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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Henan Zhengzhou Grid Connected Natural Gas Combined Cycle Power Plant
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A.2. Description of the project activity:

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Henan Zhengzhou Grid Connected Natural Gas Combined Cycle Power Plant (the "Project", or the "proposed project") is situated in the Zhengzhou City of Henan Province, and it is to be built as a grid-connected electricity generation plant using natural gas (NG) exploited from the gas fields in the Chadamu basin of Qinghai, Tarim basin of Xinjiang, and Shanganning region in the western areas of China.

Serving as a peak load balancing power plant, the proposed project has an annual installation capacity of 780 MW by 2×390 MW gas/steam turbines using combined cycle technology, running 3500h with a net electricity generation about 2598GWh to be sold into the Henan Grid, a sub-grid of an independent regional grid - Central China Grid (CCG), while an annual NG consumption of 525 millions m^3 is to be supplied on a firm basis according to a Fuel Supply Agreement singed.

The Project activity will result in a greenhouse gas (GHG) emission reductions about 691,502tons CO2 equivalent annually, in a 7x3 years of crediting period, resulting from the coal-dominated business-as-usual scenario in the CCG.

The Project will not only act as clean technology demonstration project, supply electricity to the grid, bring much better electricity peak load balancing efficiency, but also promote sustainable development of the host country and local area by means of:

- Creating new job opportunities directly at the Project site during construction and operation, and indirectly at the pipeline construction and management of gas flow to the Project;
- Improving people's living standard;
- Reducing greenhouse gas emissions compared with the business-as-usual scenario;
- Reducing other pollutants compared with the power generation in business-as-usual scenario;
- Improving the structure and peak load balancing function of the local grid;
- Demonstrating a model project for the dissemination of more environmental friendly technology in power generation field where population condensed metropolitan cities are in great need in China;
- Promoting greatly the use of natural gas in a traditionally coal gas metropolitan city for better safety and environment; and
- Using NG transmitted by the national WEST to EAST natural gas program for supporting the development in the western areas of China.

A.3. Project participants:

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Participants to the Project activity are the following:

Table 1. Information of the Project Participants

Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be in indicated using the following tabular format.		
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)**
People's Republic of China (host country)	Zhengzhou Combined Cycle Power Co., Ltd	No
United Kingdom	TOTAL Gas & Power Limited	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:

A.4.1. Location of the Project activity:

A.4.1.1. Host Party(ies):

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China

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

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Henan Province

A.4.1.3. City/Town/Community etc:

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Xiangying Village, Zhengzhou 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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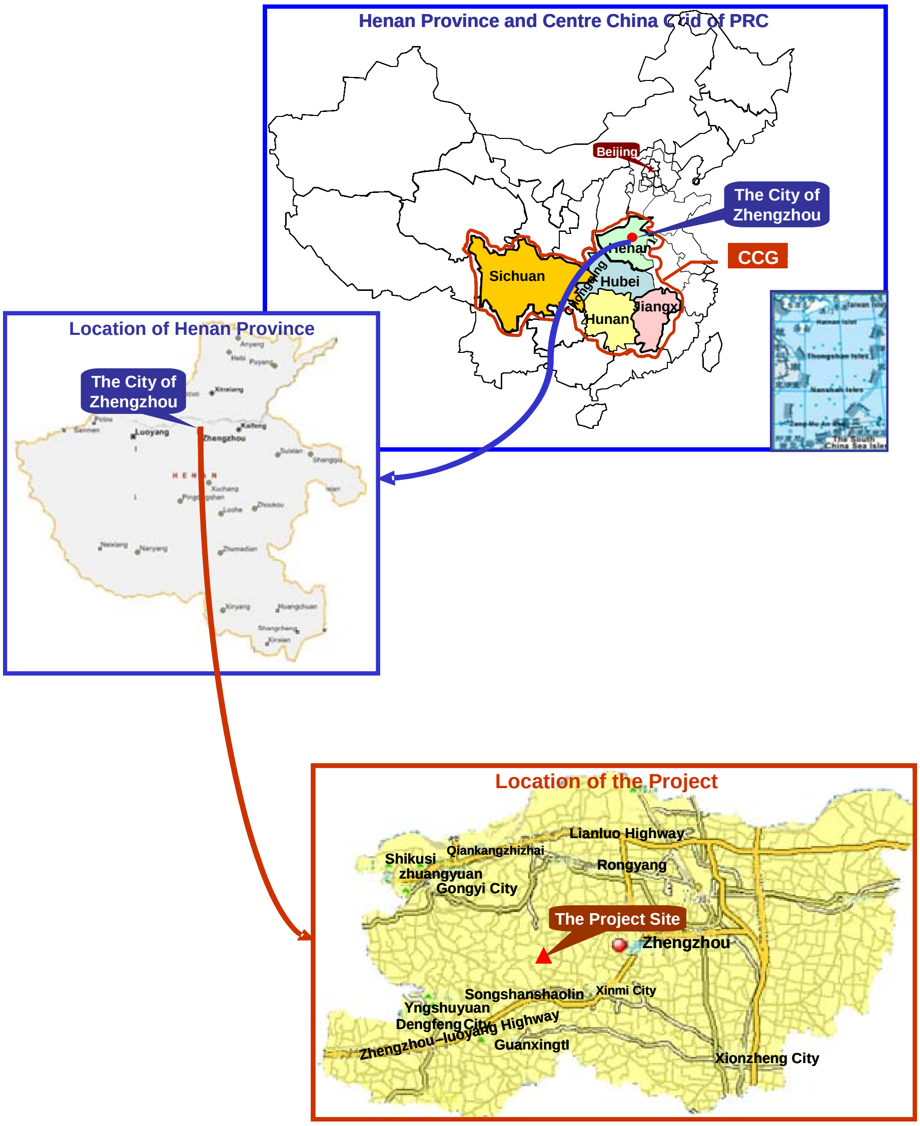
The Project is sited in the Xiangying village of Zhengzhou city with geographical coordinates of 112°42'－114°14' east longitude 34°16'－34°48' north latitude. The Project site is about 6km northwest to the downtown of Zhengzhou, and has geographical coordinates of 113°31'47" east longitude and 34°47' 45" north latitude. Figure 1 shows the location of the Project.

Figure 1. Geography Location of the Project



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

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This category would fall within sectoral scope 1: Grid-connected electricity generating project using non-renewable fuel in energy industries.

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

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The selected technology for the Project is from the German manufacturer of Siemens, which includes following main equipments：

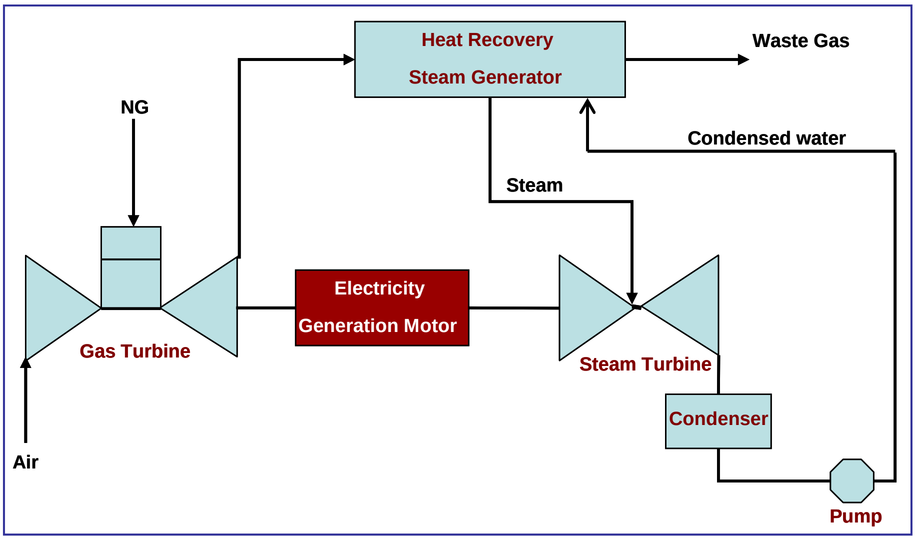
- Gas-Steam Combined Cycle unit: GUD 1S. V94.3A,390MW, made by Siemens
- Heat Recovery Steam Generator :SG-266(55) (47)/12.98(3.26) (0.27)-Q815, made by Wuhan Boiler Company

The technical parameter of the Project was described as follow:

Item	Unit	Value
Combined Cycle Rated generating thermal efficiency	%	57.21
Heat consumption rate	KJ/KWh	6139
Natural gas consumption	Nm^3/kW.h	0.198
Natural gas flow	t/h	49.25
High pressure steam volume of Heat Recovery Steam Generator	t/h	264.9
Medium pressure steam volume of Heat Recovery Steam Generator	t/h	309.3
Low pressure steam volume of Heat Recovery Steam Generator	t/h	54.18

The process flow of the Project was shown in the flowing figure 2:

Figure 2. Process Flow Diagram of the Project



The electricity for auxiliary consumption is estimated at 2.11% of power generated. The gas turbine and steam turbine generator output are stepped up into 500 KV in a newly built switchyard where is connected into the CCG, an independent regional grid in the PRC.

The Project has a Maintenance Service Agreement signed with the equipment supplier (Siemens) to ensure the maximized achievable results during the project operation. In addition, the project owner has been working with the various related professional institutions (including Siemens) and consultants to provide a series of professional training programs before, during, and after the project construction. It is very much expected that such training programs will provide the project a highly skilled technician team needed to ensure the desirable results.

The proposed project involves transfer of the state-of-art advanced NGCC technology from the world leading equipment supplier, the Siemens, and will clearly support the Chinese power industry sustainable developments in environmental, commercial, and developmental terms.

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

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The emission reductions to be generated from the Project activity over the 7×3 years of crediting period, starting from date of the Project successfully registered as the CDM project at the EB, will be calculated annually for emission reduction calculation.

Years	Annual estimation of emission reductions in tonnes of CO_2e
1 November 2007	115,250
2008	691,502
2009	691,502
2010	691,502
2011	691,502
2012	691,502
2013	691,502
31 October 2014	576,252
Total estimated reductions (tonnes of CO_2e)	**4,840,513**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**691,502**

A.4.5. Public funding of the project activity:

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There is no public funding involved in this proposed 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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Version 01 of Approved baseline methodology AM0029 (Sectoral Scope 01, 19 May 2006) – "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas.”

Version 01 of Approved monitoring methodology AM0029 (Sectoral Scope 01, 19 May 2006) – “Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel.”

ACM0002.ver 06 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources."

