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:

>>Title of project activity: Fuling Waste Heat Recovery for power generation project
Document Version No.: 04
Date of Revision: 20/04/2007

A.2. Description of the project activity:

>> Fuling Waste Heat Recovery for power generation project (hereafter "The project") is invested and developed by Sinochem Chongqing Fuling Chemical Industry Co., Ltd. (hereafter "Sinochem Fuling"), whose majority stockholder is Sinochem Group and whose main business is to produce and sell fertilizer and chemical industry products.

The project activity involves new installation of two HRS (Heat Recovery System) systems and two electricity generation systems. The purpose of the project activity is to increase amount of heat recovered, in the form of steam, from four lines of 300KT/yr sulphuric acid production, in order to generate greater amount of steam. The generated steam will be delivered to the steam turbine generators except for meeting on-site energy requirement of the industrial units, leading to a great power generation to meet in-house demand.

It is planned to install two sets of condensing steam turbines, each of which has a rated output of 15MW, providing a total capacity of 30MW.The project is designed to supply electricity approximately 225,920MWh per year. In the absence of the project, Sinochem Fuling would import electricity from Central China Power Grid as its current practice, economically more viable, and commonly being practised in the region and in the sector. Thus, with the operation of the waste heat recovery and utilization, the project will displace equal amount of imported electricity from the Central China Power Grid, which is fossil fuels dominated, and save energy losses in the cooling water. Emission reduction from the project activity is directly proportional to the net electricity generation by the project after subtracting the auxiliary consumption and is estimated 216,047tCO2e per year.

The project activity supports the circular economy ideas and increases energy supply from clean energy sources. The implement of the project will improve heat utilization ratio of the system, avoiding energy waste, and will meet China's sustainable development needs. The project leads to creation of direct employment and it helps to settle down 34 Three Gorges transmigrants. As to environmental development, the project proposes to use waste heat and therefore eliminates exploitation of conventional fossil fuels such as coal, diesel etc. Hence, the project has been able to avoid all associated pollution caused by fossil fuels.

A.3. Project participants:

>> Table A.1 project participants

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)	Sinochem Chongqing Fuling Chemical Industry Co.,Ltd.	No
Japan	Toyota Tsusho Corporation	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

>>China

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

>>Chongqing City

A.4.1.3. City/Town/Community etc:

>>Nan'anpu , Fuling District

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

The project activity is located within the Sulphuric Acid plant of Sinochem Fuling in Nan'anpu, Fuling District of Chongqing City. The project's geographical coordinates of the project activity are east longitude 107° 18′ 45″ and north latitude 29° 44′ 24″ .

Figure 1 shows the location of Fuling District in Chongqing City.

Figure 2 shows the location of the project activity in Fuling District.

Figure 1 Map of Fuling District

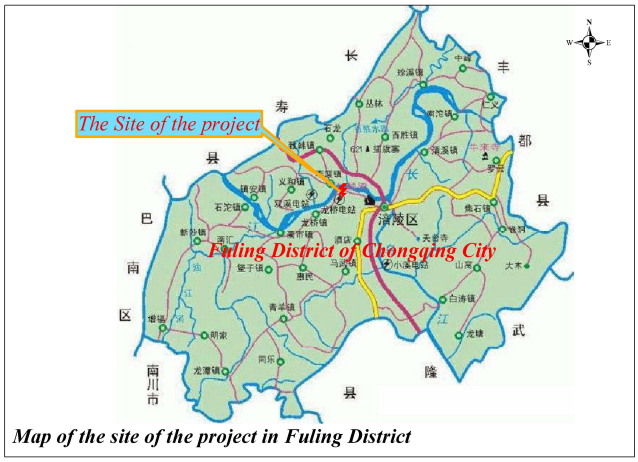

Figure 2 Map of the project

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

>>The project activity falls into Sectoral Category 1: Energy Industries.

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

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The project activity consists of two parts: new installation of two HRS systems and two condensing steam turbines. Figure 3 presents the flow sheet of the project activity.

