	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	24	24
Total （MW）	68502.4	72966.2	74337.9	83450.5	88386.7	98596.4	24258.5
Percentage of newly installed capacity to 2005	30.51%	25.98%	24.59%	15.34%	10.33%	0.00%	
Percentage of newly added fuel-fired plants			69.52%				

It can be concluded from Table A11 that capacity additions from year 2002 to 2005 is closer to 20% of the total additions and it is obvious the capacity additions during year 2002 to 2005 are larger than the capacity of five plants, so year 2002 and 2005 are chosen to calculate the BM emission factor of CCPG.

According to Table A11 and formula (8) in section B.6.1, the EF_{BM} is calculated as:

$$EF_{BM} = 0.65923 \text{ tCO}_2\text{e/MWh}$$

Step 3: Calculating the baseline emission factor (EF_y)

According to formula (9) in section B.6.1, the baseline emission factor of CCPG is calculated as:

$$EF_y = 0.97504 \text{ tCO}_2\text{e/MWh}$$

Annex 4

MONITORING INFORMATION

No additional information.