The additionality of the Project is demonstrated and assessed by using the "Tool for Demonstration and Assessment of Additionality" (Version 03，16 February 2007)

For more information regarding the methodologies please refer to
http://cdm.unfccc.int/methodologies/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 is a grid-connected natural gas power generation activity and meets all the conditions stated in the Baseline Methodology AM0029 as the follows:

1) The Project activity is the construction and operation of a new natural gas fired grid-connected-electricity generation plant with no auxiliary fuels used in the Project operation.
2) The geographical/ physical boundaries of the baseline grid, the CCG, can be clearly identified and information pertaining to the CCG and estimating baseline emissions is publicly available.
3) Natural gas is sufficiently available for the Project and for the provincial market of Henan where the Project is situated, because of that:

   (1) The natural gas consumed by the Project is to be transmitted by a national natural gas transmission pipeline operated and owned by the China National Petroleum Corporation (the PetroChina). A 20-Year Fuel Supply Agreement was signed between the Project owner and PetroChina with an ensured natural gas supply in a total amount of 525million m^3 annually (Evidence was provided to DOE).

   (2) There are two stable and reliable gas resources currently to supply the provincial market of Henan: NG supplied by Shanganning Gas Field of Tarim Basin and Chadamu Basin via the national natural gas transmission pipeline, and supplied by the Zhongyuan Oil Field. As a result, the NG supply in the market of Henan province is sufficiently available, and more detailed information on the resources are provided as follows:

      i. The NG supplied by the Shanganning Gas Field of Tarim Basin and Chadamu Basin will be transmitted, via a national natural gas transmission pipeline, to the project site as well as to other ender users in the NG markets, which is a main NG supply resource for the provincial market of Henan, accounted for about 45% of total NG consumed (about 1.4 billion m^3) in the Henan provincial market in 2007[1].

      ii. The natural gas reserve of the Zhongyuan Oil Field in the Henan province is about 367.5 billion m^3 with exploitable reserves of 128.5 billion m^3[2]. And currently about 1.723 billion m^3 NG exploited from Zhongyuan Oil Field is supplied to the provincial NG market of

1 *Data source: "Notice for Balancing the Amount of Nature Gas in 2007" issued by provincial government of Henan, http://www.hndrc.gov.cn/fgwj/bmwj/200705/t20070518_11398.htm*

2 *Data source: "Brief Introduction for Five Important Nature Gas bases in China", http://www.oilboss.cn/news/ShowArticle.asp?ArticleID=26935*

Henan per annum[3], accounted about 55% of total NG consumed in the Henan provincial market.

In addition to the above mentioned two NG supply resources, the Henan provincial government had signed an agreement in 2006 with PetroChina with a secured amount of 2.1 billion m^3 natural gas exploited from Puguang Gas field for supplying, starting from later half year of 2007, to the provincial market of Henan[4]. The natural gas consumption of Henan market during 2002~2007 are described as follow:

Year	Natural Gas Consumption (billion m^3)	Growth Rate	Note
2002	1.463	-	Data source: *China Energy Statistical Yearbook 2006*
2003	1.677	14.6%	
2004	2.029	21.0%	
2005	2.371	16.7%	
2006	2.869(Estimated)	21.0%	Calculated according to the growth rate of 21% and it is conservative.
2007	3.471(Estimated)	21.0%	Calculated according to the growth rate of 21% and it is conservative.

As illustrated above, the amount of NG available to the market is estimated about 5.223 billion m^3 in 2007, while the consumption is estimated about 3.471 billion m3, in Henan province where the Project is situated. Thus the natural gas is sufficiently available for the proposed project and for the market where the project is situated.

As a matter of fact, there are a number of new natural gas based power plants in the regional market are currently under early initiative stages and are expected to be further developed in the near future (Evidence was provided to DOE). Therefore, the proposed project does not constrain future natural gas based capacity additions in the Henan province.

Moreover, according to the pre-agreed fuel supply agreement motioned above, the Project would not displace natural gas that would otherwise be used elsewhere in an economy; giving that fact that the power industry only consuming less than 13% of the natural gas available in the national market (Evidence was provided to DOE). For the above reason, the implementation of the proposed project will not lead to leakage.

As described above, the approved baseline methodology, AM0029: "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas" is applicable to the proposed project.

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

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According *to "China's Regional Grid Baseline Emission Factors Determined" published by DNA* (for details see http://cdm.ccchina.gov.cn/web/index.asp), CCG involved in Henan, Sichuan, Hubei, Hunan and Jiangxi, and one city of Chongqing grid. The related information regarding CCG is provided at below:

	Source	Gas	Included?	Justification / Explanation
Baseline	Power generation in	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.

[3] *China Energy Statistical Yearbook 2006, page189.*

4 Data source: "SINOPEC Signed the Preliminary Agreement to Sale NG to Henan", http://www.china5e.com/news/oil/200605/200605290220.html

	baseline	N_2O	No	Excluded for simplification. This is conservative.
Project Activity	Natural gas combustion	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.

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

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According to AM0029 (version 01), the baseline scenario is identified using the following two steps.

Step 1: Identify the Plausible Baseline scenario

The Project is build with a purpose of increasing the ability of peak load balancing and meeting the local power demand and stabling the supply of electricity of the CCG. All plausible and credible alternatives available to the Project that provide outputs or services comparable to the proposed CDM project activity include:

Plausible and credible alternatives available to the Project that provide outputs or services comparable to the proposed CDM project activity include:

Alternative 1): The Project activity not implemented as a CDM project;

Alternative 2): Power generation using natural gas, but technologies other than the project activity;

Alternative 3): Power generation technologies using energy sources other than natural gas;

Alternative 4): Providing electricity by connected grids, including the possibility of new interconnections.

For Alternative 1): it is a plausible baseline scenario which can deliver similar services as the proposed project.

For Alternative 2): Power generation using natural gas, but technologies other than the project activity.

Power generation using natural gas, but technologies other than the project activity, i.e. uses natural gas with singly cycle technology for power generation. The development of singly cycle technology using natural gas has been achieved for commercialization from the 100MW to the 250-300MW unit capacity in recent years and its thermal efficiency reached up to 38%-39.5%. However, the gas/steam combined cycle technology can achieve not only much higher thermal efficiency, about 54.5-58%, but also with a commercialized unit capacity greater than 300MW[5]. Therefore, single cycle natural gas power generation technology with a unit capacity of 390MW is not commercially, technically viable in today's NG power market of the PRC. Thus, Alternative 2) the single cycle technology using natural gas is not applicable.

For Alternative 3): other energies for power generation include oil, coal, hydro resource, wind resource, solar resource, biomass and nuclear resource.

According to *Policy Outlines of China Energy Conservation Technologies* issued by *Chinese National Development and Reform Commission* and *Ministry of Science and Technology*, the development of new oil-fired power plant is prohibited. The oil-fired power plant therefore is not feasible as baseline scenario;

5 *Date source: "Assessment on the Application of Gas Turbine Power Generation Technology", http://www.chinapower.com.cn/article/1025/art1025680.asp*

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Nuclear power generation can participant in the situation of basic load supply and hardly involves in peak balancing[6], while the wind power mostly rises after mid-night, during which load of electricity grid is the smallest, so wind power grid-connected eventually increases the difficulty of peak load balancing[7].Thus, nuclear power resource and wind power resource are not applicable.

The solar power would not deliver the similar services as the proposed project (peak load balancing)[8]. The biomass power generation technology is not commercialized at present[9] and is also unable to provide the peak-load regulation service as the proposed project. Therefore, both the solar and biomass power generation technologies are not feasible as the baseline scenarios for the proposed project.

Since "Hydro is used for peak regulation during the dry season" is a rule that commonly used for power dispatching within the CCG[10], therefore, it is quite obvious that the Hydro power plant(s) will be unable to provide the similar services as the proposed project within the CCG. Thus, hydro resource is not feasible.

Dislike the developed world (the Hydro, oil, and gas power plants are commonly used for the peak regulation), China, up to date, uses the coal power plants not only for the peak regulation and frequency modulation, but also for load balancing due to the power market are dominated by the coal plants[11]. As the result, the 600MW sub-critical or super-critical coal-fired power plant is selected as this project alternative scenario.

For Alternative 4): the amount of power provided by the CCG could be the same with power generation of the Project, but it is unable to balance the peak load. So alternative 4) providing of electricity by the CCG is not applicable.

As analysed above, the likely baseline scenarios for the proposed project are: the Alternative 1), the proposed project activity (not implemented as a CDM project) and the Alternative 3), new sub-critical or super-critical coal-fired power plant with the installed capacity 600MW.

Step 2: Identify the Most Attractive Baseline Scenario Alternative

According to AM0029, the applicable alternatives illustrated in step 1 are analyzed below on the basis of investment. The economically most attractive baseline scenario alternative is finally identified using the levelised electricity generation cost (EGC). The formula[12] applied to calculate the levelised electricity generation cost (EGC) is the following:

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[6] Data source: *"Strategically Approach on Speeding up Nuclear Power Development in China"*, *http://www.jjbk.cn/qyjj/ShowArticle.asp?ArticleID=7907*

[7] Data source: *"The Off Grid Wind Power should be Developed with Large-Scale Storage Power"*, *http://www.cas.ac.cn/html/Dir/2006/11/08/14/55/28.htm*

[8] Data source: *http://www.in-en.com/newenergy/html/newenergy-1431143163139011.html*

[9] *Tentative Management Measures for Price and Sharing of Expenses for Electricity Generation from Renewable Energy*, Document No. NDRC Energy [2006]13.

[10] Data source: *"The Practical Approach to Reduce Wasted Water Resources of the Hydropower Stations in the China Central Grid", http://www.cpnn.com.cn/zgdy2/gldg/200103160057.htm*

[11] Data source: *"Assessment the Efficiency Issues for China's Power Industry", http://www.21360.cn/Html/cygc/200608/22097.html*

[12] Data source: *Appendix 5 of Projected Costs of Generating Electricity-2005 Update, International Energy Agency, http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1472*

$$EGC = \frac{\sum_t \left[(I_t + M_t + F_t)(1+r)^{-t} \right]}{\sum_t \left[E_t (1+r)^{-t} \right]}$$

Which, EGC: Average lifetime levelised electricity generation cost per KWh.

It: Capital expenditure in the year t.

Mt: Operation and maintenance expenditures in the year t.

Ft: Fuel expenditure in the year t.

ET: Electricity generation in the year t.

R: Discount rate.