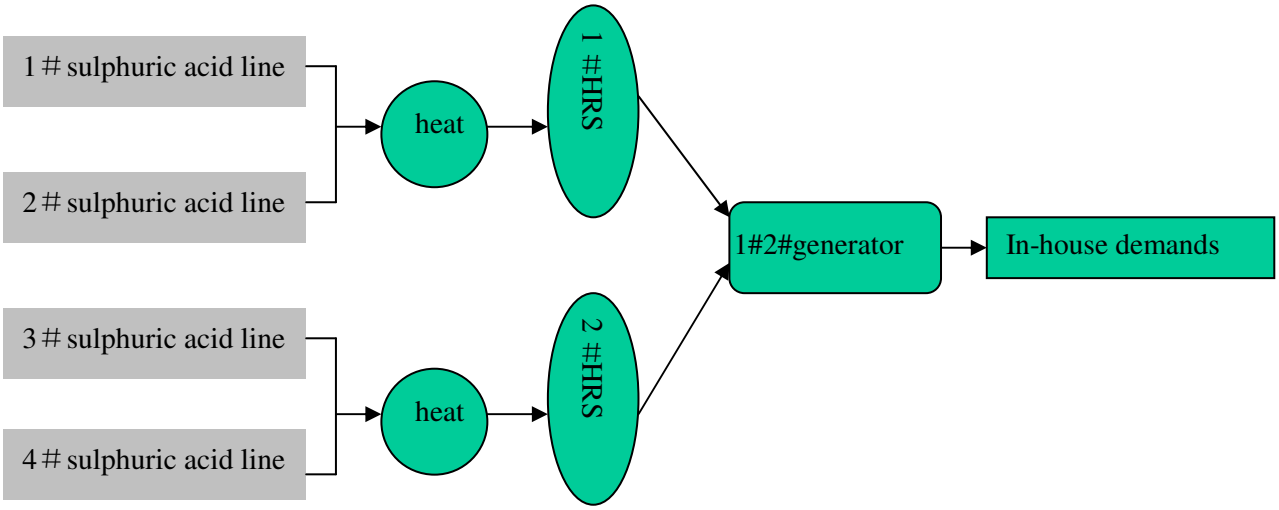

Figure 3 flow of the project activity

The project proposes to introduce HRS systems, developed by MECS of USA, into the sulphuric acid production lines. The replacement of the intermediary absorption towers of traditional technics by HRS systems will lead to an enhanced heat recovery and reduced energy waste in the cycle water. The technology is proven to be reliable, as the first unit of HRS was installed in 1987 in Norway. Figure 4 below presents a simplified flow sheet of the technology.

