CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Tadi 16 MW Hydropower Project in Zhejiang Province

Version number of the document: 07

Date: 15/06/2009

A.2. Description of the project activity:

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The Tadi 16 MW Hydropower Project in Zhejiang Province (hereafter referred to as the Project) developed by Quzhou Tadi Hydro Complex Development Co., Ltd is sited on the Qujiang River, downstream from the Quzhou City, Zhejiang Province. The primary purpose of the Project is to utilize the water resources of the Qujiang River to generate clean electricity to deliver to East China Power Grid (ECPG) through the Zhejiang Power Grid (ZJPG) without CO_2 emissions. Furthermore, the Project can promote the capability of shipping, water supply and irrigation for local area.

The Project is a newly-built hydropower project with the total installed capacity of 16 MW. The increased flooded land area resulting from the Project is 726,400[1] m^2, therefore the power density is greater than 22.0[2] W/m^2. The designed average annual electricity generation is 63.14 GWh, and the estimated electricity supplied to the grid will be 57.842 GWh annually considering the effective electricity generation, auxiliary consumption and transmission loss[3]. The Project activity will achieve greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from the business-as-usual scenario,

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[1] This data in the initial PDD for GSP is 1,298,408m^2, which is sourced from the Preliminary Design Report (PDR) of the Project. However, during the construction of the Project, by means of building protection embankments and drainage gats, the flooded land area has been decreased, which can be confirmed and evidenced by the *Clarification on the Flooded Land Area Resulting from Tadi Hydropower Station* issued by the Irrigation Bureau of Quzhou City. According to the mentioned clarification, the actual increased flooded land area resulting from the Project is 726,400m^2.

[2] The calculation of power density is based on the AM_CLA_0049 approved in EB 33, which stated that the power density was the increased power capacity divided by the increased flooded area measured in the water surface. In the PDD, due to the unavailability of the increased flooded area measured in the water surface, the actual increased flooded land area is used to calculate power density, i.e. 16000000W/726400m^2=22W/m^2. Considering that the actual value is greater than the value measured in the water surface, the power density calculated in term of AM_CLA_0049 should be greater than 22W/m^2.

[3] The coefficient of effective electricity is taken as 0.93 based on the absorptive capacity of the local grid and the regulating capacity of the Project, the rate of auxiliary consumption is taken as 1% and the rate of transmission loss is taken as 0.5%. Therefore, the electricity supply = 63.14*0.93*(1-1%)*(1-0.5%) = 57.842GWh.

electricity generated by those fossil fuel-fired power plants connected into ECPG. The estimated emission reductions are 52,324 tCO_2e per year.

As a renewable energy project, the Project will produce positive environmental and socio-economic benefits and contribute to the local sustainable development through following aspects:

- ✧ Contributing to local economy development by providing electricity to meet local increasing energy demands;
- ✧ Reducing GHG emissions compared to a business-as-usual scenario;
- ✧ Reducing the emission of other pollutants resulting from local coal-based power plants, compared to a business-as-usual scenario;
- ✧ Creating lots of permanent and short-term employment opportunities for local people during the project construction and operation period.

A.3. Project participants:

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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)	Quzhou Tadi Hydro Complex Development Co., Ltd (Project owner)	No
The Netherlands	Essent Energy Trading B.V. (Buyer)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

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A.4.1. Location of the 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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Zhejiang Province.

A.4.1.3. City/Town/Community etc:

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Qujiang Town, Quzhou City.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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The Project is sited within Tadi Village, Qujiang Town, Quzhou City, Zhejiang Province, P.R.China. The location of the Project is 6 km from the Quzhou City. The geographical coordinates of the Project site are 28°58′ 54″ N-118°55′ 37″ E in degrees. Figure 1 and Figure 2 show the detailed geographical location of the Project site.

Figure1. Location of Zhejiang Province in China

Figure 2. Location of the Project

A.4.2. Category (ies) of project activity:

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This category would fall within sectoral scope 1: energy industries (renewable-/non-renewable sources).

A.4.3. Technology to be employed by the project activity:

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The Project is a riverbed-type hydropower plant with low hydraulic head and big discharge flow. The rubber dams and the powerhouse drive up the water to form the hydraulic head, and then the water flows into the powerhouse and drives the hydraulic generators to produce electricity.

The Project includes a reservoir, rubber dams, drainage pump rooms, a powerhouse, a booster station, a sand-flushing sluice, a ship lock and a 35 KV transmission line to substation. The reservoir is of 20.80 million m^3 storage capacity, and the maximal dam height is 5.25 m.

The Project will install four turbines with a unit capacity of 4.0 MW. Key technical parameters of the hydro turbine and the generator are listed in Table 1.

Table 1. Key technical parameters of the hydro turbine and the generator

Hydro Turbine		Generator	
Turbine Type	GZTF08B-WP-360	Generator Type	SFWG4000-52/4220
Rated head	5.0m	Rated Capacity	4444.4 kVA
Rated power	4210 kW	Rated voltage	6300 V
Rated flow	93.92 m^3/s	Rated current	407.3 A
Rated speed	115.4 r/min	Rated power factor	0.9
Run-away speed	348 r/min	Rated speed	115.4 r/min
Declared working condition efficiency	91.97%	Rated efficiency	95%
Best efficiency	94.97%	-	-

With all technologies and facilities provided domestically, the Project involves no technology transfer from abroad.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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It is expected that the Project will generate GHG emission reductions for about 52,324 tCO_2e per year over the first 7-year crediting period from Oct. 1st, 2009 to Sep. 30th, 2016.

Years	**Estimation of annual emission reductions in tonnes of CO_2e**
2009 (Oct. – Dec.)	13,189
2010	52,324
2011	52,324
2012	52,324
2013	52,324
2014	52,324
2015	52,324
2016(Jan. – Sep.)	39,135
Total estimated reductions (tonnes of CO_2e)	**366,268**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**52,324**

A.4.5. Public funding of the project activity:

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No public funding from Annex I Parties is involved in the Project.

SECTION B. Application of a baseline and monitoring methodology

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

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The approved baseline and monitoring methodology, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" ACM0002 (Version 07).

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

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

For more information please refer to the link:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

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The Project meets the applicable criteria of the methodology ACM0002 (Version 07) due to following reasons:

- ✧ The Project is a newly-built grid-connected hydropower plant with a reservoir having power density[4] which is greater than 4 W/m^2;
- ✧ The geographic and system boundaries for ECPG that the Project is connected into can be clearly identified and information on the characteristics of the Grid is available; and
- ✧ The Project dose not involves switching from fossil fuels to renewable energy sources at the site of the Project activity.

Therefore the methodology ACM0002 (Version 07) is chosen and applicable to the Project. According to methodology ACM0002, the Project also refers to the latest version of "Tool for the demonstration and assessment of additionality" and "Tool to calculate the emission factor for an electricity system".

B.3. Description of the sources and gases included in the project boundary

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The electricity generated by the Project will be transferred to ECPG, therefore ECPG is defined as the project boundary of the Project. According to *Notification on Determining Baseline Emission Factors of China Power Grid*[5] issued by the National Development and Reform Commission of the Government of China (China DNA), ECPG is composed of five provincial power grids: Zhejiang Power Grid, Jiangsu

[4] Please see footnote 2.

[5] China DNA (http://cdm.ccchina.gov.cn), Aug. 9th ,2007.

Power Grid, Shanghai Power, Fujian Power Grid and Anhui Power Grid.

The spatial extent of the project boundary includes the Project power plant and all power plants connected physically into ECPG, which is delineated in the following diagram:.