In order to calculate EGC, the annual operation hours and lifetime of sub-critical and super-critical coal-fired power plants are selected as same as to the proposed project. Main parameters for the 600MW sub-critical and super-critical coal-fired power plant and the Project are as follows[13]:

Item	Unit	Sub-Critical Coal-Fired Power Plant 2×600MW	Super-Critical Coal-Fired Power Plant 2×600MW	The Proposed Project
Investment	RMB/KW	3835	4037	3037.8
Annual operation hours	h	3500	3500	3500
Water expenditure	RMB/MWh	1	1	1.41
Material expenditure	RMB/MWh	5	5	6
Maintenance cost	RMB/MWh	27.4	31.72	23.43
Other expenditure (including pollution discharge fees)	RMB/MWh	11.5	12.70	14
Employee payroll	RMB/MWh	4.46	4.70	3.286
Coal expenditure	Kg/MWh	336.66[14]	299	198m^3/MWh
Fuel price	RMB/t (Including VAT)	430	430	0.9123yuan /m^3
Desulfuration expenditure	RMB/MWh	1.20	1.09	-
Load factor	-	0.92	0.92	0.92
Life time	years	20	20	20
Construction period	years	3	4	2

As parameters provided above, the EGC of the project and the 600MW sub-critical and super-critical coal-fired plant alternative is shown below:

	Sub-Critical Coal-Fired Power Plant 2×600MW	Super-Critical Coal-Fired Power Plant 2×600MW	The Proposed Project

[13] *Data source: "China Institute of Power Planning and Design, Thermal Power Engineering Design Reference Cost Index", 2005 Edition.*

[14] *Data source: "the Baseline Emission Factors of China Grids" Issued by Chinese DNA, http://cdm.ccchina.gov.cn/web/main.asp?ColumnId=25*

EGC（RMB/KWh）	0.2880	0.3004	0.3261

When both fuel expenditure and load factor to some extent are changed, the sensitivity variation of the EGC is as follows:

EGC（RMB/KW）	Fuel Expenditure		Load Factor	
	+5％	-5％	+5％	-5％
The proposed project	0.3352	0.3171	0.2940	0.3648
Sub-Critical Coal-Fired Power Plant 2×600MW	0.2940	0.2819	0.2495	0.3339
Super-Critical Coal-Fired Power Plant 2×600MW	0.3059	0.2949	0.2513	0.3636

As analysed above, a new 600MW sub-critical coal-fired power plant is more economically attractive alternative comparing with the proposed project.

In conclusion, the practical and commercially available baseline scenario is the new 600MW sub critical coal-fired power generation plant, which provides the same services as the proposed project does. And the proposed project is not the baseline scenario.

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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According to the AM0029, the assessment of additionality comprises the following steps:

Step 1 Benchmark Investment Analysis

Sub-step 1a Benchmark Analysis Method (Option3)

With reference to *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*, the benchmark Internal Rate of Return (IRR after tax) of the total investment in Chinese Power Industries is 8%, which is commonly used for the power project investments in China.

Sub-step 1b Calculation and comparison of financial indicators

(1) Basic parameters for calculation of financial indicators

Table 2. Basic parameters of the Project

NO.	Parameters	Value
1	Installed capacity (MW)	2*390
2	Electricity supplied to CCG (GWh/y)	2,598,000
3	Bus-bar tariff (RMB / KW·h)	0.34(excluding VAT)
4	Project lifetime (yrs)	22 （Construction period 2 yrs; Operational period 20yrs）
5	Fixed investment (Million RMB, equity/debt ratio: 1:3)	2369.49
6	Debt rate	5.76％
7	Circulating fund (Million RMB)	54.08
8	Maintenance cost of transmission line(Million RMB/a)[15]	1

[15] *Data Source: Contract to Maintenance Transmission Line (this documentary evidence was provided to DOE)*

9	**Income tax rate**	33%
10	**Tax rate of city construction**	7%
11	**Tax rate of education, Million RMB)**	3%
12	**Maintenance cost （RMB/MWh）**	23.43
13	**CERs (EUR)**	8.5

Data Source: The Feasibility Study Report of the Project

(2) Comparison of IRR for the proposed project and the financial benchmark

In accordance with benchmark analysis (Option 3), if the financial indicators (such as IRR) of the Project are lower than the benchmark, the Project is not considered as financially attractive. Without CDM revenues, the Project IRR is 6.26% lower than the benchmark 8.0%; thus the proposed project is not financially attractive. With CDM, CERs revenue will improve IRR of total investment by increasing

2.85% of IRR up to 9.11%, this is greater than the benchmark scenario.

Therefore, the proposed project, with the CDM revenue, can be considered as financially viable to the investors. Table 3 shows the IRR of the Project with and without CDM revenues.

Table 3. Financial Indicators of the Project

	IRR(total investment) Benchmark=8%
Without CDM	6.26
With CDM	9.11

Sub-step 1c. Sensitivity analysis

A sensitivity analysis was conducted to test whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis based on benchmark method provides a valid argument in favor of additionality because it consistently supports (for a realistic range of assumptions) the conclusion that the Project activity is unlikely to be financially attractive with FIRR under various adverse situation less than the benchmark IRR (8%).

For the Project, following financial parameters were taken as uncertain factors for sensitive analysis of financial attractiveness:

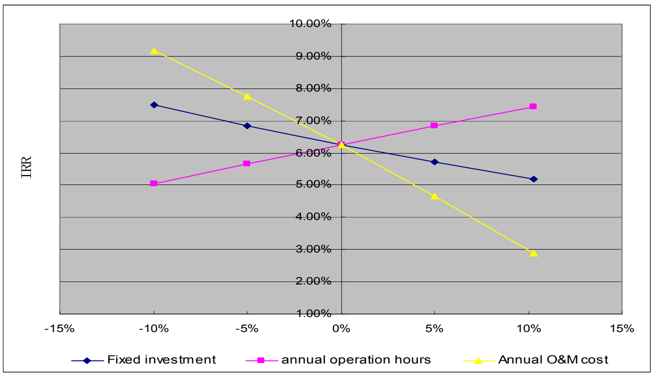
– Annual Operation Hours
– Annual O&M Costs
– Fixed Investment

Take no account of CERs revenue; the impacts of Annual Operation Hours, Annual O&M Cost and Total Investments of the Project on IRR were analyzed. The results of sensitive analysis of three indicators are shown in Table 4 and Figure 3.

Table 4. IRR Sensitivity to Different Financial Parameters of the Project (total investment, without CDM)

IRR	-10%	-5%	0%	5%	10%
Fixed Investment	7.49%	6.85%	6.26%	5.71%	5.20%
Annual Operation Hours	5.04%	5.66%	6.26%	6.86%	7.44%
Annual O&M Cost	9.17%	7.76%	6.26%	4.65%	2.89%

Figure 3. IRR Sensitivity to Different Financial Parameters of the Project (total investment, without CDM)



As can be concluded from the above analysis, the Project IRR will not reach 8% even with 10% decreases in fixed assets investment. With 10% reduction in annual O&M costs, the Project IRR will reach 8%. It's however that Natural Gas Price, as the key factor of the annual O&M costs, is commonly believed to be continuing to increase in the future, resulting the IRR of the Project will be remained below 8%[16].

As a peak load balancing power plant, the annual operation time of the Project will not exceed 3500h, so the Project IRR will not reach 8% with the changing of the annual operation time.

The sensitivity analysis confirms that the Project faces a rigorous financial barrier and hence presents a clear additionality of the Project.

Step2 Common practice analysis

Sub-step 2a Analyze other activities similar to the proposed project activity:

There is only one project, the Zhumadian NGCC Project, with the installed capacity of 3×350MW that is similar to the proposed project (2×390MW) is currently under construction within Henan province. (Evidence was provided to DOE).

Sub-step 2b. Discuss any similar options that are occurring:

The Hamadan NGCC Project currently is under the CDM project developments, so it should not be deemed as any impacts toward the additionality of the proposed project.

Step 3 Impact of CDM Registration

The Project is to be fully operational by the 1 July 2007. CDM activity had been considered in the early project development stages (Evidence was provided to the DOE) as a mean by the Project owner to achieve sustainable operations of the Project. With the CERs revenue, the Project will be able to battle against financial risks both coming from electricity price fluctuations and from natural gas price increasing, both obviously to the risky side. Clear additionality made the Project owner believe that the Project falls under CDM concept and relevant board decision was made at the beginning of project decision.

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[16] *Data Source: "Notice for NG Pricing Reform, and Appropriately Increasing the Natural Gas Price in the Near Future", issued by Chinese NDRC (http://www.sdpc.gov.cn/zcfb/zcfbtz/zcfbtz2005/t20051227_54876.htm)*

Should the Project be granted with CDM access, revenues from CERs shall enrich financial indicators of the Project, reinforcing the Project owner capability to keep project going under negative and risky environment of market, and ultimately achieve GHG reduction goal within CCG as calculated hereinafter.

However, if registration process fails to be completed resulting in anticipated CERs revenue lost, impacts to the Project will be realistic and practical in the following perspective:

1) Loss of capability to combat risks in the fluctuation of natural gas and electricity prices will lead the Project into a financial difficulty with less revenue and higher cash payment creating a financial failure both on liability repayment and on cash flow management, both will prevent the Project from going as planned.

2) Decrease capacity to overcome the technology barriers during the Project implementation. As the Project is built primarily to meet the peak demand of the CCG, and therefore the turbines and other major equipments will face a much higher degree of abrasion with increasing frequency off-on operations, which results in much higher risks from the aspect of project maintenance during the Project operation.

3) The GHG reduction calculated based on BM and OM of the Project towards CCG will not occur without operation of the Project, and the rising coal fired power generation and expansion of such capacity will unavoidably increase at even accelerating pace as currently showing within CCG.

4) Without operation of the Project, a series of consequences of negative impacts will follow, such as sustainable city development will be badly hurt by more GHG intensive thermal projects, pipeline system that had been laid in place will be wasted, loss of employment will occur not only at the Project but also spreading to the whole pipeline service, and huge investment capital will become just liability. In addition, shortfall of electricity supply by stoppage of the Project will cause more thermal power generation investment while peak load balancing ability of the city will be further bottlenecked and distorted. Social impacts will be even serious as the failure of the Project will demonstrate impact of confidence for overall business and residents.

As can be concluded from the above, the proposed project is not the baseline scenario. The additionality of the proposed project is fully demonstrated in environmental economy, investment and technology. Without the registry of CDM, reductions of anthropogenic emissions of GHG by electricity generation through these fossil fuel resources are not to occur.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The Project emissions reduction was calculated according to the approved methodology AM0029, and the main steps were as follows:

Step1: Project emission

The Project activity is on-site combustion of natural gas to generate electricity and without auxiliary fuels in project operation. The CO_2 emissions from electricity generation (PEy) are calculated as follows:

$$PE_y = \sum_f FC_{f,y} \times COEF_{f,y} \qquad (1)$$

Where:

$FC_{f,\,y}$: is the total volume of natural gas combusted in the Project plant or other startup fuel (m_3 or similar) in year(s) ‘y’

$COEF_{f,\,y}$: is the CO_2 emission coefficient (tCO_2/m_3 or similar) in year(s) for each fuel and is obtained as:

$$COEF_{f,y} = \sum NCV_y \times EF_{CO_2,f,y} \times OXID_f \qquad (2)$$

Where:

$NCV_{f,\,y}$: is the net calorific value (energy content) per volume unit of natural gas in year ‘y’ (GJ/m^3) as determined from the fuel supplier, wherever possible, otherwise from local or national data;

$EF_{CO2,\,f,\,y}$: is the CO_2 emission factor per unit of energy of natural gas in year ‘y’ (tCO_2/GJ) as determined from the fuel supplier, wherever possible, otherwise from local or national data;

$OXID_f$: is the oxidation factor of natural gas

In this PDD, $NCV_{f,\,y}$ is taken from Feasibility Study Report of the Project, $EF_{CO2,\,f,\,y}$ and $OXID_f$ are IPCC defaults. As a result, the $COEF_f$, y is 0.001897 tCO_2/m^3, the Project emissions are 995,639tCO_2e/a.