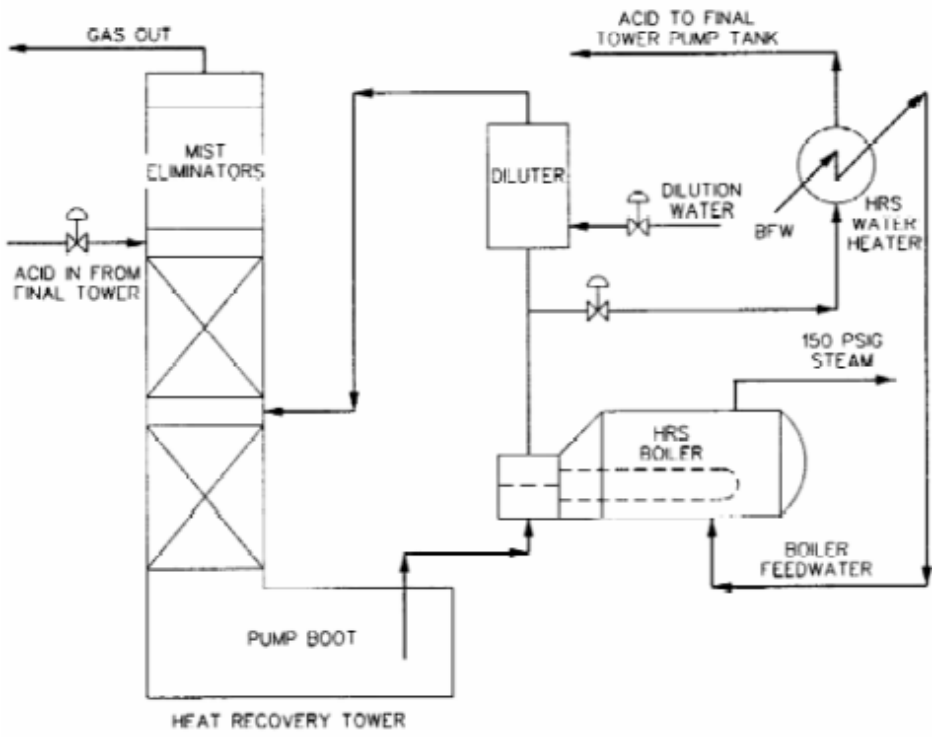

Figure 4 technological flow sheet

The HRS absorption tower is characterised by a high temperature of the gases at the exit, which allows the generation of additional saturated steam, and leads to a greater ratio between the heat recovered and the heat released by the exothermic absorption process. The project activity implies the installation of two HRS systems, together with their tanks and pumps, steam boilers, water preheaters, dilution devices etc., in the dry absorption workshop section of 1#,2# sulphuric acid production line and 3#,4# sulphuric acid production line respectively. It is mentionable that incorporating gases from two 300KT/yr lines into one 600kt/a HRS system is firstly initiated in China. Devices of one set of 600kt/a HRS system are shown as follows (Table A.2):

Table A.2 devices of a 600kt/a HRS

No.	Device Name	model	quantity	Note
1	HRS tower	Negotiation with MECS	1	Imported
2	HRS Boiler		1	Imported
3	HRS Acid Circulation Pump		1	Imported
4	HRS Acid Diluter		1	Imported
5	HRS Heater		1	Imported
6	HRS Preheater		1	Imported
7	HRS 2nd Stage Cooler		1	Imported
8	HRS Tower Mist Eliminators		40	Imported
9	HRS pump for acid ejection		2	Imported
10	HRS instruments			Imported
11	HRS acid trap		2	Imported
12	HRS acid pipes			Imported
13	HRS padding support		2	Imported
14	HRS boiler water supply pump		2	Imported

Domestic condensing steam turbines will be used in the project activity. The owner of the project selects N12-3.43 steam turbines made by Qingdao steam turbine plant and QF2-15-2 generator made by Dongfeng generator plant.

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

>>The chosen crediting period for the project activity is 10 years. The starting date of the crediting period for the project is expected to be January 1st, 2008. During the crediting period, estimation of emission reductions of the project would be shown in the table A.3 below.

Table A.3 estimation of emission reductions

Year	Annual estimation of emission reductions in tonnes of CO_2 e
2008	216,047
2009	216,047
2010	216,047
2011	216,047
2012	216,047
2013	216,047
2014	216,047
2015	216,047

2016	216,047
2017	216,047
Total estimated reductions (tonnes of CO_2e)	2,160,470
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	216,047

A.4.5. Public funding of the project activity:

>> There is no any public funding from Parties included in Annex I of the UNFCCC.

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:

>> ACM0004 – "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation", Version 02, 3rd Mar 06.
ACM0002 – "Approved Consolidated Baseline Methodology for grid connected electricity generation from renewable sources", Version 06 (19th May, 2006).
Additionality of the project has been justified using the approved "Tool for the demonstration and assessment of additionality", Version 03, EB29.
It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC CDM website (http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html).

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

>>The following table B.1 presents why the methodology ACM0004 is applicable to the project.