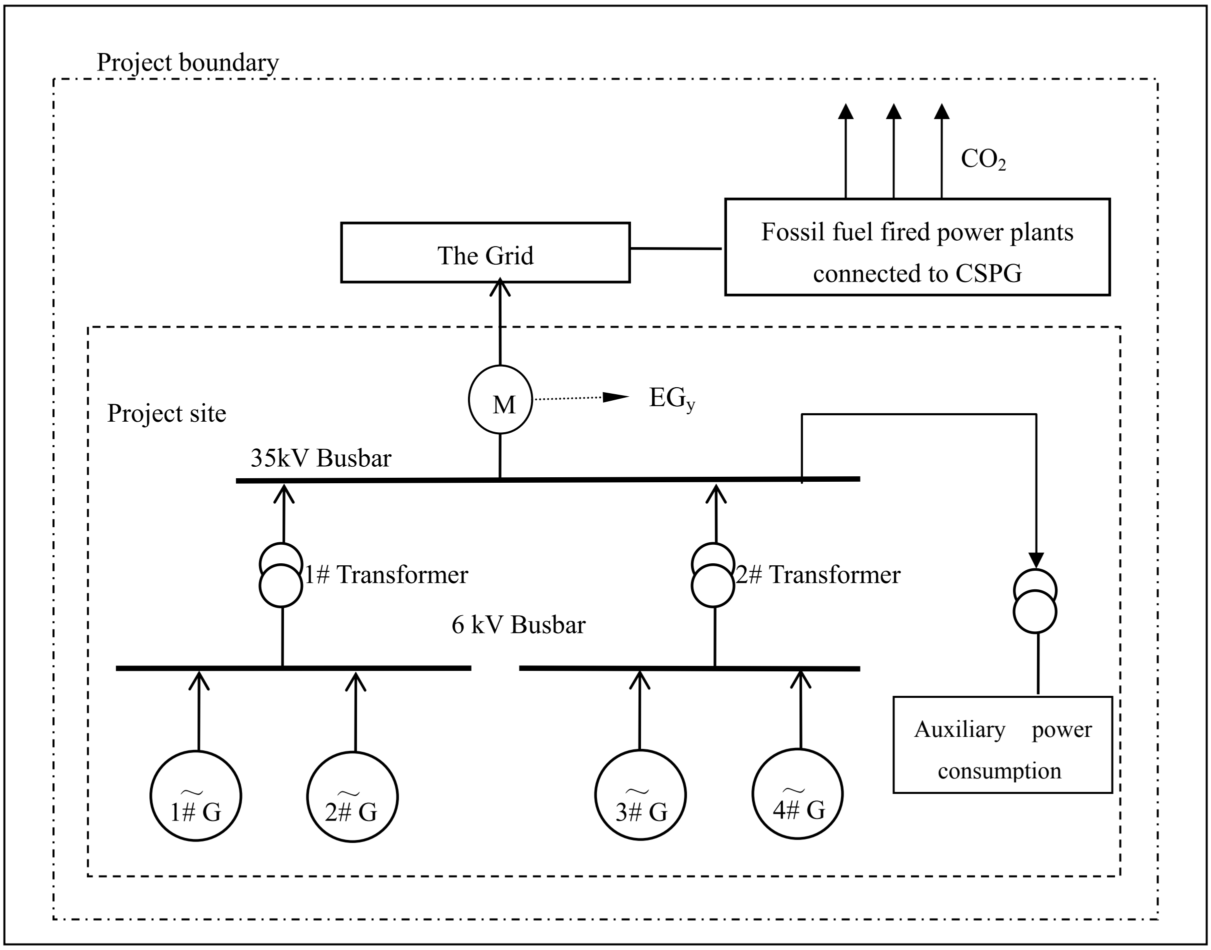

Figure 3. Map of the project boundary

The source and gas included in the project boundary is shown as below:

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the Project activity.	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	Reservoir emissions	CO_2	No	Minor emission source.
		CH_4	No	The power density of the Project is greater than 10 W/m^2.
		N_2O	No	Minor emission source.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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According to ACM0002, the baseline scenario of the Project is electricity delivered to the grid by the Project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within ECPG, as reflected in the combined margin (CM) calculations described in the *Tool to calculate the emission factor for an electricity system*. The calculation of CM is detailed 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 CDM project activity (assessment and demonstration of additionality):

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In the Project's Preliminary Design Report (PDR) designed on Jul. 2003 and approved by the Development and Reform Commission of Zhejiang Province on Aug. 2003, it was concluded that the Project would be economically unattractive because its IRR was less than the financial benchmark IRR based on the financial evaluation, meanwhile to develop the Project as a CDM project was also suggested. For improving the Project owner's confidence of CDM, on Aug. 5th, 2003, the Irrigation Bureau of Quzhou City issued a *Recommendation Letter* to the Project owner, with further explanation of CDM and support of the Project's future CDM application. Then the Shareholder's General Meeting of Quzhou Tadi Hydro Complex Development Co., Ltd made a decision of developing the Project as a CDM project and proceeding with it on Aug. 6th, 2003. The Project owner began to contact CDM consultants, and intended to commission the Institute of Electrification in Rural Areas (IERA) to be the cooperator of the Project's

CDM work. At the same time, the *Main Equipments Purchasing Contract* was signed. Afterward, the Project owner applied for the construction of the Project, and acquired the approval issued by the Irrigation Bureau of Zhejiang Province on Sep. 15th, 2003. Then the Project started construction.

On Jun. 2004, the National Development and Reform Commission of the Government of China (China DNA) issued the *Provisional Administration Method of Working of CDM* which meant it would be operable to develop CDM projects in China. IERA then issued a letter to the Project owner on Jun. 15th, 2004 to propose to formally fix on the CDM cooperation relationship, and the *CDM developing contract* was signed on Sep. 20th, 2004. According to the contract, IERA should help the Project owner to acquire DNA's LoA before Dec. 31st, 2005, but this deadline could be extended to three month later if required by one party.

On May 10th, 2005, being concerned about the progress of the CDM development, the Project owner delivered a letter to IERA with the inquiry of the status of the Project. IERA replied that they have been preparing the DNA application since the signing of contract, but the PDD was not finished yet because the grid emission factor could not be calculated by them due to the limitation of data accessibility. On Oct. 2005, the deviation in application of AM0005 in China was accepted, and the BM emission factor could be calculated based on publicly available data, however, IERA didn't have enough time to finish the DNA application work. The Project owner issued a letter to IERA again on Jan. 5th, 2006 to remind the deadline of the *CDM developing contract*. Meanwhile, worrying about this situation, the Project owner began to contact Farsighted Investment Group (hereafter referred as Farsighted, the parent company of the PDD developing entity). On Feb. 21st, 2006, the shareholders held a General Meeting, deciding to withdraw from the cooperation with IERA immediately, and to start the negotiation with Farsighted about the project's CDM development.

On Mar 27th, 2006, IERA finally fed back a notice to the Project owner, to agree with the termination of the CDM cooperation. The Project owner then signed the new *CDM Development Agreement* on May 31st, 2006 with Farsighted.

With the assistant of Farsighted, the Project owner began to search for carbon buyer. On October 2006, in the Carbon EXPO held in Beijing China, Farsighted met the agent of Essent Energy Trading B.V. (hereafter referred as Essent, the final another PP of the Project), and proposed the Project to them. However, at that time, there was still uncertainty about the calculation of emission factor in spite of the deviation of AM0005. As to the Project, when calculating ECPG's emission factor, the methodology required the emission factor of Yangcheng Power Plant because of the electricity import from Yangcheng Power Plant to ECPG, but the exact information of fuel consumption was unavailable for this specified power plant. Farsighted has taken long time to communicate with Essent regarding the information of the Project's emission reductions provided in the PIN. On Dec. 15th, 2006, China DNA issued official notification about China's grid emission factors, which was finally accepted by DOEs and EB after a time. Then the work was accelerated. After the on-site investigation and many rounds of negotiation, the *Term Sheet* for carbon business was signed between the Project owner and Essent on Aug. 22nd, 2007. Given the complete conditions, the Project applied for China DNA's approval on Nov. 2007, and started GSP on Jan.

29th, 2008. In summary, the Project owner has seriously considered CDM before starting the Project and continuously pushed CDM application work forward along with the project implementation.

The timeline of the Project is shown in table2 as below:

Table2 Timeline of Tadi 16 MW Hydropower Project in Zhejiang Province

Date	**Main events**		**Documents/evidences**
	Engineering progress	**Parallel CDM activities**	
28/03/2003	Acquired approval of EIA	-	*Approval letter of EIA* issued by the Environment Protection Bureau of Zhejiang Provinces
01/08/2003	Acquired approval of PDR	-	*Approval letter of PDR* issued by the Development and Reform Commission of Zhejiang Province
05/08/2003	-	Acquired *Recommendation Letter* with support of CDM application	*Recommendation letter* issued by the Irrigation Bureau of Quzhou City
06/08/2003	-	Decided to develop the Project as a CDM project	*Resolution of General Meeting of Shareholders* of Quzhou Tadi Hydro Complex Development Co., Ltd
29/08/2003	-	Intended to commission IERA to be the cooperator of the Project's CDM work	*Minute of meeting* between IERA and Quzhou Tadi Hydro Complex Development Co., Ltd
29/08/2003	Signed the contract of purchasing main equipments	-	*Main Equipments Purchasing Contract*
15/09/2003	Acquired permission of project construction	-	*Approval letter of permitting construction* issued by the Irrigation Bureau of Zhejiang Province
15/06/2004	-	IERA proposed to formally fix on the CDM cooperation relationship with the Project owner	*Proposal letter* issued by IERA
20/09/2004	-	Signed CDM developing contract with IERA	*CDM Developing Contract*
10/05/2005	-	Inquired the status of the CDM development of the Project	*Inquiry letter* issued by the Project owner
12/05/2005	-	IERA explained the CDM development work	*Response letter* issued by IERA

05/01/2006	-	Remind IERA the deadline of *CDM Developing Contract*	*Reminding letter* issued by the Project owner
21/02/2006	-	Decided to withdraw from cooperation with IERA and start the negotiation with Farsighted	*Resolution of General Meeting of Shareholders* of Quzhou Tadi Hydro Complex Development Co., Ltd
27/03/2006	-	IERA agreed to terminate the CDM cooperation with the Project owner	*Notice of termination of CDM Developing Contract* issued by IERA
31/05/2006	-	Commissioned Farsighted to conduct the Project's CDM application works	*CDM Project Design and Service Agreement*
30/10/2006	-	Contacted the agent of Essent with the proposal of the Project	Email delivered by Farsighted
01/03/2007	Commence trial operation of the Project	-	Interview with the Project owner
22/08/2007	-	Selection of Essent Energy Trading B.V. as another project participant	*Term Sheet*
08/11/2007	-	Application for DNA's approval	*Notice of approval of CDM projects* by DNA
29/01/2008	-	Start of GSP	UNFCCC website

The additionality of the Project is demonstrated by using the *Tool for the Demonstration and Assessment of Additionality* approved by the CDM EB and requested by the methodology ACM0002. The *Tool for the Demonstration and Assessment of Additionality* provides for a step-wise approach to demonstrate and assess the additionality. These steps include:

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

The objective of this step is to identify realistic and credible alternatives to the Project activity through the following sub-steps:

Sub-step 1a. Define alternatives to the project activity

For the Project, the possible alternative scenarios that provide outputs or services comparable to the Project should be as follows:

Alternative I: To implement the proposed project activity, but not as a CDM project activity;

Alternative II: To construct a thermal power plant with the same annual electricity generation as the Project, and

Alternative III: To provide for the same annual electricity output as the Project by ECPG.