Step2: Baseline emission

Baseline emissions are calculated by multiplying the net amount of electricity supplied to the Grid $EG_{PJ,y}$ with a baseline CO_2 emission factor ($EF_{BL,\,CO2,\,y}$), as follows:

$$BE_y = EG_{PJ,y} \times EF_{BL,CO2,y} \qquad (3)$$

Which $EG_{PJ,y}$ is electricity generation in the project plant during the year in MWh.

For construction of large new power capacity additions under the CDM, there is a considerable uncertainty relating to which type of other power generation is substituted by the power generation of the Project plant. As a result of the Project, the construction of an alternative power generation technology could avoid, or the construction of a series of other power plants could simply be delayed. Furthermore if the Project were installed sooner than these other projects might have been constructed, its near-term impact could be largely to reduce electricity generation in existing plants. This depends on many factors and assumptions (e.g. whether there is a supply deficit) that are difficult to determine and that change over time. In order to address this uncertainty in a conservative manner, project participants shall use for $EF_{BL,\,CO2,\,y}$ the lowest emission factor among the following three options:

Option 1: The build margin, calculated according to ACM0002; and

Option 2: The combined margin, calculated according to ACM0002, using a 50/50 OM/BM weight.

Option 3 The emission factor of the technology (and fuel) identified as the most likely baseline scenario under “Identification of the baseline scenario” above, and calculated as follows:

$$EF_{BL,CO2,y}(tco2/Mwh) = \frac{COEF_{BL}}{\eta_{BL}} \times 3.6GJ/MWh \qquad (4)$$

In this PDD, $EF_{BL, CO2, y}$ was calculated according to all the methods mentioned above:

Option 1：Calculate the Build Margin Emission Factor ($EF_{BM,y}$)

According to the consolidated baseline methodology ACM0002 using equations (3) calculates the Build Margin Emission Factor ($EF_{BM,y}$):

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

where:

$F_{i,m,y}$ is the total amount of fuel i (in a mass or volume unit) consumed by all the sample power sources m in year(s) y, m refers to the sample power plants serving the grid, excluding those low-operating cost and must-run power plants, and including imports to the grid.

$COEF_{i,m,y}$ is the total amount 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 sample power sources m and the oxidation rate of the fuel in year(s) y, and $GEN_{m,y}$ is the electricity output (MWh) supplied to the grid by the sources m.

ACM0002 provides two options for sample group *m:*

Option 1. Calculate the Build Margin 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. The sample group *m* consists of either the five power plants that have been built most recently or 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. Project participants should use from these two options that sample group that comprises the larger annual generation.

Option 2. For the first crediting period, the Build Margin 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. The sample group *m* consists of either the five power plants that have been built most recently or 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. Project participants should use from these two options that sample group that comprises the larger annual generation.

In this PDD, option 2 is choice. In China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently because these data are considered as confidential business information by the plants owners. Taking notice of this situation, EB accepts the following deviation in methodology application:

(1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for

grid electricity.

(2) Use of weights estimated using installed capacity in place of annual electricity generation.

And the EB suggested that the Project participants use the following alternative solution in absence of data:

(a) For small scale project activities, use the average emission factor of the grid described in the AMS-I.D;

(b) Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, foe each fuel type in estimating the fuel consumption to estimate the build margin. For the estimation of the operating margin the average emission factor for the grid for each type can be used.

In this PDD, as required, according the data published by DNA[17] was used for estimating the $EF_{BM,y}$.

Therefore it is calculated as follows:

Step a: Calculate the proportions of the corresponding CO_2 emissions of the solid fuel, liquid fuel and gas fuel to the total emission by the energy information available of the last year;

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (6)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (7)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (8)$$

Where:

$F_{i,j,y}$ is the fuel（tce）consumed by the province j in the year y;

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i（tCO_2/tce）, taking into account the carbon content and the percent oxidation of the fuel in year y;

COAL, OIL and *GAS* are the footnotes of the solid fuel, liquid fuel and gas fuel respectively.

λ_{Coal} , λ_{Oil} and λ_{Gas} of CCG are 0.9953, 0.0022, 0.0025 respectively (see Annex 3 for details).

Step b: Calculate the fuel-fired emission factors ($EF_{Thermal}$) of the grids based on the emissions of the best technology commercially

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (9)$$

Where:

[17] *Data Source: "the Baseline Emission Factors of China Grids" Issued by Chinese DNA (http://cdm.ccchina.gov.cn/web/index.asp)*

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ *is* emission factor of coal, oil, gas-fired power with the most efficiency level of the best technology commercially available in China was selected (see Annex 3 (TableA12) for details).

Step c: Calculate $EF_{BM,y}$ of the grid based on equation (10):

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (11)$$

Where*:*

CAP_{Total} is the total Change in installed capacity of the Grid, MW;
$CAP_{Thermal}$ is the Incremental capacity of fuel-fired power of the Grid, MW. See Annex 3(TableA14~A17) for details.

Based on these data, the build margin emission factor ($EF_{BM,y}$) of the CCG is 0.6494tCO_2e/MWh.

Option 2. Calculate the baseline emission factor EF_y

Step a. Calculate the Operating Margin Emission Factor ($EF_{OM,y}$ **)**

Out of four options for the OM, the Simple Operating Margin Emission Factor (S-OM) was chosen for the following two reasons.

1. Detailed hour dispatch data is not available. In China, the China Grid Power Company run the dispatch center and does not make this information available to the public.
2. From historical data that are public available, the ratio of electricity generated by hydro power plants against the total electricity generated in the Central China grid over the past five years is following: 38%, 36.76%, 35.95%, 34.43%, and 38.44% for 2000, 2001, 2002, 2003 and 2004.Therefore, the CCG generation system is dominated by coal-fired power, using the average of the five most recent years it can be shown that low-cost/must run hydro resources constitute less than 50% of total grid generation in the CCG.

As a result of these two factors and in accordance with the Methodology which states:

The Simple OM method (a) can only 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 normals for hydroelectricity production.

The simple OM has been used.

Simple OM

The Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding low-operating cost and must-run power plants. The formula of $EF_{OM,simple,y}$ calculation is

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (12)$$

Where:

$F_{i,j,y}$ is the total amount of fuel *i* (in a mass or volume unit) consumed by all the relevant power sources *j* in year(s) *y*, *j* refers to the power sources serving the grid, excluding those 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 oxidation rate of the fuel in year(s) y, and $GEN_{j,y}$ is the electricity output (MWh) supplied to the grid by the sources *j*.

The CO_2 emission coefficient $COEF_i$ is then obtained from equation (13) as

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (13)$$

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 (see page 1.29 in the 2006 Revised IPCC Guidelines for Default Values).

$EF_{co_2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

The Simple OM Emission Factor ($EF_{OM,y}$) of the proposed project is calculated based on the electricity generation mix of the CCG, excluding low-operating cost and must-run power plants, such as hydropower, wind power etc. The data on installed capacity and electricity generation of different power generation sources are taken from the *China Electric Power Yearbook* (published annually, 2003, 2004 and 2005 editions). The data on different fuel consumptions for power generation in the CCG are taken from the *China Energy Statistical Yearbook* (year 2000 to year 2002, 2004, and 2005 editions).

Based on these data, the Simple OM Emission Factor ($EF_{OM,y}$) of the CCG is calculated as 1.2778tCO_2e/MWh (see Annex 3 (Table A1~TableA10) for details).

Step b. Calculate the baseline emission factor EF_y

The Operating Margin Emission Factor ($EF_{OM,y}$) and Build Margin Emission Factor ($EF_{BM,y}$) of the CCG was described as follows:

Regional Grid	$EF_{OM,y}$ (tCO2/MWh)	$EF_{BM,y}$ (tCO2/MWh)
CCG	1.2778	0.6494

The Combined Margin Emission Factor ($EF_{CM,y}$) was calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$), where the weights w_{OM} and w_{BM} are 50% (i.e., $w_{OM} = w_{BM} = 0.5$).

$$EF_{CM,y} = 0.5\times(EF_{BM,y} + EF_{OM,y}) = 0.5\times(1.2778+0.6494) = 0.9636(tCO_2e/MWh)$$

Option 3: The emission factor of the technology (and fuel) identified as the most likely baseline scenario under “Identification of the baseline scenario” above, and calculated as follows:

$$EF_{BL,CO2,y}(tco2/Mwh) = \frac{COEF_{BL}}{\eta_{BL}} \times 3.6GJ/MWh \qquad (14)$$

Where,

$COEF_{BL}$ = the fuel emission coefficient (tCO_2e/GJ), based on national average fuel data, if available, otherwise IPCC defaults can be used;

η_{BL} = the energy efficiency of the technology, as estimated in the baseline scenario analysis above.

In this PDD, the most likely baseline scenario is to build a new 600MW sub-critical coal-fired power plant, and the coal consumption takes the value of 336.66kg/MWh according to the data published by the Chinese DNA[18] , and its technology efficiency η_{BL} = 36.48%, $COEF_{BL}$ *is* IPCC defaults about 25.8tC/TJ. Based on these data the $EF_{BL,CO2,y}$ is calculated as 0.9334 tCO2e/MWh

The baseline CO_2 emission factor was calculated according the options mentioned above is as following:

Option	Baseline CO_2 emission factor (tCO_2e/MWh)
Option 1	0.6494
Option 2	0.9636
Option 3	0.9334

According to AM0029, the Project shall use for $EF_{BL, CO2, y}$ the lowest emission factor among the three options, i.e. the Option 1. The net Grid-connected electricity generated by the Project is about 2,958,000MWh, so the baseline emissions are calculated for the total amount of 1,687,141tCO_2e/a.

Step3: Leakage

Leakage may result from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the Project boundary. This includes mainly fugitive CH_4 emissions and CO_2 emissions from associated fuel combustion and flaring. In the methodology AM0029, the leakage emission was calculated as follows:

$$LE_y = LE_{CH4,y} + LE_{LNG,CO2,y} \qquad (15)$$

Where:

LE_y: Leakage emissions during the year y in tCO_2e

$LE_{CH4,y}$: Leakage emissions due to fugitive upstream CH_4 emissions in the year y in t CO_2e

$LE_{LNG,CO2,y}$: Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO_2e

In this PDD, only take fugitive upstream CH_4 emissions ($LE_{CH4, y: Leakage}$) into account due to this project used NG as fuel, i.e. $LE_y = LE_{CH4,y}$.