Table B.1 analysis of methodology application

	Applicability Conditions as per ACM0004	Situation of this Project Activity	Yes/No
1.	Applicable to project activities that generate electricity from waste heat in industrial facilities	The project activity generates electricity from waste heat recovered from sulphuric acid production facility.	Yes
2.	Applicable to electricity generation project activities that displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels.	The project activity generates electricity for industrial production and living usage of the Sinochem Fuling, which displaces electricity imported from the Central China Power Grid	Yes
3.	Applicable to electricity generation project activities where no fuel switch is done in the process where the waste heat or the waste gas is produced after the implementation of the project activity	The project activity will not result in any fuel switch in sulphuric acid production process where waste heat is generated, because waste heat is a kind of chemical reaction heat. Fuel switch is not applicable in the process where the waste heat is produced.	Yes

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

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The project boundary is defined as waste heat, waste heat recovery system, electricity generation system and its auxiliary facilities and all power plants physically connected with the Central China Power Grid.(see in the dashed frame of Figure 5). The Table B.2 illustrates baseline emission and project emission source.

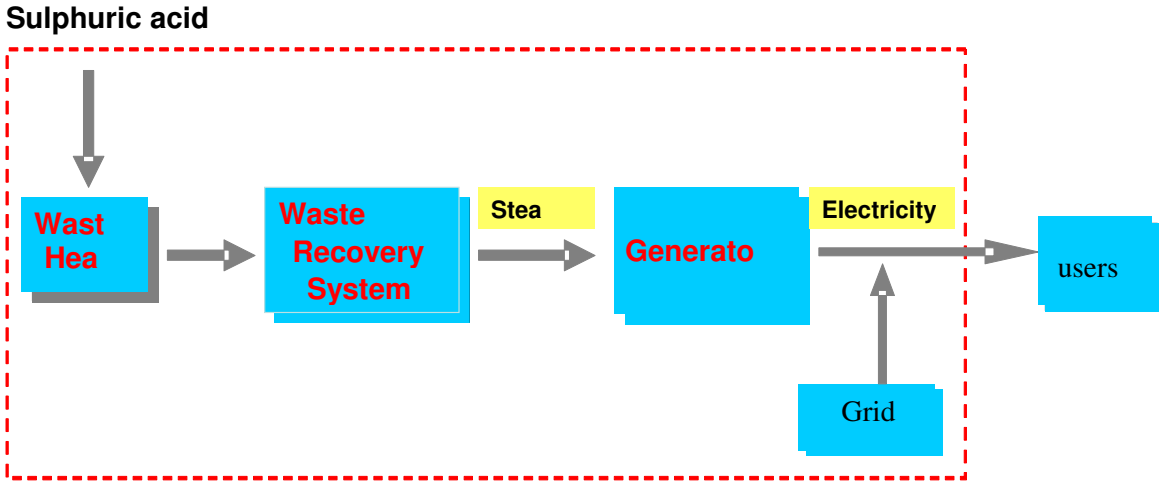


Figure 5 project boundary

Table B.2 Emission sources included in the project boundary

	Source	Gas		Justification / Explanation
Baseline	Power plants connected to Central China Power Grid	CO2	Included	Main emission source
		CH4	Excluded	Excluded for simplification. This is conservative.
		N2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	On-site fossil fuel consumption due to the project activity	CO2	Excluded	It is excluded in the project because there is no auxiliary fossil fuel needs and no such consumption within the project boundary.
		CH4	Excluded	Excluded for simplification.
		N2O	Excluded	Excluded for simplification.

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

>> ***Step 1: Identify the realistic and credible alternatives to the project activity***

According to the methodology ACM0004, for the project activity the possible baseline scenario alternatives would be as follows:

1. the proposed project not undertaken as a CDM project

2. waste heat is released to the atmosphere in the cooling water, and Import of equivalent electricity from the Central China Power Grid
3. Equivalent power supply from on-site new captive plants based on fossil fuels
4. Equivalent power supply from on-site new captive plants based on renewable energy
5. other use of waste heat

Step 2: Determine the baseline scenario to the project activity.