Sub-step 1b. Enforcement of applicable laws and regulations:

Alternative I: To implement the proposed project activity, but not as a CDM project activity. The alternative is in compliance with current laws and regulations of China.

Alternative II: To construct a thermal power plant with the same annual electricity generation as the Project. Based on the requirements of applicable laws and regulations, the alternative is not realistic. Considering the annual generation hours of thermal power plant is greater than that of hydropower plant, and the Project is a grid-connected power plant, Alternative II should be to construct a grid-connected thermal power plant with the installed capacity less than 16 MW. However, construction of coal-fired power plants with capacity of less than 135 MW are forbidden in the areas which can be covered by large grids[6], and the fossil fuel-fired power units with capacity of less than 100 MW is strictly limited for installation[7].

Alternative III: To provide for the same annual electricity output as the Project by ECPG. The alternative is in compliance with current laws and regulations of China.

Therefore, Alternative I and Alternative III should be considered in following steps.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

Three methods can be applied for the investment analysis: the simple cost analysis, the investment comparison analysis and the benchmark analysis. Considering that the Project will earn revenues from electricity sales, and that to provide for the same annual electricity output as the Project by ECPG (Alternative III) is not an investment activity, the benchmark analysis has been selected.

Sub-step 2b. Apply benchmark analysis

The total investment's internal rate of return (abbreviated as "IRR", which means Project IRR) is adopted

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6 *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. 2002-6.

7 *Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators* (issued in Aug., 1997).

here for the benchmark analysis. According to *Economic Evaluation Code for Small Hydropower Projects* issued by the Ministry of Water Resources (Document No. SL16-95), the benchmark IRR for small hydropower projects is 10%. Therefore, 10% is adopted as the financial benchmark IRR for the Project. If the IRR of the Project is lower than 10%, the Project will be financially unfeasible and then be additional.

Although the *Economic Evaluation Code for Small Hydropower Projects* (Document No. SL16-95) was issued by the Ministry of Water Resources in 1995, it is valid nowadays. Its validity has been acknowledged by the *Bulletin from Ministry of Water Resources* about the valid water resources technology standard in June 2002[8] and in Sep 2006[9]. It has not been replaced by any other standard from its issuance. Therefore, the application of the *Economic Evaluation Code for Small Hydropower Projects* (Document No. SL16-95) in the PDR of the Project and in this PDD is considered reasonable.

Sub-step 2c. Calculation and comparison of financial indicators

The basic parameters to calculate the financial indicators of the Project are listed in Table 3.

Table 3. Basic parameters for calculation of financial indicators of the Project

Items	Unit	Amount	Data sources
Installed capacity	MW	16	PDR
Estimated annual output	GWh	57.842	PDR
Project lifetime (including two and a half year of construction period)	years	32.5	PDR
Total investment on fixed assets	Million RMB	196.55	PDR
Electricity tariff (excl. VAT)	RMB/kWh	0.425	PDR
VAT	%	6	PDR
Income tax	%	33	PDR
Tax of expense for city maintenance and construction	%	1	PDR
Tax of education fee addition	%	3	PDR
Period of depreciation of the hydropower station	years	30	PDR
Period of depreciation of the matching power transmission project	years	20	PDR
Rate of scrap value	%	0	PDR
Annual O&M cost	Million RMB	3.69	PDR

The Data are from the PDR of the Project, which was developed by Power Industry Reconnaissance & Design Institute of Zhejiang Province, a qualified, third-party and professional design institute, in Jul.

8 http://www.cws.net.cn/guifan/bzdt/bzgg.asp.

9 http://www.mwr.gov.cn/tzgg/qt/20060926000000479251.aspx.

2003 and has been approved by the Development and Reform Commission of Zhejiang Province on Aug. 1st, 2003. All the input values used in the investment analysis are the same as in the PDR and PDD. Besides, all the costs and the tariff make utilization of fixed value based on current price level, which is regulated by the document of SL16-95.

Calculation is based on the data in Table 3, and the IRR of the Project is 7.59%. It is lower than the financial benchmark IRR (10%), which is considered that the Project is financially unfeasible and demonstrates the addtionality.

Sub-step 2d. Sensitivity analysis

The purpose of this step is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.

These factors are should be considered in following sensitivity analysis:

- ✧ Total investment on fixed assets.
- ✧ Electricity tariff.
- ✧ Annual electricity generation.
- ✧ Annual O&M cost.

Assuming that the above factors fluctuate until making the IRR reach the benchmark, the corresponding results are shown in Table 4.

Table 4. Sensitivity analysis (IRR of the total investment)

Item	Fluctuate	Corresponding IRR	Benchmark
Total Investment on fixed assets	-23.3%	10.00%	10%
Electricity tariff	+29.6%	10.00%	
Annual electricity generation	+29.6%	10.00%	
Annual O&M cost	-197%	10.00%	

As shown in the sensitivity analysis above, in cases where the total investment on fixed assets is decreased by 23.3%, the annual O&M cost is decreased by 197%, or the electricity tariff/annual electricity output is increased by 29.6%, the IRR of the Project will reach the benchmark. However, it seems that there is little probability of this situation. The reasons are:

- ✧ The total investment on fixed assets was budgeted based on the price level in 2003. However, in recent years the price of raw materials such as steel and cement has been continuously increased in

China[10]. Therefore, great decrease of total investment should not happen. In fact, according to the *Audit Report*[11] issued by Quzhou Chengzhongcheng Accounting Firm, the actual total investment on fixed assets of the Project is 192.37 Million RMB, a little smaller than the budget in the PDR.

- ✧ The annual O&M cost should not be negative, so it is impossible to decrease the annual O&M cost by 197%.
- ✧ As stated in the article of *Rural Hydropower Development Problem and Suggestion in Developing Area Zhejiang Province* published in *China Hydropower & Electrification* (No. 1, 2006)[12], small-scale hydropower projects in Zhejiang Province presently face unreasonable and unfair tariff policy barrier which make these projects not economical13. On the 9th Fellowship of Zhejiang Small-scale Hydropower Association hold on Aug. 2007, it was also pointed out that during the past years the electricity tariff for small hydropower projects in Zhejiang Province has been actually decreased[14]. In conclusion, the probability for the increase of electricity tariff of the Project by 29.6% is very small. Furthermore, the actual average electricity tariff acquired by the Project is 0.45 RMB/kWh (including VAT, equal to 0.425RMB/kWh excluding VAT[15]) which was approved by the Price Bureau of Quchou City[16]. This tariff is consistent with the value in the PDR and this PDD.
- ✧ The annual electricity generation of the Project is an average data on a multi-year basis designed by a professional institute according to a set of yearly hydrological data (from 1958 to 2001, 44 years totally) which were monitored by the Quzhou Hydrographic Station, and is unlikely to be changed obviously. The value of this data has been confirmed in the official approval letter of the PDR.

To sum up, the sensitivity analysis supports the conclusion of financial infeasibility of the Project.

Step 3. Barrier Analysis

No barrier analysis has been applied.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity

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10 www.bmlink.com/news/message/123944.html, www.cmwin.com/CBPResource/StageHtmlPage/A280/A28020071180931218.htm.

11 *Audit Report* of the proposed project.

12 http://scholar.ilib.cn/A-dfdlgl200601013.html.

13 http://www.shp.com.cn/news/info/2007/8/6/1410018826.html.

14 http://www.86ne.com/Ocean/200708/Ocean_82106.html.

15 0.45/(1+6%)=0.425.

16 *Approval letter of electricity tariff.*

Firstly, to define activities similar to the Project as hydropower projects in Zhejiang Province that started operation after 2002.

The reason for the limitation of geographical range is that the investment environment for each province differs with regards to electricity tariffs in China. For example, the local government authorities of Fujiang Province, Hunan Province, Guangxi Autonomous Region and Yunnan Province have issued their tariff regulations for hydropower projects respectively. The tariff level is 0.27-0.345RMB/kWh in Fujian Province [17], 0.25-0.326RMB/kWh in Hunan Province [18], 0.26RMB/kWh in Guangxi Autonomous Region[19], 0.18-0.215RMB/kWh in Yunnan Province[20]. The total area of Zhejiang Province is 101,800 km^2 with a population of 48.98 million[21], which deemed to be equivalent to one country, and the local government of Zhejiang has the potency to constitute the regulations of tariffs. Therefore, it is obvious that the investment environment differs province by province.

The reason for the limitation of time frame is that the operation environment for power plants changed greatly since the year of 2002. In 2002 China Electric Power Industry conducted a comprehensive and in-depth reform, which led to the implementation of policy as "separating power plants from power grids, and marketing the electricity tariff through competition". Consequently, power plants commenced after 2002 significantly differs from those commenced before 2002 in operational environment. Therefore, projects started before 2002 are not considered in the common practice analysis.

Secondly, use the *China Hydro Resources Yearbook 2006 Edition*, which is the only publicly available source as the basis of analysis. There are 16 hydropower plants in Zhejiang Province which are listed in the yearbook. After eliminating those projects operated before 2002[22], the remaining projects are shown in Table 5 below.

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[17] http://www.fsou.com/html/text/lar/169238/16923827.html.

[18] http://www.priceonline.com.cn/priceGOV/news/jgzc_detail.jsp?doc_id=119167&channelname.

[19] http://www.glprice.cn/news/zxjgzc/2004/07/1202.htm.

[20] http://www.custeel.com/Scripts/viewArticle.jsp?articleID=335739.

[21] http://www.zj.gov.cn/gb/zjnew/index.html.