According to AM0029, for the purpose of estimating fugitive CH_4 emissions, the Project participants should multiply the quantity of natural gas consumed by the Project in year y with an emission factor for

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[18] *Data sources: "the Baseline Emission Factors of China Grids" Issued by Chinese DNA" (http://cdm.ccchina.gov.cn/web/index.asp)*

fugitive CH_4 emissions ($EF_{NG, upstream, CH4}$) from natural gas consumption and subtract the emissions occurring from fossil fuels used in the absence of the Project activity, as follows:

$$LE_{CH4,y} = (FC_y \times NCV_y \times EF_{NG,upstream,CH4} - EG_{PJ,y} \times EF_{BL,upstream,CH4}) \times GWP_{CH4} \qquad (16)$$

FC_y : Quantity of natural gas combusted in the Project plant during the year *y* in m³;

$NCV_{NG,y}$: Average net calorific value of the natural gas combusted during the year *y* in GJ/m³;

$EF_{NG,upstream,y}$: Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system, in t CH_4 per GJ fuel supplied to final consumers;

$EG_{PJ,y}$: Electricity generation in the Project plant during the year in MWh;

GWP_{CH4} : Global warming potential of methane valid for the relevant commitment period

$EF_{BL,upstream,CH4}$: Emission factor for upstream fugitive methane emissions occurring in the absence of the Project activity in t CH_4 per MWh electricity generation in the Project plant, as defined below;

The emission factor for upstream fugitive CH_4 emissions occurring in the absence of the Project activity ($EF_{BL,upstream,CH4}$) should be calculated consistent with the baseline emission factor ($EF_{BL, CO2}$) used in step 2, so the $EF_{BL,upstream,CH4}$ in this PDD was calculated as follows:

$$EF_{BL,upstream,CH4} = \frac{\sum_j FF_{j,k} \times EF_{k,uptream,CH4}}{\sum_j EG_j} \qquad (17)$$

Where:

j: Plants included in the build margin;

$FF_{j,k}$: Quantity of fuel type *k* (a coal or oil type) combusted in power plant j included in the build margin;

$EF_{k,upstream,CH4}$: Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or oil type) in t CH_4 per MJ fuel produced;

EG_j : Electricity generation in the plant j included in the build margin in MWh/a

In this PDD, j is the plant in the CCG; $FF_{j,k}$ and EG_j are taken from *China Electric Power Yearbook* (2005 editions, see Annex 3 (Table B4) for details); $EF_{k,upstream,CH4}$ and $EF_{NG,upstream,y}$ are IPCC defaults; $NCV_{NG,y}$ is taken from Feasibility Study Report of the Project, 0.033812GJ/m³.

Based on these data, the leakage of the Project(LE_y) is -135,805tCO2e＜0. So according to the AM0029.where the total net leakage effects are negative, Project should assume $LE_y = 0$.

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

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Data / Parameter:	$OXID_f$
Data unit:	
Description:	*The oxidation factor of natural gas*
Source of data used:	*IPCC*
Value applied:	*100%*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Select IPCC default*
Any comment:	

Data / Parameter:	$EF_{NG,upstream,y}$
Data unit:	*tCH_4/GJ*
Description:	*Emission factor for upstream fugitive methane emissions of nature gas*
Source of data used:	*IPCC*
Value applied:	*0.000296*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Select IPCC default*
Any comment:	

Data / Parameter:	$EF_{k,upstream,CH4}$
Data unit:	*tCH_4/Ktcoal*
Description:	*Emission factor for upstream fugitive methane emissions from production of the fuel(coal)*
Source of data used:	*IPCC*
Value applied:	*13.4*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Select IPCC default*
Any comment:	

Data / Parameter:	$F_{i,y}$
Data unit:	*t/m3*
Description:	*Amount of fuel I consumed in year(s) y for generation*
Source of data used:	*China Energy Statistical Yearbook*
Value applied:	*See Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Since the detailed fuel consumption data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.*
Any comment:	

Data / Parameter:	GENi,y
Data unit:	*MWh*

Description:	*Electricity (MWh) delivered to the grid excluding low operation cost/must run power plants in year y*
Source of data used:	*China Electricity Power Yearbook*
Value applied:	*See Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Since the detailed generation data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.*
Any comment:	

Data / Parameter:	*NCVi*
Data unit:	*GJ/t(ce)*
Description:	*Net caloric value of fuel i*
Source of data used:	*China Energy Statistics Yearbook 2004, p535*
Value applied:	*See Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*This data comes from an official statistics.*
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	
Description:	*The oxidation factor of fuel i*
Source of data used:	*IPCC default value in revised 2006 IPCC Guideline for National Greenhouse Gas Inventories*
Value applied:	*See Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*This data is based on IPCC default value because the national specific value is unavailable.*
Any comment:	

Data / Parameter:	$EFco_{2,i}$
Data unit:	*tCO2/GJ*
Description:	*The emission factor of fuel i*
Source of data used:	*IPCC default value in revised 2006 IPCC Guideline for National Greenhouse Gas Inventories*
Value applied:	*See Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Since the detailed generation data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.*
Any comment:	

Data / Parameter:	COEFi
Data unit:	*tCO2/t(m3)*
Description:	*CO2 emission coefficient of fuel i*
Source of data used:	*Calculated*
Value applied:	*See Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Calculated according to the formula suggested by ACM0002.*
Any comment:	

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

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According to AM0029, the calculation of the emission reductions was applying the following equation:

$$ER_y = BE_y - PE_y - LE_y \qquad (18)$$

Where:
ERy: emissions reductions in year y (t CO_2e)
BEy: emissions in the baseline scenario in year y (t CO_2e)
PEy: emissions in the Project scenario in year y (t CO_2e)
LEy: leakage in year y (t CO_2e)
In this Project, LEy is equal to zero, so the emission reductions is 691,502tCO_2e/a.

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

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According to an analytical report[19], the profile of coal dominated power industry will basically remain unchanged during the year of 2006-2010 and the effect of the adjustment electricity generating structure will ultimately be reflected in 2020, while the overall energy efficiency of the power generation will unlikely to be changed in a foreseeable future. Base on these analyses, the baseline emission will be most likely remaining on the level of 1,687,141t CO_2e/a.

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)
1 November 2007	165,940	281,190	0	115,250
2008	995,639	1,687,141	0	691,502
2009	995,639	1,687,141	0	691,502
2010	995,639	1,687,141	0	691,502
2011	995,639	1,687,141	0	691,502
2012	995,639	1,687,141	0	691,502
2013	995,639	1,687,141	0	691,502
31 October 2014	829,699	1,405,951	0	576,252
Total (tonnes of CO_2e)	**6,969,475**	**11,809,988**	**0**	**4,840,513**

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

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Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	Amount of electricity generated by the Project sold into the grid
Source of data to be used:	Reading of the meter at the identified Metering point
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2,598,000
Description of measurement methods and procedures to be applied:	The readings of electricity meter will be measured hourly and recorded monthly. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup.
QA/QC procedures to be applied:	The amount of electricity generated by the proposed project and to be sold into the grid will be monitored and recorded at the control centre using a computer system. The Project owner is responsible for recording this set of data.

[19] Assessment on the Chinese Power Industry Energy Efficiency Situation, from the Electrical Equipment, Issue 5， 2006, an on-line magazine, by Mr. Mi Jianhua from the China Electricity Consul.

	Commercial receipts for electricity sold will also be kept for cross check.
Any comment:	

Data / Parameter:	$EF_{BL,CO2,y}$
Data unit:	tCO2e/MWh
Description:	Baseline CO_2 emission factor
Source of data to be used:	Calculated under project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.6494
Description of measurement methods and procedures to be applied:	According to the China's Regional Grid Baseline Emission Factors http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1053.pdf
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$FC_{f,y}$
Data unit:	M^3
Description:	The total volume of nature gas supplied annually to the Project
Source of data to be used:	Fuel flow meter readings
Value of data applied for the purpose of calculating expected emission reductions in section B.5	524,890,000
Description of measurement methods and procedures to be applied:	The natural gas flow rate will be monitored continuously both by the supplier and the Project owner. The natural gas consumption will be aggregated automatically and recorded daily.
QA/QC procedures to be applied:	The total amount of natural gas consumed by the proposed project will be monitored by both supplier and Project owner for cross-verification. All meters used for the reading of the gas supplied will be remained for regular maintenance and testing services for an ensured accuracy.
Any comment:	.

Data / Parameter:	$NCV_{f,y}$
Data unit:	GJ/m^3
Description:	The net calorific value per volume unit of nature gas
Source of data to be used:	Fuel supplier
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0338121
Description of measurement methods and procedures to be applied:	Measurement Report for the NG character as determined from fuel supplier
QA/QC procedures to be applied:	
Any comment:	.

Data / Parameter:	$EG_{\text{in},y}$
Data unit:	MWh
Description:	Electricity purchased from CCG
Source of data to be used:	Electricity meter reading
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0 MWh
Description of measurement	The readings of the meter identified at the Metering Point will be measured

methods and procedures to be applied:	hourly and recorded monthly. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup.
QA/QC procedures to be applied:	The electricity purchased from the grid will be monitored and recorded at the control centre using a computer system. The Project owner is responsible for recording this set of data. Commercial receipts for electricity bought will also be obtained for cross check.
Any comment:	

B.7.2. Description of the monitoring plan:

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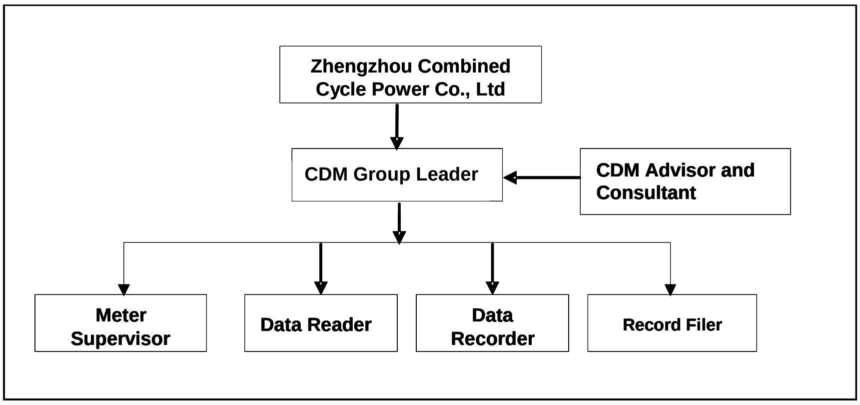
Detailed monitoring arrangements of emission reduction will be determined before the Project starts its operation, according to the monitoring manual.The monitoring plan, implemented by the Project owner, is made to ensure that the emission reductions will be monitored transparently and clearly in the crediting period.