As to option 1 " the proposed project not undertaken as a CDM project", this alternative is in compliance with all applicable legal and regulatory requirements. However, this alternative has been associated with many barriers to its implementation (please refer to Barrier Analysis in Section B.5 below). So, this alternative would not be a credible and realistic alternative option for Sinochem Fuling to implement without CDM benefits. Therefore option 1 is excluded.

As to option 2 "waste heat is released to the atmosphere in the cooling water, and Import of equivalent electricity from the Central China Power Grid", this alternative is in compliance with all applicable legal and regulatory requirements. Currently, the corresponding power for industries facilities and living usage of Sinochem Fuling is imported from Central China Power Grid, So, option 2 scenario is actually what Sinochem Fuling has been taken before the proposed project, and this scenario is also the continuation of current situation. Therefore, option 2 is considered as a Baseline Scenario.

As to option 3 "Equivalent power supply from on-site new captive plants based on fossil fuels", this alternative should be eliminated from the following consideration because it does not comply with the national regulations upon prohibiting small scale coal-fired power plant. To provide the same output as the proposed project activity, the capacity of coal power plant will be less than 50 MW then the project will be categorized as the small scale coal power plant. According to the national regulations[1], the coal power plant under 50 MW should be shut down and the construction of coal power plant under 100 MW will be forbidden within the connected area. Thus, option 3 could be excluded.

As to option 4 "Equivalent power supply from on-site new captive plants based on renewable energy", this alternative is in compliance with all applicable legal and regulatory requirements. However, the project site is short of wind energy, and also it does not adapt to set up a hydropower plant. What's more, Sinochem Fuling belongs to Chemical Industry and its core business is sulphuric acid and fertilizers production. Hence, option 4 is not recognized as a Baseline Scenario.

As to option 5 "other use of waste heat", the heat for power generation is surplus and there are no other new heat demands on-site, so the waste heat for power generation has no other use. Therefore option 5 is excluded.

Based on above analysis, the Baseline Scenario of the project is option 2: waste heat is released to the atmosphere in the cooling water, and Import of equivalent electricity from the Central China Power Grid

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): >>

According to ACM0004, the "Tool for the demonstration and assessment of additionality (version 03)" is applied to demonstrate the additionality of the project activity versus the baseline scenario. The processes are as follows:

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

Sub-step1a.Define alternatives to the project activity:

The alternatives of the project activity are listed as follows:

Alternative 1: the proposed project not undertaken as a CDM project

[1] "the inform on shutdown small-scale coal-fire power plant" by office of China State Council, http://www.haolawyer.com/law/view.asp?id=38930

Alternative 2: waste heat is released to the atmosphere in the cooling water, and Import of equivalent electricity from the Central China Power Grid
Alternative 3: Equivalent power supply from on-site new captive plants based on fossil fuels
Alternative 4: Equivalent power supply from on-site new captive plants based on renewable energy
Alternative 5: other use of waste heat

As stated in B.4., alternative 5 is not considered to be a credible and realistic one for there is no other uses, and alternative 4 is excluded due to shortage of wind resource and lack of feasible site for hydropower station construction and experienced experts on operating hydropower projects.

Sub-step1b.Enforcement of applicable laws and regulations:

According to Chinese laws and rules, waste heat recovery and utilization projects are encouraged, but it is not enforceable since different companies have different resources、economic conditions、technologies and so on.

Section B.4 has demonstrated that alternative 3 does not conform to the relevant regulations and alternative 1 and alternative 2 are in line with laws or rules. Therefore, alternative 1 "the proposed project not undertaken as a CDM project" is not the only alternative one of the proposed project activity.

Step 2: investment analysis

The purpose of investment analysis is to determine whether the Proposed Project activity is financially less attractive than other alternatives without the revenue from the sales of CERs. The investment analysis was done in the following steps:

Sub-step2a: Determine appropriate analysis method:

The "Tool for the Demonstration and Assessment of Additionality" recommends three investment analysis methods including simple cost analysis (option 1), investment comparison analysis (option 2) and benchmark analysis (option 3).