[22] For the information of those eliminated projects regarding time of starting operation, please see these links: http://www.sp.com.cn/zgsd/tjzl/gsstj/200805/t20080515_104341.htm, http://www.ounenggroup.com/web/group_content.asp?GroupID=298, http://www.cacem.com.cn/News/open_BHI.asp?ID=5357, http://www.wzdl.org.cn/newstxt/bx.htm.

Table 5. Basic information of similar projects in Zhejiang Province

No.	Project Name	Installed Capacity (MW)	Starting operation time (Year)	Total Investment (Million RMB)	Unit Investment (RMB/kW)
1	Yingchuan Hydropower Plant[23]	40	2002	315	7875
2	Ruiyang Erji Hydropower Plant[24]	30	2003	199	6633
3	Baishuikeng Hydropower Plant[25]	40	2003	377	9425
4	Huaguangtan Erji Hydropower Plant[26]	25	2004	129	5160
5	Xianju Hydropower Plant[27]	25	2004	162	6480
6	Yingcun Hydropower Plant[28]	32	2004	290	9063
7	Dayankeng Hydropower Plant[29]	36	2004	290	8056

Sub-step 4b. Discuss any similar Options that are occurring

According to the table above, the Baishuikeng Hydropower Plant has the biggest unit investment of 9,425 RMB/kW. However, the unit investment of the Project is 12,284 RMB/kW, greatly higher than that of Baishuikeng Hydropower Plant. The index of unit investment has significant impact on the financial performance. If the unit investment of the Project decreases from 12,284 RMB/kW to 9,425 RMB/kW which means that the total investment decreases by 23.3%, the IRR of the proposed project will be increased from 7.59% and reach the benchmark IRR. Therefore, the proposed project obviously differs from other hydropower projects in Zhejiang Province.

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[23] http://www.zj.xinhuanet.com/old/20025/29/100005615.htm, http://www.zjwater.gov.cn/pages/document/1/document_128.htm.

[24] http://www.lsnews.com.cn/2004-09-03/ca72234.htm

[25] http://ymb.lishui.gov.cn/ymlt/t20051025_112704.htm

[26] http://www.freshpower.cn/news/news_detail.asp?NewsId=5538, http://www.sp.com.cn/zgsd/tjzl/gsstj/200805/t20080515_104341.htm.

[27] http://www.mwr.gov.cn/xwpd/dfss/200610130758498094ef.aspx

[28] http://www.freshpower.cn/news/news_detail.asp?NewsId=5060, http://www.zwcc.com.cn/cg_scycsl.asp.

[29] http://www.lsdlhx.com/view.asp?aid=932

The most important reason for the high unit investment of the Project is the location of dam site and accordingly adopted technology. The proposed project is a riverbed-type hydropower plant with low hydraulic head and big discharge flow, which is located on the Qujiang River with wide water surface and flat topography, therefore it has to built rubber dams with a length of 425 m and adopt bulb tubular type turbines, which is very huge and consumes more raw materials compared with other types of turbine. These technical requirements lead to the high investment of the proposed project. The investment data in the PDR has been evaluated by experts and approved by Zhejiang Province Development and Reform Commission. Furthermore, it can be found that some hydropower projects with low hydraulic head and big discharge flow which are applying for CDM registration also have big unit investment, e.g. the unit investment of “Longyou 18 MW Hydropower Project in Zhejiang Province” is 15106 RMB/kW[30], and that of “Dong River Dongyuan 20MW Hydropower Project in Guangdong Province” is 14666 RMB/kW[31]. These two mentioned projects have the same level of unit investment with the proposed project. So it can be concluded that it is the special technology characteristic that result in the poor financial performance of the proposed project, and make it not a common practice.

In addition, when validation, DOE required the project participant (PP) to use local data sources to consider power plants in the range of 15-25 MW for the common practice analysis, because all the projects listed in Table 5 are equivalent to or greater than 25 MW in scale. Therefore the PP would like to complement information as below:

Table 6 shows the information cited from *Hydropower projects in the range of 15-25 MW in Zhejiang Province* issued by the Water Resources Bureau of Zhejiang Province on Jan. 12th, 2009[32].

Table 6.Information of hydropower projects in the range of 15-25 MW in Zhejiang Province (excluding the Project)

No.	Project Name	Installed Capacity (MW)	Starting operation time (Year)	Total Investment (Million RMB)	Unit Investment (RMB/kW)
1	Zhejiang Longyou Hydropower Plant	18	-	-	-
2	Xianju Xia’an Hydro Project	16	2006	-	-
3	Changshan Furong Hydro Project	16	2005	270	7500[33]

30 http://cdm.unfccc.int/Projects/DB/DNV-CUK1218618349.9/view.

31 http://www.netinform.net/KE/files/pdf/Dong_River_Dongyuan_20MW_Hydropower_Project_gs20080313.pdf

32 *Hydropower projects in the range of 15-25 MW in Zhejiang Province*, which was submitted to the DOE for validation.

33 Please see statement below.

4	Junyun Longgongdong Hydropower Plant	20	1990	-	-
5	Taizhou Fushan Hydropower Plant	16	1998	-	-

As stated in sub-step 4a, project No. 4 and No. 5 should be excluded firstly because of the date of starting operation.

Project No. 1, Zhejiang Longyou Hydropower Plant is also under the application for CDM[34], therefore it should not be included in this analysis according to the *Tool for the Demonstration and Assessment of Additionality*.

For project No. 2, it is a large-scale reservoir of 135.0 million m^3 storage capacity, a key construction project of Zhejiang Province, and a comprehensive hydro-junction project with the primary purpose of flood control, irrigation and water supply[35]. Electricity generation is just an additional function of project No. 2. It was invested by the government of Zhejiang Province and the government of Xianju County to produce social benefits for local residents[36]. Therefore project No. 2 is essentially different from the Project.

For project No. 3, it is also a comprehensive hydro project with a reservoir of 95.8 million m^3 storage capacity, primarily aiming at flood control and electricity generation[37]. It was invested together by the local government who conducted the costs for resettlement and land occupation and the private investor who conducted the investment on the construction of reservoir and power plant[38]. The latter was 120 million RMB, which means the unit investment for electricity generation of project No. 3 is only 7500 RMB/kW, therefore project No. 3 obviously differs from the Project as mentioned above.

To sum up, based on data complemented by local authority, it can still be demonstrated that the Project is not a common practice.

To summarize, the Project passed all criteria of the *Tool for the Demonstration and Assessment of Additionality*. Therefore, the Project is adequately additional.

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34 Please see footnote 30.

35 http://jgx.zjwchc.com/zjsjy/szy/jj02.swf.

36 http://www.co188.com/neteaseivp/webforum/servlet/Controller?RequestType=searchforum&SubType=getThreadContent&threadID=75205&boardID=208&pageNum=1.

37 http://news.qz828.com/system/2009/01/16/010107286.shtml.

38 http://www.hwcc.com.cn/nsbd/NewsDisplay.asp?Id=158227.

B.6. Emission reductions:

>>

B.6.1. Explanation of methodological choices:

>>

Baseline emissions

The Project is a new power plant, therefore, according to ACM0002, the baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = EG_y \times EF_{grid,CM,y} \qquad (1)$$

Where:

BE_y = Baseline emissions in year *y* (tCO_2/yr).

EG_y = Electricity supplied by the project activity to the grid (MWh).

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y*, calculated using the latest version of the *Tool to calculate the emission factor for an electricity system*.

The *Tool to calculate the emission factor for an electricity system* provides for a step-wise approach to calculate the $EF_{grid,CM,y}$. These steps include:

Step 1. Identify the relevant electric power system

As described in section B.3, the spatial extent of the Project boundary includes the Project power plant and all power plants connected physically into ECPG. Therefore, the project electricity system is defined as ECPG.

For ECPG, there are electricity imports from Central China Power Grid (CCPG) and Yangcheng Power Plant[39], therefore the connected electricity system is defined as CCPG and Yangcheng Power Plant. When determining the operating margin (OM) emission factor of ECPG, the PDD uses the weighted average operating margin emission rate of CCPG and Yangcheng Power Plant respectively as the emission factor of net electricity imports ($EF_{grid,import,y}$) from CCPG and Yangcheng Power Plant to ECPG, and the data

39 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls.

used for calculation is adopted from the most recent 3 years[40]. (For detail information please refer to Annex 3).

Step 2. Select an operating margin (OM) method

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

From 2002 to 2006, among the total electricity generation of ECPG that the Project is connected into, the amount of low-cost/must run resources accounts for 11.7%, 10.9%, 9.7%, 11.6% and 11.1% respectively[41], all less than 50%, therefore, method (a), simple OM is adopted to calculate the operating margin emission factor of ECPG in this PDD.

To calculate the simple OM emission factor of ECPG, the *ex-ante* option is adopted with using the data vintage as a 3-year generation-weighted average based on the most recent data.

Step 3. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

Option A: Based on data on fuel consumption and net electricity generation of each power plant / unit, or
Option B: Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, or
Option C: Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option A should be preferred. However, the data on fuel consumption and net electricity generation of

[40] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls.

[41] China Electric Power Yearbook 2003, 2004, 2005, 2006 and 2007 Edition which were the most recent available sources in the time of starting GSP.

each power plant / unit is not publicly available. Thus, Option A cannot be adopted. Similarly, the data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit are not available too, thus Option B cannot be adopted.

According to the *Notification on Determining Baseline Emission Factors of China Power Grid*, only nuclear and renewable power generation are considered as low-cost / must-run power sources in China. Furthermore, the quantity of electricity supplied to the grid by low-cost / must-run power sources is known. Therefore, Option C is adopted to calculate the simple OM emission factor of ECPG.

The simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{co2,i.y}}{EG_{grid,y}} \qquad (2)$$

where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh).

$FC_{i,y}$ = Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit).

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit).

$EF_{co2.i.y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ).

$EG_{grid,y}$ = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh).

i = All fossil fuel types combusted in power sources in the project electricity system in year *y*.

y = The three most recent years.

The data on net electricity generation are obtained from the *China Electric Power Yearbook* from 2004 to 2006[42] (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2004 to 2006 (published annually). The emission factors adopted are obtained from *Table 1.3* and *Table 1.4* of the *2006*

[42] China Electric Power Yearbook 2007 was published on Dec. 2007, whereas China Energy Statistical Yearbook 2007 was published on Mar. 2008. When the PDD started GSP on Jan. 29th, 2008, the latter was unavailable. Therefore, for calculating OM and BM, these two kinds of Yearbooks from 2004 to 2006 are used.

IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chap 1, Page 1.21-1.24.

Step 4. Identify the cohort of power units to be included in the build margin

The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

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

The sample group (b) is used for calculating the build margin of ECPG. In terms of vintage of data, the PDD choose the options as below:

For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Step 5. Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (3)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh).

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh).

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh).

m = Power units included in the build margin.

y = Most recent historical year for which power generation data is available.

Currently in China, the data of sampling power units group *m* are publicly unavailable. Taking notice of this situation, CDM EB accepts the following deviation in application of methodology AM0005 in China[43]:

- ✧ Use of capacity additions exceeds 20% of total generation for estimating the build margin emission factor for grid electricity.
- ✧ Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Since methodology AM0005 has been replaced by the consolidated methodology ACM0002, the deviation above is also applicable to the consolidated methodology ACM0002. Therefore for the Project: Firstly, calculate the share of different power generation technology in recent capacity additions. Secondly, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor using the efficiency level of the best technology commercially available in China.

Since data of installed capacities can not be separated to coal-based, oil-based and gas-based at present, BM is calculated with following steps and formula:

Substep 5a. Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the Energy Balance Table of the most recent year.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}} \quad (4)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}} \quad (5)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}} \quad (6)$$

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43 http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ.

where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by province *j* in year(s) *y*.

$NCV_{i,j}$ = Net calorific value (energy content) of fossil fuel type *i* consumed by province *j* (GJ / mass or volume unit).

$EF_{co2.i.j}$ = CO_2 emission factor of fossil fuel type *i* consumed by province *j* (tCO_2/GJ).

COAL, *OIL* and *GAS* are footnote group for solid fuels, liquid fuels and gas fuels.

Substep 5b. Calculate emission factor for thermal power of each grid based on the result of Substep 5a and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \qquad (7)$$

Where $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the efficiency level of the best coal-based, oil-based and gas-based power generation technology commercially available in China.

Substep 5c. Calculate BM of the grid based on the result of Substep 5b and the share of thermal power of recent 20% capacity additions.

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

Where CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions of thermal power.

The data for the calculation of BM emission factor are obtained from the *China Electric Power Yearbook* from 2004 to 2006 (published annually) and the *China Energy Statistical Yearbook* from 2004 to 2006 (published annually). The emission factors of the fuels adopted are obtained from *Table 1.3* and *Table 1.4* of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2, Chap 1, Page 1.21-1.24.

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid,* the weighted average fuel consumption for power generation of 600 MW sub-critical coal-fired power generators built in 2005 (343.33 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (258 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

Step 6. Calculate the combined emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (9)$$

Where:

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh).

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh).

w_{OM} = Weighting of operating margin emissions factor (%).

w_{BM} = Weighting of build margin emissions factor (%).

The weighting w_{OM} and the weighting w_{BM} are both taken 0.5 as default for the first crediting period.

For the second and third crediting period, w_{OM} = 0.25 and w_{BM} = 0.75.

Project activity emissions

The power density[44] of the Project is greater than 10 W/m^2. Therefore, based on the methodology ACM0002, the GHG emission of the project is zero, as PE_y =0 tCO_2e.

Leakage

According to the methodology ACM0002, the Project takes no account of leakage, L_y =0 tCO_2e.

Emission reductions

The emission reductions (ER_y) by the Project activity during a given year *y* is the difference between

[44] Please see footnote 2.

baseline emissions (BE_y), project activity emissions (PE_y) and leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - L_y \quad (10)$$

B.6.2. Data and parameters that are available at validation:	
>> **Data / Parameter:**	$EG_{grid,y}$
Data unit:	*MWh*
Description:	*The net electricity generated and delivered to ECPG on 2003, 2004 and 2005, excluding those generated by low-cost/must run power plants/units.*
Source of data used:	*China Electric Power Yearbook 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*ECPG is defined as the project electricity system of the Project.* *According to "Tool to calculate the emission factor for an electricity system", those low-cost/must-run power plants/units in ECPG are excluded for calculation of simple OM emission factor.*
Any comment:	*Official data.*

Data / Parameter:	*Installed Capacity*
Data unit:	*MW*
Description:	*The installed capacity by different sources of ECPG in 2003, 2004 and 2005.*
Source of data used:	*China Electric Power Yearbook 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*ECPG is defined as the project electricity system of the Project.* *According to the deviation accepted by the CDM EB, the installed capacity is used in place of annual electricity generation for calculation of BM emission factor.*
Any comment:	*Official data.*

Data / Parameter:	$FC_{i,y}$
Data unit:	$10^4 t$ *or* $10^8 m^3$
Description:	*Different fuel consumptions for power generation in ECPG in 2003, 2004 and 2005.*
Source of data used:	*China Energy Statistical Yearbook 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*ECPG is the project electricity system of the Project.*
Any comment:	*Official data.*

Data / Parameter:	$NCV_{i,y}$
Data unit:	*GJ/t or GJ/10³m³*
Description:	*Average low calorific values of fuels for electricity generation.*
Source of data used:	*China Energy Statistical Yearbook 2006 Edition, P287.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Country-specific values are adopted.*
Any comment:	*Official data.*

Data / Parameter:	$EF_{co2,i,y}$
Data unit:	*tCO_2/TJ*
Description:	*CO_2 emission factors of fuels for electricity generation.*
Source of data used:	*"2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2.*
Value applied:	*Detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*IPCC world-wide default values are adopted.*
Any comment:	*IPCC data.*

Data / Parameter:	$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$.
Data unit:	-
Description:	*The efficiency level of the best coal-based, oil-based and gas-based power generation technology commercially available in China.*
Source of data used:	*"Notification on Determining Baseline Emission Factors of China Power Grid"*
Value applied:	*Detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*According to the deviation accepted by CDM EB, the efficiency level of the best technology commercially available in the national grid of China is used as a conservative value for calculation of BM emission factor.*
Any comment:	*Official data.*

B.6.3. Ex-ante calculation of emission reductions:

>>

Baseline emissions calculation

Referring to *Notification on Determining Baseline Emission Factors of China Power Grid* issued by China DNA, the OM emission factor ($EF_{grid,OM,y}$) of ECPG is calculated as 0.9421 tCO_2e/MWh[45], and the build margin emission factor ($EF_{grid,BM,y}$) of ECPG is calculated as 0.8672 tCO_2e/MWh[46]. The detailed calculations and data are listed in Annex 3.

Based on formula (9) in section B.6.1, the baseline emissions factor ($EF_{grid,CM,y}$) of ECPG is calculated as 0.9046 tCO_2e/MWh.

Based on *Preliminary Design Report* of the Project, the annual output supplied to the grid (EG_y) is estimated to be 57.842 GWh. So it is estimated that the baseline emissions of the Project (BE_y) will be 52,324 tCO_2e based on formula (1) in section B.6.1.

Project activity emissions calculation

As described in part B.6.1, the Project activity emissions (PE_y) will be 0 tCO_2e.

Leakage

As described in part B.6.1, the leakage of the Project (L_y) is 0 tCO_2e.

Emission reductions calculation

Based on formula (10), the ex-ante annual emission reductions (ER_y) are estimated as 52,324 tCO_2e.

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45 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls.

46 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf.

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

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Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2009 (Oct. – Dec.)	0	13,189	0	13,189
2010	0	52,324	0	52,324
2011	0	52,324	0	52,324
2012	0	52,324	0	52,324
2013	0	52,324	0	52,324
2014	0	52,324	0	52,324
2015	0	52,324	0	52,324
2016 (Jan. – Sep.)	0	39,135	0	39,135
Total (tCO_2e)	**0**	**366,268**	**0**	**366,268**

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

>>

B.7.1. Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	*MWh*
Description:	*Electricity supplied by the project activity to the grid.*
Source of data to be used:	*Measured by meters installed at the Project site.*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	*57842* *For ex-ante calculations, electricity import is considered to be zero.*
Description of measurement methods and procedures to be applied:	*The electricity supplied to ECPG by the Project is measured continuously through a bidirectional meter at the Project site and will be recorded by designated staff on a monthly basis. The bidirectional gateway meter will also monitor the occasional electricity import from ECPG to the Project, so EGy reflects the net electricity export of the Project.*
QA/QC procedures to be applied:	*Please refer to section B.7.2.*
Any comment:	*The data will be kept during the crediting period and two years after the end of crediting period or the last issuance of CERs for the Project, whichever occurs later.*

Data / Parameter:	CAP_{PJ}
Data unit:	*W*
Description:	*Installed capacity of the hydropower plant after the implementation of the project activity.*
Source of data to be used:	*Project site.*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	*16000000.*
Description of measurement methods and procedures to be applied:	*Determine the installed capacity yearly based on recognized standards.*
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	M^2
Description:	*Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.*
Source of data to be used:	*Project site.*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	*726,400.*
Description of measurement methods and procedures to be applied:	*Yearly measured from topographical surveys, maps, satellite pictures, etc.*
QA/QC procedures to be applied:	-
Any comment:	-

B.7.2. Description of the monitoring plan:

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For the purpose of the integrated, continuous, transparent and accurate monitoring of the Project and the precise calculation of emission reductions during the crediting period, based on the monitoring methodology and the actual conditions of the Project, the monitoring plan is designed as follow:

1. Data to be monitored

In this PDD, emission factor of the Project is determined ex-ante. Therefore the electricity generation supplied to the grid by the Project is defined as the key data to be monitored.