1. Monitoring institution

The CDM team that the Project operator will implement is charge of collecting, monitoring and verifying the data, while the CDM group director will be assisted by the CDM consultant company. The operational and management structure is as follows:



In order to ensure all the relevant personnel has the knowledge and capacity that sufficient to perform the assigned tasks, the Project owner is responsible to provide the personnel with the relevant training programs, and all the corresponding minutes and reports should be documented. The training programs should include, but not limited to:

1) Technical training: before the project implementation, a group of technicians will be selected for the training focusing on the equipment operation and maintenance, including theoretical training classes at the selected universities, on-site experimental workshop at the selected project sites, and one-month training program provided by the Siemens company. In addition, during the project installation and test-run, a special on-site training workshop is provided by the technical service providers.

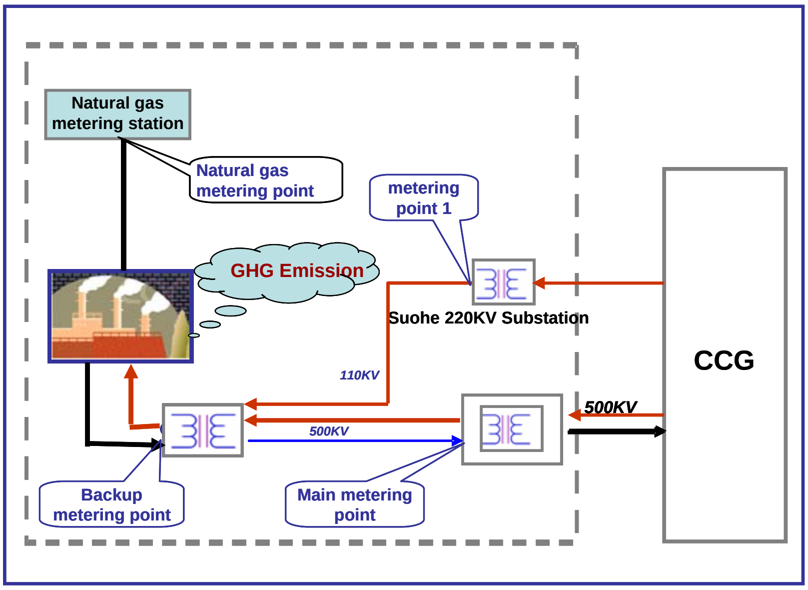
2) All monitoring personnel working at the Project dispatching management centre will be required in training courses provided by Zhengzhou Provincial Power Company Dispatching Centre (the Centre) with a presented appointment certificates. Monitoring personnel receives the work permit only after

he/she receives the training certificates issued by the Centre, and further passes a 2-day field experimental test.

3) All monitoring personnel will be required for the CDM related training workshops and training provided by the CDM consulting company.

2. The data to be monitored

The key data to be monitored during operation phase including Grid-connected Electricity Generated by the Project, quantity of NG combusted and NVC of the NG. The metering points set up of the proposed project are as follow:



3. The equipments for monitoring and the installation of them

3.1 Monitoring of Grid-connected Electricity Generated by the Project

The ammeter should be installed according to the 《the Technical Rules for Ammeter》 (DL/T448-2000 issued by the State Economic and Trade Commission of the People's Republic of China, in the 3 November 2000, and as effective in 1 January 2001), and checked before acceptance by both grid company and the Project owner before the ammeter is operational.

Serving as a peak-load balancing power plant, the proposed project will be sometime in a standby status during the course of operation, therefore, it needs to take electricity from the grid while in such idle status.

The Main Metering System equipment (the Main Metering Point) and the Backup Metering System equipment (the Main Metering Point) will have the capability to be read remotely through a communication line. And all the readings will be recorded and documented by the Henan Grid. Both meters are enabled to monitor the electricity generated by the project to be sold to the grid $(EG_{out,y})$ and part of electricity to be bought from the grid (EG_{in,y_1}). Additionally, the Project should bought the other part of electricity from CCG (EG_{in,y_2}) through Suohe substation, which can be monitored by a separate meter (metering point1), so the total amount of electricity bought from CCG $(EG_{in,y})$ is equal to $(EG_{in,y_1} + EG_{in,y2})$.

Detailed monitoring procedure of grid-connected electricity generated by the Project will be established in accordance with the Grid Connection Agreement. The readings of the main meters will be used for the business as well as CDM purposes, while the readings of the backup meters only serve for the emergency situation.

The meter reading will be readily accessible for DOE. Calibration tests records will be maintained for verification.

3.2 Monitoring of amount of NG combusted

Amount (m^3) of NG combusted will be monitored through metering equipment, detailed monitoring procedure of Quantity of NG combusted by the Project will be established in accordance with the Gas Supply Agreement.

The meter reading will be readily accessible for DOE. Calibration tests records will be maintained for verification.

3.3 Monitoring of NCV

NVC of the NG was used during calculate the CO_2 emission coefficient, so the Measure report of NG character must be obtained from fuel supplier.

3.4 Monitoring of the data needed to calculate the baseline emission factor

The baseline emissions factor for the CCG is obtained according *to China's Regional Grid Baseline Emission Factors Determined published by DNA.* The Project owner should check the data and submit the revised ex-post calculation to the DOE on an annual basis. If data for determining the baseline emission factor are no longer provided by the DNA, the Project owner should notify the CDM developer of the Project, Green Capital Consulting Company, or other qualified entity to redesign the access to obtain the data to calculate the conservative baseline emission factor of the Project boundary.

The emission reduction of the Project is calculated based on the deviations for AM0029 agreed by EB. The CDM project developer has advised the Project owner that when the data is available, the calculation of emission factor should be strictly in accordance with the methodology and will be validated by the DOE.

4. Data collection

Detailed monitoring arrangements of net amount of power supply of the Project are as follows:

1) The representatives from the power station and the grid company will be together check and read the meter and write the record $(EG_{out,m})$ at every 1st of month on the 26th at the 0:00am.

2) The commercial receipts for the electricity sold will be kept by the project owner as a main evidence of the monitoring of the total amount of electricity generated from the proposed project and sold into the grid $(EG_{out,y} = \sum EG_{out,m})$, and both records and receipts will be readily accessible for the verification of the DOE; and

3) The representatives from the power station and the grid company will be together check and read the meter and write the record $(EG_{in,m1}, EG_{in,m2})$ at every 1st of month on the 26th at the 0:00am. The commercial receipts for the electricity purchased from gird will be kept and documented as an evidence of the monitoring of the amount of electricity purchased from the grid $(EG_{in,y} = \sum EG_{in,m1} + \sum EG_{in,m2})$ by the Project owner, and will be readily accessible for the verification of the DOE.

The calculation for the annual net amount of electricity sold to the Grid $EG_{PJ,y}$ is equal to the $(EG_{out,y} - EG_{in,y})$.

In case data accuracy is not within the area of allowable error or the function of ammeter is abnormality, the amount of power supply arising from the Project activity will be confirmed by the following methods:

1) Firstly, data from cross checking will be recorded and the amount of electricity supplied to grid will be calculated on the basis of historical wasting rate of line unless any discrepancy is identified in metering system;
2) The reasonable and conservative method for metering of power supply will be designed and the abundant evidence will be provided to verifying DOE by the Project owner and the power plant if ammeter accuracy is not acceptable or the operation is not standardization.

Detailed monitoring arrangements of net amount of natural gas consumed by the proposed project are as follows:

1) The qualified personnel from the Project owner will check and read the meter for the natural gas consumed and record the readings daily, and prepared a weekly record $(FC_{i,w})$ in every week on Monday before the 18:00 pm and send it to the natural gas supplier for cross-check.
2) The commercial receipts for the gas purchased by the Project will be kept and documented as evidence and will be readily accessible for the verification of the DOE.

Therefore, the annual net amount of natural gas consumed by the proposed project is equal to $FC_{i,y} = \sum FC_{i,w}$

5. Calibrations

An agreement should be signed between the Project owner and Henan Power Grid, a sub-grid of CCG, which defines the metering arrangements and the required quality control procedures to ensure accuracy. The main terms and conditions of the Agreement are as follows:

1) The metering equipment will be properly calibrated and checked annually for accuracy in compliance with DL/T448-2000 (Energy Metering Device Technology management regulations).
2) The metering equipment shall have sufficient accuracy so that error resulting from such equipment shall not exceed +0.5% of full-scale rating.
3) All Meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.
4) All the meters installed shall be tested by CCG within 10 days after:
   (1) The detection of a difference larger than the allowable error in the reading of both meters,

(2) The repair of all or part of the meter caused by the failure of one or more parts to operate in accordance with the specifications,

(3) If any errors are detected the party owning the meter shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.

5) Should any previous months reading of the Main Meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the grid-connected electricity generated by the Project shall be determined by:

(1) First, by reading Backup Meter, unless a test by either party reveals it is inaccurate;

(2) if the backup system is not with acceptable limits of accuracy or is otherwise performing improperly the Project owner and the CCG shall jointly prepare an estimate of the correct reading; and

(3) If the Project owner and the CCG fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.

6) The electricity recorded by the Main Meters alone will suffice for the purpose of billing and emission reduction verification as long as the error in the Main Meter is within the permissible limits.

Calibration is carried out by the CCG with the records being provided to the Project owner, and these records will be maintained by the Project owner and the third party designated.

6. Data management

The CDM team assigned by the Project owner would save the monitoring data as paper documents by the end of per month.

Physical documentation such as paper-based maps, diagrams and environmental assessment will be collated in a central place, together with this monitoring plan. In order to facilitate auditor's reference, monitoring results will be indexed. All paper-based information will be stored by the CDM team and kept at least one copy. All these data should be kept until two years after the end of the crediting period.

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)

>>
The baseline and monitoring study of the Project was completed on 11 November 2006, by the Technical Service Division of Green Capital Consulting Co. Ltd. whose contact information is provided at below:

Huang Jin-Feng, Project Manager, the Technical Service Division, Tel.: (8610) 5869-3461, Fax: (8610) 5869 3463, Email: tech.service@co2-china.com;

Green Capital is not the Project participant.

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:

>>

15/06/2005 (signed date of the Project construction contract)

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:

>>

01/11/2007[20]

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:

>>

Not applicable

[20] *The crediting period shall start after the registration of the project. If the registration date is late than the 01/11/2007, the starting date of the first crediting period should be revised to the registration date.*

SECTION D. Environmental impacts

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

>>

The Environmental Impact Assessment (EIA) of the Project was conducted by the Henan Province Environmental Protection Research institute to ensure that the Project complied with national, regional and local environmental regulations. The results of the EIA were positive and approved by the State Environmental Protection Administration of China.

A summary of the key aspects of the report conclusion is listed below. Copy of the full report can be presented to the validator upon request.