The project activity generates financial and economic benefits through the sales of electricity as well as the revenues from the CDM and therefore option 1 "simple cost analysis" is not appropriate. Option 2 "investment comparison analysis" is applicable when other alternative options are available, in this case, the alternative 2 "waste heat is released to the atmosphere in the cooling water, and Import of equivalent electricity from the Central China Power Grid" is not of an investment project, so it is not appropriate.

Since the full investment benchmark internal rate of returns (FIRR) is available, the project will use the option 3 benchmark analysis.

Sub-step2b: Option 2-Apply benchmark analysis:

Sinochem Fuling is a chemical industry enterprise with the core business sulphuric acid, DAP etc. in the absence of the project activity, the project owner would invest its capital on its core business with proven returns. On the other hand, the HRS installation to recover waste heat for power generation is absolutely depending on the sulphuric acid production lines where the waste heat generates. Since there are high risks on HRS installation with possibly consequent significant negative impacts on sulphuric acid production lines and other fertilizers production lines, no one would be interested in such investment and,in this case, there is only one potential project developer.

According to the feasibility study reports of project activities developed by Sinochem Fuling in the past, the FIRR of 12%, which is the benchmark FIRR of chemical industry, is consistently used as its company internal benchmark, therefore, the FIRR of 12% is selected as the benchmark financial indicator.

Sub-step2c: Calculation and comparison of financial indicators:

From the feasibility study report of the project, the basic parameters for the investment analysis are shown in Table B.3 below:

Table B.3 basic parameters of investment analysis of the project

Items	Unit	Value	Reference
Capacity	MW	30	Feasibility study report
Total Investment	Yuan	215,785,800	Feasibility study report
Construction Investment	Yuan	203,905,500	Feasibility study report
Interest(construction period)	Yuan	4,880,300	Feasibility study report
Annual Depreciation Fee	Yuan	18,351,000	Feasibility study report
Loan(s) Amount	Yuan	142,700,000	Feasibility study report
Loan Interest rate	%	6. 84%	Feasibility study report
Annual Running costs	Yuan	24,210,700	Feasibility study report
Power supply	KWh/year	225,920,000	Feasibility study report
Electricity Tariff(Excluding VAT)	Yuan/kWh	0.265	Feasibility study report
Value Added Tax (VAT)	%	17%	Feasibility study report
Income tax	%	33%	Feasibility study report

In the project scenario, the FIRR after tax is 7.98%, less than 12%. It is economically unattractive for Sinochem Fuling. Hence, it is concluded that the project without CDM support is not economically feasible to Sinochem Fuling.

Sub-step 2d. Sensitivity analysis.

The sensitivity analysis is used to show that the financial attractiveness is robust to reasonable variations in the critical assumptions.

Three factors are considered in following sensitivity analysis:

1) Total investment
2) Electricity Tariff or Electricity Generation
3) Operation and maintenance fee

Sensitivity has been tested and the results are presented below in Table B.4.

Table B.4 sensitivity analysis of the project

Assumptions	FIRR
Total Investment reduces 10%	11.28%
Electricity price or electricity generation increases 5%	11.09%
Operation and maintenance fee reduces 10%	11.02%
Project Scenario	7.98%

It can be seen from Table B.4 that:

(1) when total investment reduces 10%, the FIRR of the project will reach 11.28%, which is still lower than the benchmark 12%.

(2) the tariff or electricity generation has a marked effect on the project FIRR. When the tariff or power generation increases 5%, the project FIRR will go up 7.98% to 11.09%, which is lower than 12%. What's more, electricity generation is calculated in the light of theoretical parameters of devices and, according to national regulations, electricity tariff for middle or small scale fertilizers

company like Sinochem Fuling is a kind of awarded tariff, which is lower than common practice and will not alter in a large range, therefore this scenario is impossible to take place.
(3) it is the first time for Sinochem Fuling to operate the project and high cost of operation and maintenance is inevitable. Even though the cost for maintenance decreases 10%, the FIRR project comes up to 11.02%, still lower than 12%.
The above analysis shows that without further incentive, in this case from the CDM, the project activity is less financial attractive and Sinochem Fuling would not invest in the proposed project activity.