For the installed capacity and the increased flooded land area resulting from the Project, monitoring will be conducted yearly according to the measurement procedures described in corresponding tables in section B.7.1. During the operation, the project will not submerge more land because the project owner doesn't have any plan to change the installed capacity and storage capacity of reservoir which are both approved by government. In other words, any change is forbidden. Therefore, the increased flooded land area resulting from Tadi Project will not change.

2. Implementation of the monitoring plan

The Project owner will take the responsibility for the monitoring plan implementation. A CDM working team, which is supervised by a manager, will be established. It consists of CDM principal, technical staff, and statistic staff. Organizational structure of the CDM team is shown as Figure 4. The staff concerned will receive training on monitoring and measurement to ensure the implementation of this monitoring plan before project operation. In the following years within the crediting period, the training will also be provided.

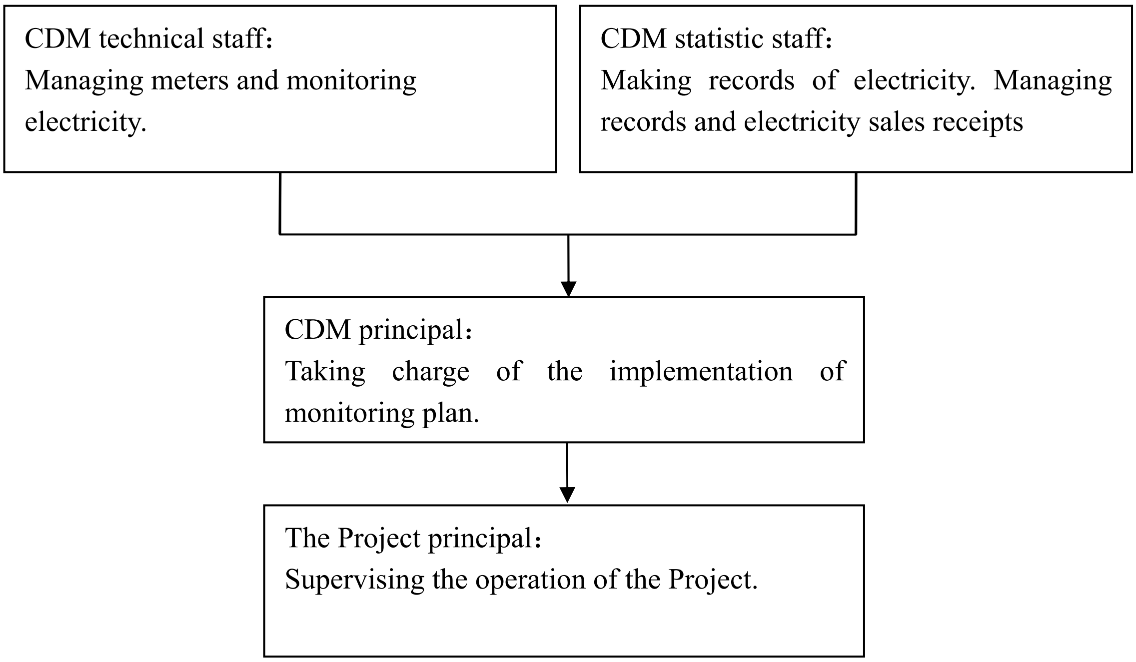

Figure 4 Structure of the CDM team

3. Monitoring meters

The electricity supplied to ECPG by the Project will be continuously monitored through a bidirectional gateway meter installed at the Project site, which can also monitor the occasionally electricity import from ECPG to the Project, so the net electricity export of the Project can be acquired to calculate emission reductions when verification. The accurate level of the meter should be 0.5S which is consistent with the Technical Administrative Code of Electric Energy Metering (DL/T448－2000).

4. Procedures of monitoring

On-duty CDM technical staff will watch the operation status of metering equipments and collect the measured electricity data everyday on site. Before being archived, these records will be checked by other CDM technical staff to ensure the correctness. The data from these records will be summarized and analyzed by the CDM manager on a monthly basis. And the monthly summary will be reported to project manager.

After operation of the Project, the project owner will annually monitor the installed capacity and the increased flooded land area resulting from the Project through on-site investigation and corresponding calculation.

All the relevant data records will be kept by the Project owner during the crediting period and two years after the end of crediting period or the last issuance of CERs for the Project, whichever occurs later.

5. Quality assurance and quality control

The quality assurance and quality control procedures involves of data monitoring, recording, maintaining and archiving, and monitoring equipment calibration.

The electricity generation supplied to ECPG will be monitored through calibrated metering equipment at the Project site. The data should be double checked against relevant electricity sales receipts and/or monitoring records from the grid for quality control. The Power Purchase Agreement between the Project owner and Grid Company can be used as guidance on data collection and documentation.

Third parties such as the design institute or local water resource bureau will be invited to measure the area of reservoir yearly.

6. Procedures of exception handling and reporting

The CDM technical staffs will take real-time monitoring on the operation status of metering meters to ensure that any abnormity could be detected and the corresponding measures of processing, reporting and recording will be taken in time. In case of malfunction, the abnormal meter will be replaced and new meter must be calibrated by a qualified third-party before being put into use again.

Problem occurred in monitoring and measurement process will be recorded and reported to CDM manager and project manager. Consequently, the corrective actions will be updated to the Monitoring Manual by the CDM manager or project manager for the purpose of continuous improvement.

All the relevant records of exception handling will be kept by the Project owner during the crediting period and two years after the end of crediting period or the last issuance of CERs for the Project, whichever occurs later.

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

>>

Completion date: 09/04/2008

Entity: Cleanergy Investment Service (Beijing) Co., Ltd.

Address: Capital Times Square, 88 Xichang'an Jie, Beijing, China, 100031.

Tel: +86-10-83914567

Fax: +86-10-83914555

The entity is not the project participants listed in Annex 1.

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:

>>

29/08/2003. (Signature of *Main Equipments Purchasing Contract*.)

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

>>

30y-0m.

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:

>>

01/10/2009 or registration date, whichever is the later.

C.2.1.2. Length of the first crediting period:

>>

7y-0m.

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>

Not applicable.

C.2.2.2. Length:

>>

Not applicable.

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

Zhejiang Design & Research Institute of Environment Protection Science (ZDIEPS) was commissioned by the Project owner to conduct the Environmental Impact Assessment (EIA) of the Project. The EIA of the Project has been approved by the Environment Protection Bureau of Zhejiang Province.

According to the EIA and *Preliminary Design Report* of the Project, environmental impacts possibly caused by the Project and protect measures adopted by the project owner are analyzed as follows:

Wastewater

Wastewater includes production wastewater and sanitary wastewater. The production wastewater of the Project mainly consists of water produced by pouring, equipment maintenance and flushing, which will be washed downstream after sedimentation process. Thus, there has little influence on the water quality. The sanitary wastewater cannot be drained unless it is disposed in advance to reach the class I of Chinese environmental standard specified as "*Sewage Discharge Standard" (GB8978-1996).*

Air pollution and noise

The Project will generate noise, exhaust gas and dust pollution as a result of construction activities of facilities operating, excavating, filling, milling, cement loading and unloading, and increased traffic. As the construction site is far from the inhabitants, e.g. Zhangtan Town is more than 1000 m from the Project site, the impacts of the Project on the inhabitants are considered insignificant. The Project owner will mitigate the impacts on workers from exhaust gas, noise and dust through sprinkling at irregular intervals, enclosing the construction area and strengthening labour protection measures. These impacts will be eliminated with the achievements of the construction.

Ecological impacts

After the achievement of the construction, the quantity of upstream plankton will be slightly increased, while the type of the biological species would not be changed. The obstruct of the hydro complex will cause some impacts on wild migratory fish living in the Qujiang River, however, the Project will construct a special channel for migratory fish to ensure their natural living condition.

The project will submerge some farmland, grassland and woodland. For the flooded vegetation is common in type, the Project has no impacts on the species resources.

After the achievement of the construction, the river upstream from the dam remains the shape of valley, and the impact on wild animal is insignificant. As the local climate change of riverside is good for vegetation growth, and the reservoir will produce new ecological environment such as river cove and drawdown zone, it is beneficial for the growth and breed of bird and mammalian.

Water and solid loss

Water and solid loss will come along with the construction of the Project because of excavation of earth, construction and solid waste dumping. The Report of Water and Solid Conservation Plan has been approved by the Water Resources Bureau of Zhejiang Province, and the Project owner will strictly enforce this plan during the construction period to mitigate the water and solid loss.

In conclusion, environmental impacts arising from the Project are considered insignificant.

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:

>>

The Project has not significant impacts on local environment and the EIA of the Project has been approved by the local environmental protection authority.

SECTION E. Stakeholders' comments

>>

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

>>

On Jul. 2007, staffs from the Project owner carried out a survey of local residents possibly be impacted in the area where the Project is sited to collect public comments and attitudes towards the Project. The survey was conducted through distributing and collecting responses to a questionnaire.