Potential Environmental Impacts and Mitigation Measures

The Project used NG as fuel and there is no solid waste during operation phase. The main environmental impact and mitigation measures will be carried out during construction and operation phase was summarized as follows:

Key Parameters	Source	Mitigation Measures
Water pollution	Construction phase: - Construction Wastewater - Domestic sewage	1) Wastewater from tunnel construction and sand and rock processing will be retained in the sedimentation pond before discharge into river; 2) Domestic sewage should be treated by using wastewater treatment equipment before discharge.
	Operation phase: - Domestic sewage - Cooling water system bow down - Demineralization waste water	3) Wastewater should be treated by using wastewater treatment equipment before discharge into municipal pipe network. 4) Wastewater will be monitored discharge to ensure compliance with relevant guideline set out in GB8978-1996.
Air pollution	Construction phase: - Construction equipments and vehicles - Construction sites	1) Watering of exposed area or worksite of excavation 2) Using closed and semi-closed vehicles to transport construction materials; 3) Regular maintenance of construction equipments and transportation vehicles.
	Operation phase: - fuel combustion (SO_2、NOx)	4) Using low nitrogen inflamers, and emission concentration of NOx will be kept within 51.25mg/m^3, which much lower than the corresponding standard limits(650mg/m^3) set out in GB13223-1996
Noise pollution	Construction Phase: - Construction equipments and vehicles	1) Around the construction site set noise barrier, and arranging construction time and plane reasonably to ensure compliance with relevant guideline set out in the *Noise Limits for Construction Site* (GB 12523-1990); 2) Limiting the speed of vehicle 3) Using low noise equipments

		4) Regular maintenance of construction equipments
	Operation phase: - Equipments	5) Arranging plane reasonably 6) Install noise barrier for equipment 7) Green belt of 2.58hm2 , and the green rate can reach 36% 8) Through above measures to ensure compliance with relevant guideline set out in GB12348-1990

Environmental Monitoring

During the construction and operation phases, environmental monitoring will be carried out to verify the Project's actual impacts on the environment, identify unexpected environmental problems at an early stage, and adjust environmental measures as appropriate. Environmental monitoring will be conducted by the relevant department. The monitored items include water quality, air pollution, noise, waste dumping, and so on.

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 EIA of the Project was approved by the State Environmental Protection Administration of China.

Those findings and approval evidence that strict environmental monitoring and mitigation measures will be carried out during the construction and operation phase of the Project. Multiple measures are taken into account to deal with environmental impacts that might arise from or hide in the Project minimizing negative effects to the lowest possible level with little significance.

SECTION E. Stakeholders' comments

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

>>

1. December 2006, the Project owner, together with the CDM consultants, provided the information of the Project to local residents in the form of poster, and at the same time questionnaires of the Survey were distributed to the individuals from the local community (including Xiangying Village, Dongshima Village, and Budaili Village) for a better understanding of the stakeholders' comments.

2. The Project owner also invited officials from the relevant local governmental agencies, including the Zhengzhou Environment Protect Agency, Zhengzhou City Development and Reform Commission, and the Gouzhao Tax Revenue Bureau for comments of Zhengzhou High and New Technology Industrial Development Zone. As a result, the Supporting Letter issued from the above mentioned relevant government agencies was received by the project owner (Evidence was provided to the DOE).

E.2. Summary of the comments received:

>>

The Survey was completed by collecting all the questionnaire distributed to the residents of the local community. 36 questionnaires in total were returned, which represented 100% responding rate (Evidence was provided to the DOE). The following is a summary of the key findings based on returned questionnaires.

1. The key issues affect the local economic development

The respondents generally deem that the shortage of power supply (49.2%) and natural resources (23.8%) are the main issues affecting the local economic development.

2. Attitude of the residents toward the Project:

The respondents generally deem the Project uses natural gas as a ‘cleaner source’ of thermal energy, emits less pollutants compared to those coal-fired power plants, therefore does not harm to the local ecological environment.

At the same time, the respondents also deem that the Project will bring multiple benefits to their livelihoods, particularly it is very much hoped that the Project can improve current situation in the local power supply market (38.4%) and increase employment opportunities (25.9%).

The Survey shows that the Project receives very strong support from local community (100%). This is closely linked to the fact that the all respondents think that the construction of the Project will contribute to the sustainable local economic development (97.2%).

3. Conclusion:

The Survey shows that the proposed project receives very strong support from local community and the relevant local government agencies.

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

>>

The Survey shows that the proposed project receives very strong support from local community and the relevant local government agencies; therefore there has been no need to modify the project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Zhengzhou Combined Cycle Power Co., Ltd
Street/P.O.Box:	No. 100, Wutong Street, Hi-New Technology Industry Open Zone
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FAX:	0371-67848500
E-Mail:	
URL:	http://www.cpi-zgp.cn/xmgk.asp
Represented by:	
Title:	Mr.
Salutation:	
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URL:	
Represented by:	Basak Beyazay Odemis
Title:	Trading Manager
Salutation:	Ms.
Last Name:	Beyazay Odemis
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Direct Tel:	+44 (0) 20 7718 6553
Personal E-Mail:	basak.beyazay@total.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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There is no public funding for the Project.

Annex 3

BASELINE INFORMATION

The following tables summarise the numerical results from the equations listed in the ACM0002 Baseline methodology for grid-connected electricity generation from renewable sources. The information provided by the tables includes data, data sources and the underlying computations.

1. Calculation of OM

Table A1-A2 are the basic data for calculation the Operating Margin Emission Factor ($EF_{OM,y}$). Based on these data and the calculation formula of $EF_{OM,simple,y}$, the Operating Margin Emission Factor ($EF_{OM,y}$) of CCG is equal to Emission of CO_2/Fuel-fired power generation = 841,852,509.1/658,795,290=1.2778tCO_2e/MWh.

2. Calculation of BM

1) Calculation of $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$

According to the statistical analysis of newly-built fuel-fired power plants in the 10th Five-Year Plan (2000-2005) a by State Electricity Regulatory Commission of China, for the coal-fired power plant, the most efficiency level of the best technology commercially available in China was selected as 600MW. The fuel consumption is 336.66gce/kWh, while the corresponding efficiency of the power supply is 36.53%.

The best technology commercially with the most efficiency level applied in the combined cycle power plant (including gas power plant and oil power plant) is selected as 200MW level, (equals to the technology of 9E unit from GE). According to the data in 2004, the fuel consumption of the combined cycle power plant with the actual most efficiency level of the best technology commercially is 268.13 gce/kWh, while the corresponding efficiency of the power supply is 45.87%.

The emission factors of coal-fired power, oil-fired power and gas-fired power respectively with the most efficiency level of the best technology commercially was described in Table B1.

2) Calculation of λ_{Coal} , λ_{Oil} and λ_{Gas}

Based on the data described in Table A1, the emission of CO2 caused by power plant of CCG is equal to 346,040,311. 7t; including：

The emission of CO2 caused by coal-fired power plant was equal to 339,092,605.3+58,316.1322+1,921,441.232+3,337,011.415=344,409,374.1tCO2;

The emission of CO2 caused by oil-fired power plant was equal to

33,118.272+2,089.3257+266,627.3198+464,893.1434=766,728.0609tCO2;

And the emission of CO2 caused by gas-fired power plant was equal to 149,899.5271+65,029.107+153,506.3811+495,774=864,209.6208tCO2;

So the; λ_{coal}=344,409,374.1/346,040,311. 7=0.9953

Similarly λ_{oil}=0.0022; λ_{gas}=0.0025

3) Calculation of $EF_{thermal}$

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.9953×0.9323+0.0022×0.6072+0.0025×0.4403＝0.9304

4) Calculation of BM

The Change in total installed capacity and the fuel installed capacity of CCG in 2002~2004 was described in Table B3, according to the data, the BM of the CCG is equal to 0.9304×0.698＝0.6494tCO_2/MWh.

3. Calculation the baseline emission factor EF_y

The Combined Margin Emission Factor (EF_y) was calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$), where the weights w_{OM} and w_{BM} are 50% (i.e., $w_{OM} = w_{BM} = 0.5$).

EF_y =0.5× ($EF_{BM,y} + EF_{OM,y}$) =0.5× (1.2778+0.6494) =0.9636(tCO_2e/MWh)

Table A1. [21] Fossil Fuel Consumption for Power Generation of CCG in 2002~2004

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Emission factors[22] tc/TJ	oxidation factor[23] %	Average low calorific Value MJ/t,km^3	Emission of CO_2 tCO_2e
Fossil Fuel Consumption of CCG in 2002												
Raw Coal	10^4t	1,062.63	4,679.02	1,710.00	1,113.78	398.57	1,964.32	10,928.32	25.8	100	20908	216,150,891.6
Cleaned Coal	10^4t	2.72						2.72	25.8	100	26344	67,786.27328
Other Washed Coal	10^4t	3.66	26.49			249.99		280.14	25.8	100	8363	2,216,299.036
Coke	10^4t		1.15					1.15	29.2	100	28435	35.011.06767
Coke Oven Gas	10^8m^3			1.11				1.11	12.1	100	16726	82,370.5322
Other Gas	10^8m^3		2.16					2.16	13	100	5227	53,817.192
Crude Oil	10^4t		0.67	1.17			0.81	2.65	20	100	41816	81,262.42667
Diesel Oil	10^4t	1	1.34	1.08	2.19	0.51	0.51	6.63	20.2	100	42652	209,447.7642
Fuel Oil	10^4t	0.33	0.16	0.34	0.69		1.51	3.03	21.1	100	41816	98,025.48536
PLG	10^4t		0.02					0.02	17.2	100	50179	632.9244533
Refinery Gas	10^4t	0.49			1.9			2.39	15.7	100	46055	63,364.46472
Nature Gas	10^8m^3						1.75	1.75	15.3	100	38931	382,205.0925
Other Petroleum Products	10^4t							0	20	100	38369	0.0
Other Coking Products	10^4t							0	25.8	100	28435	0.0
Other Energy	10^4tce		3.38					3.38	0	0	0	0.0
Subtotal								**219,441,113.8**				
Fossil Fuel Consumption of CCG in 2003												
Raw Coal	10^4t	1,427.41	5,504.94	2,072.44	1,646.47	769.47	2,430.93	13,851.66	25.8	100	20908	273,971,539.9

[21] Data source: *China Energy Statistical Yearbook* 2000 ~ 2002, 2004, 2005.

[22] Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook

[23] Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook

Cleaned Coal	10^4t							0	25.8	100	26344	0.00
Other Washed Coal	10^4t	2.03	39.63			106.12		147.78	25.8	100	8363	1,169,146.396
Coke	10^4t				1.22			1.22	29.2	100	28435	37,142.17613
Coke Oven Gas	10^8m^3			0.93				0.93	12.1	100	16726	69,013.1486
Other Gas	10^8m^3							0	13	100	5227	0.00
Crude Oil	10^4t		0.5	0.24			1.2	1.94	20	100	41816	59,490.22933
Diesel Oil	10^4t	0.52	2.54	0.69	1.21	0.77		5.73	20.2	100	42652	181,015.941
Fuel Oil	10^4t	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.1	100	41816	157,228.9963
PLG	10^4t							0	17.2	100	50179	0.00
Refinery Gas	10^4t	1.76	6.53		0.66			8.95	15.7	100	46055	237,285.3386
Nature Gas	10^8m^3					0.04	2.2	2.24	15.3	100	38931	489,222.5184
Other Petroleum Products	10^4t							0	15.3	100	38369	0.00
Other Coking Products	10^4t							0	20	100	28435	0.00
Other Energy	10^4tce		11.04			16.2		27.24	0	0	0.00	0.00
Subtotal				**276,371,084.6**								
					Fossil Fuel Consumption of CCG in 2004							
Raw Coal	10^4t	1,863.80	6,948.50	2,510.50	2,197.90	875.50	2,747.90	17,144.10	25.8	100	20908	339,092,605.3
Cleaned Coal	10^4t		2.34					2.34	25.8	100	26344	58,316.13216
Other Washed Coal	10^4t	48.93	104.22			89.72		242.87	25.8	100	8363	1,921,441.232
Coke	10^4t		109.61					109.61	29.2	100	28435	3,337,011.415
Coke Oven Gas	10^8m^3			1.68		0.34		2.02	12.1	100	16726	149,899,5271
Other Gas	10^8m^3					2.61		2.61	13	100	5227	65,029.107
Crude Oil	10^4t		0.86	0.22				1.08	20	100	41816	33,118.272
Gasoline	10^4t		0.06			0.01		0.07	18.9	100	43070	2,089.3257
Diesel Oil	10^4t	0.02	3.86	1.7	1.72	1.14		8.44	20.2	100	42652	266,627.3198
Fuel Oil	10^4t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41816	464,893.1434
PLG	10^4t							0	17.2	100	50179	0.00
Refinery	10^4t	3.52	2.27					5.79	15.7	100	46055	153,506.3811

Gas										
Nature Gas	10^8m^3				2.27	2.27	15.3	100	38931	495,774.6057
Other Petroleum Products	10^4t					0	20	100	38369	0.00
Other Coking Products	10^4t					0	25.8	100	28435	0.00
Other Energy	10^4tce	16.92	15.2	20.95		53.07	0	0	0	0.00
Subtotal				**346,040,311,7**						
Total Emission of CO_2 =219,441,113.8+276,371,084.6+346,040,311,7=841,852,509.1 tCO2										

Table A2. [24] **Fossil-Fuel Fired Power Generation of CCG from 2002 to 2004**

Regions	Electricity Generation（MWh)	Rate of Electricity Consumption（%）	Electricity Supply to Grid（MWh)
Fossil-Fuel Fired Power Generation of CCG in 2002			
Jiangxi	18,648,000.00	7.67	17,217,698.00
Henan	84,734,000.00	8.03	77,929,860.00
Hubei	34,301,000.00	7.73	31,649,533.00
Hunan	20,058,000.00	7.73	18,507,517.00
Chongqing	14,727,000.00	10.21	13,223,373.00
Sichuan	27,879,000.00	9.59	25,205,404.00
		Subtotal	183,733,385.00
Fossil-Fuel Fired Power Generation of CCG in 2003			
Jiangxi	27,165,000.00	6.43	25,418,291.00
Henan	95,518,000.00	7.68	88,182,218.00
Hubei	39,532,000.00	3.81	38,025,831.00
Hunan	29,501,000.00	4.58	28,149,854.00
Chongqing	16,341,000.00	8.97	14,875,212.00
Sichuan	32,782,000.00	4.41	31,336,314.00
		Subtotal	225,987,719.00
Fossil-Fuel Fired Power Generation of CCG in 2004			
Jiangxi	30,127,000.00	7.04	28,006,059.00
Henan	109,352,000.00	8.19	100,396,071.00
Hubei	43,034,000.00	6.58	40,202,363.00
Hunan	37,186,000.00	7.47	34,408,206.00
Chongqing	16,520,000.00	11.06	14,692,888.00
Sichuan	34,627,000.00	9.41	31,368,599.00
		Subtotal	249,074,186.00
	Total		658,795,290.00

Table B1. The Emission Factor of Coal, Oil, Gas-fired Power Plant

	Variable	Efficiency of Power Supply	Emission Factor of the Fuel (tc/TJ)	Oxidation Factor	Emission Factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	36.53%	25.8	1	0.9323
Gas-fired power plant	$EF_{Gas,Adv}$	45.87%	15.3	1	0.4403
Oil-fired power plant	$EF_{Oil,Adv}$	45.87%	21.1	1	0.6072

[24] *China Electric Power Yearbook 2003,2004,2005*

Table B2. [25] The Installed Capacity of CCG

	unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
The Installed Capacity of CCG in 2004								
Fuel-fired power	MW	5,496.00	21,788.50	9,509.30	6,779.50	3,271.10	6,900.30	53,744.70
Hydropower	MW	2,549.90	2,438.00	7,415.10	7,448.20	1,407.90	13,382.90	34,642.00
Other	MW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
The Installed Capacity of CCG in 2001								
Fuel-fired power	MW	4,869.80	15,349.00	8,077.30	4,997.80	2,898.30	6,377.00	42,569.20
Hydropower	MW	2,067.80	2,438.00	7,125.60	5,966.10	1,268.00	11,531.50	30,397.00
Other	MW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
The Installed Capacity of CCG in 2000								
Fuel-fired power	MW	4,474.30	13,789.00	8,038.80	4,477.40	2,995.00	6,090.10	39,864.60
Hydropower	MW	1,846.00	1,528.00	7,070.50	5,858.00	1,327.00	11,008.30	28,637.80
Other	MW	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table B3. Changes in Installed Capacity of CCG in 2000~2004

Year	2000 A	2001 B	2004 C	Change in Installed Capacity from 2000 to 2004 D=C-A	The Proportion of the Total Change Capacity
Fuel-fired power(MW)	39,864.60	42,569.20	53,744.70	13,880.10	69.80%
Hydropower(MW)	28,637.80	30,397.00	34,642.00	6,004.20	30.20%
Other(MW)	0.00	0.00	0.00	0.00	0.00%
Total(MW)	**68,502.40**	**72,966.20**	**88,386.70**	**19,884.30**	**100.00%**

Table B4. Data for $EF_{BL,upstream,CH4}$ Calculation

Change in Fuel-fired Power Installed Capacity from 2000 to 2004	Annual Operation Hours	Standard Coal Consumption kgce/kwh	NCV（IPCC）	Coal Consumption MJ
13,880.10	6546h	0.336	29.28tTJ/ktce	8.5×10^{11}

Table B5. Data for Project Emissions Calculation

	ID number	Value	Unit	Data Source
Quantity of NG consumption by the Project during the year y	FC_f	524,890,000	m³	Feasibility Study Report of the Project
Net calorific value of NG	NCV_{NG}	0.0338121	GJ/m^3	Feasibility Study Report of the Project
CO_2 emission factor per unit of energy of NG	$EF_{CO2,f,y}$	15.3	tC/TJ	IPCC default
Oxidation factor of NG	$OXID_f$	1	-	IPCC default
Project emissions	PE_Y	995,639	tCO2e	-

[25] *China Electric Power Yearbook 2003,2004,2005, excluding Three Gorge Installed Capacity.*

Table B6. Data for Baseline Emissions Calculation

	ID number	Value	Unit	Data Source
Electricity generation in the Project plant during the year	$EG_{PJ,y}$	2,598,000	MWh	Feasibility Study Report of the Project
Baseline CO_2 emission factor	**EFBL, CO2, y**	0.6494	tCO_2e /MWh	-
Baseline emissions	**BEy**	1,687,141	tCO2e	-

Table B7. Data for Leakage Emissions Calculation

	ID number	Value	Unit	Data Source
Quantity of NG consumption by the Project during the year y	FC_f	524,890,000	m³	Feasibility Study Report of the Project
Net calorific value of NG	NCV_{NG}	0.0338121	GJ/m^3	Feasibility Study Report of the Project
Emission factor for upstream fugitive methane emissions of NG	$EF_{NG,upstream}$	0.0002 96	tCH_4/GJ	AM0029
Electricity generation in the Project plant during the year	$EG_{PJ,y}$	2,598,000	MWh	Feasibility Study Report of the Project
Emission factor for upstream fugitive methane emissions from production of the coal	$EF_{k,upstream,CH4}$	13.4	$tCH_4/ktcoal$	AM0029
Net calorific value of coal	NCV_{coal}	29.28	GJ/tsce	GB2589-90
The emission factor for upstream fugitive CH4 emissions occurring in the absence of the Project activity	$EF_{BL,upstream,CH4}$	0.0045	tCH_4/MWh	-
Global warming potential of methane	GWP_{CH4}	21	-	-
Leakage emissions	LE_Y	-135,805	tCO2e	-

Annex 4

MONITORING INFORMATION

Detailed monitoring plan can be seen in B.7.2, and the primary parameters to be monitored during the crediting period of the project activity are listed below.

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
EGy	Electricity supplied to the grid by the project	Ammeter reading at project boundary	MWh	Directly measured	hourly measurement and monthly recording	100%	Electronic	Electricity supplied by the project activity to the grid. Double check by receipt of sales.
FCf,y	Annual quantity of natural gas consumed in project activity	Fuel flow meter reading at project boundary	m^3	m	Daily	100%	paper	The total fuel consumption will be monitored both at supplier and project end for cross-verification.
NCVf,y	Net Calorific Value of natural gas	Fuel Supplier,	GJ/m^3	e	Fortnightly	100%	paper	Use supplier-provided data.
OXIDf	Oxidation factor	IPCC		e	Annual	100%	Electronic	Use IPCC current default
EFCO2,f,y	Emission factor for natural gas	Global (IPCC)	tCO2/GJ	e	Annual	100%	Electronic	Use IPCC values.
COEFy	CO2 emission coefficient	Calculated Under project activity	$tCO2/m^3$	c	Annual	100%	Electronic	
GENj/k/n,,y	Electricity generation of each power source / plant j, k or n	Local Authority	MWh/ a	m	Yearly	100%	Electronic	During the crediting period and two years after

PEy	Project emission due to combustion of fuel	Calculated under project activity	tCO2	c	Annual	100%	Electronic	[∑i Fi,y*COEFi] / [∑m GENm,y] over recently built power plants defined in the baseline methodology
EFBM,y	CO2 Build Margin emission factor of the grid	Local Authority	tCO2 / MWh	c	Yearly	100%	Electronic	Obtained from the power producers, dispatch centers or latest local statistics.
Fi,y	Amount of each fossil fuel consumed by each power source / plant	Local Authority	Mass or volume	m	Yearly	100%	Electronic	Plant or country-specific values to calculate COEF are preferred to IPCC default values.