Questionnaires were distributed according to the principle of both representation and randomness in order to reflect the public opinions and comments in a fair and real manner. Totally 35 questionnaires were distributed with a response rate of 100%.

The survey had taken full account into the public advice of different ages, genders, education level and occupations. Of all the respondents, 17% are under the age of 30, 49% between 30 and 50 and 34% over 50; 71% are male and 29% female; 54% with a education level of elemental school, 37% junior middle school and 9% senior middle school or above; 27 farmers, 5 civilians, 2 students and 1 worker.

E.2. Summary of the comments received:

>>

The following is a summary of the key findings based on returned questionnaires.

- 71% of the respondents are familiar with the Project and 29% partly know about the Project.
- 86% of the respondents support the construction of the Project, 14% hold a neutral attitude and no objection.
- The respondents consider construction and operation of the Project may produce positive impacts of lessening of power cut (3%), decrease of electricity price (14%), improvement of local environment (54%), increase of income (6%) and increase of employment opportunities (23%).
- The respondents are wondering whether construction and operation of the Project will produce negative impacts of noise (91%), land occupation (6%) and 1 person (3%) leave the question blank.
- For 15 respondents whose land is occupied by the Project, all of them have obtained the compensation.

It shows that the local residents strongly support the Project, and they consider the Project will bring various positive impacts on their lives. The possible negative impacts focus on noise and occupation of lands.

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

>>

The Project owner will pay much attention to the comments and suggestions of stakeholders and will put all of the measures listed in the EIA into effect during construction and operation period, so as to achieve environmental benefits, social benefits and economic benefits.

As described in section D.1 of this PDD, because the construction site is far from the inhabitants, the impacts of noise on the inhabitants are insignificant. Furthermore, the Project owner will strengthen labour protection to mitigate impacts on workers.

The Project owner has signed the land occupation agreement with local residents, and the compensation standards were set according to relevant laws and regulations. At present all the relevant residents have obtained the compensation.

To sum up, the local residents are very supportive on the Project. The Project owner has taken full consideration of the comments and suggestions given by stakeholders during the project implementation. The Project owner will also keep regular communication with the public regarding the construction and operation of the Project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I Parties is involved in the Project.

Annex 3

BASELINE INFORMATION

Data and calculation method recommended in the *Notification on Determining Baseline Emission Factors of China power Grid*[47] for ECPG are adopted in this PDD.

1. Calculation of OM Emission Factor of ECPG

Table A1. Thermal power supplied to ECPG in 2003

	Thermal power generation	Auxiliary electricity consumption	Thermal power supplied to the grid
	（MWh)	（%）	（MWh)
Shanghai	69,444,000	5.14	65,874,578
Jiangsu	133,277,000	5.9	125,413,657
Zhejiang	83,089,000	5.31	78,676,974
Anhui	54,156,000	6.06	50,874,146
Fujian	42,146,000	5.07	40,009,198
Total	-	-	360,848,554

Data source: China Electric Power Yearbook 2004 Edition.

Table A2. Thermal power supplied to ECPG in 2004

	Thermal power generation	Auxiliary electricity consumption	Thermal power supplied to the grid
	（MWh)	（%）	（MWh)
Shanghai	71,127,000	5.22	67,414,171
Jiangsu	163,545,000	5.93	153,846,782
Zhejiang	95,255,000	5.68	89,844,516
Anhui	59,875,000	6.03	56,264,538
Fujian	50,490,000	6.07	47,425,257
Total	-	-	414,795,263

Data source: China Electric Power Yearbook 2005 Edition.

Table A3. Thermal power supplied to ECPG in 2005

	Thermal power generation	Auxiliary electricity consumption	Thermal power supplied to the grid
	（MWh)	（%）	（MWh)
Shanghai	74,606,000	5.05	70,838,397
Jiangsu	211,429,000	5.96	198,827,832
Zhejiang	108,110,000	5.59	102,066,651
Anhui	62,918,000	5.9	59,205,838
Fujian	48,600,000	4.57	46,378,980
Total	-	-	477,317,698

Data source: China Electric Power Yearbook 2006 Edition.

[47] China DNA (http://cdm.ccchina.gov.cn), August 9th, 2007.

Table A4 shows the low calorific values, emission factors and oxidation rates of fuels consumed for electricity generation that are to be used in the following OM emission factor calculation and BM emission factor calculation.

Table A4. Data of fuels consumed for electricity generation

Fuel type	**Low calorific value**	**Emission factor (tc/TJ)**
Raw coal	20,908 kJ/kg	25.80
Cleaned coal	26,344 kJ/kg	25.80
Other washed coal	8,363 kJ/kg	25.80
Coke	28,435 kJ/kg	29.20
Crude oil	41,816 kJ/kg	20.00
Gasoline	43,070 kJ/kg	18.90
Kerosene	43,070 kJ/kg	19.60
Diesel	42,652 kJ/kg	20.20
Fuel oil	41,816 kJ/kg	21.10
Other petroleum products	38,369 kJ/kg	20.00
Natural gas	38,931 kJ/m^3	15.30
Coke over gas	16,726 kJ/m^3	12.10
Other coal gas	5,227 kJ/m^3	12.10
LPG	50,179 kJ/m^3	17.20
Refinery gas	46,055 kJ/m^3	15.70

Data sources: China Energy Statistical Yearbook 2006 Edition, P287;
"2006 IPCC Guidelines for National Greenhouse Gas Inventories", Volume2, Chap 1, Table 1.2, Table 1.4

Table A5~A7 show the calculation of simple OM emission factor of ECPG in 2003, 2004 and 2005.

Table A5. Calculation of simple OM emission factor of ECPG in 2003

Fuel type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission factor	NCV	CO_2 emissions（tCO_2e）
								（tc/TJ）	（MJ/t,km^3）	I=F*G*H*44/12/10000（mass unit）
		A	B	C	D	E	F=A+B+C+D+E	G	H	I=F*G*H* 44/12/1000 (volume unit)
Raw coal	10^4t	2618	6417.74	3442.4	2669.67	1754	**16901.81**	25.8	20908	334300359.13
Clean washed coal	10^4t	0	0	0	0	0	**0**	25.8	26344	0.00
Other washed coal	10^4t	0	0	0	0	0	**0**	25.8	8363	0.00
Coke	10^4t	0	0	0	0	0	**0**	29.2	28435	0.00
Coke oven gas	10^8m^3	1.99	0.06	0	0	0	**2.05**	12.1	16726	152125.76
Other gas	10^8m^3	66.34	0	0	0	0	**66.34**	12.1	5227	1538454.90
Crude oil	10^4t	0	0	0	0	0	**0**	20	41816	0.00
Gasoline	10^4t	0	0	0	0	0	**0**	18.9	43070	0.00
Diesel	10^4t	1.26	14.71	13.99	0	0	**29.96**	20.2	42652	946463.80
Fuel oil	10^4t	95.49	0.76	174.48	0	18.89	**289.62**	21.1	41816	9369683.52
LPG	10^4t	0	0	0	0	0	**0**	17.2	50179	0.00
Refined gas	10^4t	0.49	0.96	0	0	0	**1.45**	15.7	46055	38442.88
Natural gas	10^8m^3	0	0	0	0	0	**0**	15.3	38931	0.00
Other petroleum products	10^4t	18.91	5.3	15.04	0	0	**39.25**	20	38369	1104387.72
Other coking products	10^4t	0	0	0	0	0	**0**	25.8	28435	0.00
Other energy	10^4t Ce	5.68	0	7.08	0	0	**12.76**	0	0	0.00
Total emissions (tco_2)										347449917.70
							MWh	**Emission factor (tCO_2e/MWh)**		**Emissions（tCO_2e）**
Thermal power supplied to ECPG							360848554	-		347449918
Imports from CCPG							13756040	0.797442		10969644
Imports from Yangcheng Power Plant							10705870	0.94978		10168221
Total							**385310464**	-		368587783

Data sources: China Energy Statistical Yearbook 2004 Edition; China Electric Yearbook 2004 Edition.

Table A6. Calculation of simple OM emission factor of ECPG in 2004

Fuel type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission factor	NCV	CO_2 emissions（tCO_2e）
								（tc/TJ）	（MJ/t,km^3）	I=F*G*H*44/12/10000（mass unit）
		A	B	C	D	E	F=A+B+C+D+E	G	H	I=F*G*H* 44/12/1000 (volume unit)
Raw coal	10^4t	2779.6	7601.9	4008.9	2906.2	2183.7	**19480.3**	25.8	20908	385300230.33
Clean washed coal	10^4t	0	0	0	0	0	**0**	25.8	26344	0.00
Other washed coal	10^4t	0	5.46	0	0	4.63	**10.09**	25.8	8363	79826.01
Coke	10^4t	0	0	0	0	0	**0**	29.2	28435	0.00
Coke oven gas	10^8m^3	2.59	0	0	0	0	**2.59**	12.1	16726	192197.91
Other gas	10^8m^3	72.46	0	0	0	0	**72.46**	12.1	5227	1680380.49
Crude oil	10^4t	0	0	0	0	0	**0**	20	41816	0.00
Gasoline	10^4t	0	0	0	0	0	**0**	18.9	43070	0.00
Diesel	10^4t	2.69	27.17	6.23	0	0	**36.09**	20.2	42652	1140116.11
Fuel oil	10^4t	58.52	55.07	202.89	0	23.26	**339.74**	21.1	41816	10991147.99
LPG	10^4t	0	0	0	0	0	**0**	17.2	50179	0.00
Refined gas	10^4t	0.77	0.55	0	0	0	**1.32**	15.7	46055	34996.27
Natural gas	10^8m^3	0	0.14	0	0	0	**0.14**	15.3	38931	30576.41
Other petroleum products	10^4t	21.22	1.37	24.89	0	0	**47.48**	20	38369	1335957.42
Other coking products	10^4t	0	0	0	0	0	**0**	25.8	28435	0.00
Other energy	10^4t Ce	6.43	0	15.48	0	0	**21.91**	0	0	0.00
Total emissions (tco_2)										400785428.93
							MWh	**Emission factor (tCO_2e/MWh)**		**Emissions（tCO_2e）**
Thermal power supplied to ECPG							414,795,263	-		400785429
Imports from CCPG							26,933,850	0.826448		22259426
Imports from Yangcheng Power Plant							11,649,610	0.944241		11000039
Total							**453378723**	-		434044894

Data sources: China Energy Statistical Yearbook 2005 Edition; China Electric Yearbook 2005 Edition.

Table A7. Calculation of simple OM emission factor of ECPG in 2005

Fuel type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission factor	NCV	CO_2 emissions（tCO_2e）
								（tc/TJ）	（MJ/t,km^3）	I=F*G*H*44/12/10000（mass unit）
		A	B	C	D	E	F=A+B+C+D+E	G	H	I=F*G*H* 44/12/1000 (volume unit)
Raw coal	10^4t	2847.31	9888.06	4801.52	3082.9	2107.69	**22727.48**	25.8	20908	449526099.64
Clean washed coal	10^4t	0	0	0	0	0	**0**	25.8	26344	0.00
Other washed coal	10^4t	0	0	0	0	0	**0**	25.8	8363	0.00
Coke	10^4t	0	0	0.03	0	0	**0.03**	29.2	28435	913.33
Coke oven gas	10^8m^3	1.68	1.38	0	1.71	0	**4.77**	12.1	16726	353970.67
Other gas	10^8m^3	83.72	24.97	0.06	30	0	**138.75**	12.1	5227	3217675.86
Crude oil	10^4t	0	0	27.01	0	0	**27.01**	20	41816	828263.45
Gasoline	10^4t	0	0	0	0	0	**0**	18.9	43070	0
Diesel	10^4t	1.25	16	4.52	0	1.67	**23.44**	20.2	42652	740491.04
Fuel oil	10^4t	59.39	13.22	153.22	0	7.45	**233.28**	21.1	41816	7546991.82
LPG	10^4t	0	0	0	0	0	**0**	17.2	50179	0.00
Refined gas	10^4t	0.57	0.83	0	0	0	**1.4**	15.7	46055	37117.26
Natural gas	10^8m^3	1.09	1.85	0.62	0	0	**3.56**	15.3	38931	777514.36
Other petroleum products	10^4t	21	8.38	34.8	0	0	**64.18**	20	38369	1805849.77
Other coking products	10^4t	0	0	0	0	0	**0**	25.8	28435	0.00
Other energy	10^4t Ce	12.36	0	15.29	0	0	**27.65**	0	0	0.00
Total emissions (tco_2)										464834887.21
							MWh	**Emission factor (tCO_2e/MWh)**		**Emissions（tCO_2e）**
Thermal power supplied to ECPG							477,317,698	–		464834887
Imports from CCPG							160,410,000	0.771225		123712202
Imports from Yangcheng Power Plant							77,244,000	0.938703		72509175
Total							714971698	-		661056264

Data sources: China Energy Statistical Yearbook 2006 Edition; China Electric Yearbook 2006 Edition.

The Simple OM emission factor is the weighted average value of the Simple OM emission factors in the year 2003, 2004and 2005, i.e.

$EF_{OM,y}$ = (368587783+434044894+661056264)/(385310464+453378723+714971698) = 0.9421 tCO2e/MWh.

2. Calculation of BM Emission Factor of ECPG

Table A8 is data of the efficiency level of the best electricity generation technologies commercially available in China and the corresponding emission factors with reference to the *Notification on Determining Baseline Emission Factors of China Power Grid* issued by Chinese DNA.

Table A8. The efficiency level of the best electricity generation technology commercially available in China

	Parameter	**Efficiency of supplying electricity**	**Fuel emission factor (tc/TJ)**	**Emission factor (tCO_2e/MWh)**
		A	B	C=3.6/A/1000*B*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	35.82%	25.8	0.9508
Gas-fired power plant	$EF_{Gas,Adv}$	47.67%	15.3	0.4237
Oil-fired power plant	$EF_{Oil,Adv}$	47.67%	21.1	0.5843

Table A9 shows the CO_2 emissions of ECPG in 2005.

Table A9. CO_2 emissions of ECPG in 2005

Fuel type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission factor	NCV	CO_2 emissions（tCO_2e）
								（tc/TJ）	（MJ/t,km^3）	I=F*G*H*44/12/100
		A	B	C	D	E	F=A+B+C+D+E	G	H	
Raw coal	10^4t	2847.31	4801.52	9888.06	3082.9	2107.69	**22727.48**	25.8	20908	449526100
Cleaned coal	10^4t	0	0	0	0	0	**0**	25.8	26344	0
Other washed coal	10^4t	0	0	0	0	0	**0**	25.8	8363	0
Coke	10^4t	0	0.03	0	0	0	**0.03**	29.2	28435	913
Sub-total										**449527013**
Crude oil	10^4t	0	27.01	0	0	0	**27.01**	20	41816	828263
Gasoline	10^4t	0	0	0	0	0	**0**	18.90	43070	0
Kerosene	10^4t	0	0	0	0	0	**0**	19.60	43070	0
Diesel	10^4t	1.25	4.52	16	0	1.67	**23.44**	20.2	42652	740491
Fuel oil	10^4t	59.39	153.22	13.22	0	7.45	**233.28**	21.1	41816	7546992
Other petroleum products	10^4t	21	34.8	8.38	0	0	**64.18**	20	38369	1805850
Sub-total										**10921596**
Natural gas	10^7m^3	10.9	6.2	18.5	0	0	**35.6**	15.3	38931	777514
Coke oven gas	10^7m^3	16.8	0	13.8	17.1	0	**47.7**	12.1	16726	353971
Other gas	10^7m^3	837.2	0.6	249.7	300	0	**1387.5**	12.1	5227	3217676
LPG	10^4t	0	0	0	0	0	**0**	17.2	50179	0
Refinery gas	10^4t	0.57	0	0.83	0	0	**1.4**	15.7	46055	37117
Sub-total										**4386278**
Total emissions										**464834887**

Data sources: China Energy Statistical Yearbook 2006 Edition.

Calculate with data provided in Table A9:

λ_{Coal} = 449527013/464834887×100% = 96.71%

λ_{Oil} = 10921596/464834887×100% = 2.35%

λ_{Gas} = 4386278/464834887×100% = 0.94%

Based on Table A8, the emission factor for thermal power is:

$EF_{Thermal} = \lambda_{Coal} \cdot EF_{Coal,Adv} + \lambda_{Oil} \cdot EF_{Oil,Adv} + \lambda_{Gas} \cdot EF_{Gas,Adv}$ =0.9372 tCO_2e/MWh.

Table A10. Basic data of ECPG in 2005

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired power	MW	13113.5	42506.4	27688.1	11423.2	9345.4	104076.6
Hydro Power	MW	0	142.6	6952.1	749.8	8224.9	16069.4
Nuclear Power	MW	0	0	3066	0	0	3066
Wind power & others	MW	253.3	58.8	37.2	0	52	401.3
Total	MW	13366.8	42707.8	37743.4	12173	17622.3	**123613.3**

Data source: China Electric Power Yearbook 2006 Edition.

Table A11. Basic data of ECPG in 2004

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired power	MW	12104.9	28289.5	21439.8	9364.5	8315.4	79424.1
Hydro Power	MW	0	126.5	6418.4	692.8	7180.1	14417.8
Nuclear Power	MW	0	0	3056	0	0	3056
Wind power & others	MW	3.4	17.5	39.7	0	12	72.6
Total	MW	12018.3	28433.5	30953.9	10057.3	15507.5	**96970.5**

Data source: China Electric Power Yearbook 2005 Edition.

Table A12. Basic data of ECPG in 2003

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired power	MW	11092.6	22245	15321.2	9284.9	7092.8	65036.5
Hydro Power	MW	0	137.8	6054.5	649.1	6761.1	13602.5
Nuclear Power	MW	0	0	2406	0	0	2406
Wind power & others	MW	0	0	39.7	0	12	51.7
Total	MW	11092.6	22382.7	23821.4	9934	13865.8	**81096.5**

Data source: China Electric Power Yearbook 2004 Edition.

Table A13. Calculation for BM emission factor of ECPG

	2003	**2004**	**2005**	**2004-2005 increment**	**Ratio to total increment**
	A	B	C	D=C-B	
Fuel-fired power（MW）	65036.5	79424.1	104076.6	24652.5	**92.53%**
Hydro Power（MW）	13602.5	14417.8	16069.4	1651.6	6.20%
Nuclear Power（MW）	2406	3056	3066	10	0.04%
Wind power（MW）	51.7	72.7	401.3	328.7	1.23%
Total（MW）	**81096.7**	**96970.6**	**123613.3**	**26642.8**	**100.00%**
Ration compared to 2004	**65.60%**	78.45%	100%	-	-

BM emission factor of ECPG can be calculated as:

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

Where CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions of thermal power, therefore,

$EF_{BM,y}$ = 0.9253 × 0.9372 = 0.8672 tCO_2e/MWh.

Annex 4

MONITORING INFORMATION

Please refer to section B.7. No need to complement more information here.