Step 3. Barrier analysis.
Sub-step 3a Identify barriers that would prevent the implementation of type of the proposed project activity.
Many barriers exist in the project activity and it is difficult to implement in Sinochem Fuling. The above investment analysis implies that the project activity is confronted with investment barriers such as high investment but low returns, high operation and maintenance costs and so on. The following barriers will focus on the technical barriers.

Technical Barriers:

- **Strict operation and control regulations**

The following Table B.5 illustrates the parameters of sulphuric acid production procedures with HRS comparison with routine sulphuric acid lines without HRS to show strict operation and control regulations:

Table B.5 Parameter and Requests Comparison

Phase of Sulphuric Acid Production	Parameter and Demands	Routine Project Without HRS	Project activity With HRS
SO_3 gas combines with water in HRS Tower	**The range of sulfuric acid consentration**	Wide (90%-98%), Easy to control	Narrow (99.0%-99.7%)[2], Hard to control
	Temperature Demand	Lower temperature（90℃-100℃）, Weak causticity;	Higher temperature（225 ℃[3]）, Strong causticity[4];
	Demands for the staff	Familiar with operation and maintenance of Routine equipments from domestic.	Familiar with the new technology, rich experience at the production process, ability to identifying, analysis and disposal of the malfunction.

As showed in Table B.5 above, the technical parameter of SO_3 absorption must be controlled within the range from 99.0% to 99.7%, which is obviously narrower than routine project operation (90%-98%), and the temperature must be controlled above 200 ℃, comparing to 90℃-100℃ of

[2] Monsanto Operation Manual---Section10 Acid Heat Recovery System

[3] Monsanto Operation Manual---Section10 Acid Heat Recovery System

[4] Monsanto Operation Manual---Section10 Acid Heat Recovery System

routine demand. It is hard to master in practice. Furthermore, if the technical parameter is not controlled within this range, the HRS would be damaged in a few minutes. Some industry experts point out that *the HRS requests the very narrow range at which the concentration sulfuric acid was controlled, any warp shall bring on the equipment totally destroyed.*[5] And with the damage of HRS, sulphuric acid production lines would have to be shut, which will result in additional tremendous loss to Sinochem Fuling.

Besides, as to the project activity of Sinochem Fuling, It is mentionable that incorporating gases from two 300KT/yr lines into one 600kt/a HRS system will face the barrier of pressure balancing control. Thus it can be seen that applying HRS would be confronted with many technical barriers, which will cause extra expenditure of operation and maintenance fee.

- **Shortage of experienced engineers**

When the project activity is implemented, new technical criteria stated in the Table B.5 would bring on extra demands of experienced engineers. Also accurate procedures and frequent examination should be made during the running period. And furthermore, HRS technology belongs to one of the patents of MECS, USA, implement of the project activity will face the technical patent barrier. It is indispensable for Sinochem Fuling to invite foreign experts to provide basic and necessary training to technicians, which needs huge training expense.

Sub-step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The alternative of the project "waste heat is released to the atmosphere in the cooling water, and Import of equivalent electricity from the Central China Power Grid"is in compliance with national laws and regulations. Sinochem Fuling does not have to invest some extra capital on this alternative and it has no technical barriers. Therefore, the barriers mentioned above would not prevent the implementation of the alternative "waste heat is released to the atmosphere in the cooling water, and Import of equivalent electricity from the Central China Power Grid".

Step 4. Common Practice Analysis

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

In China, most of sulphuric acid product lines are installed in fertilizers company, where the production of phosphates need heat consumption. Some companies use traditional technics to recover heat from sulphuric acid lines, in the form of steam, for meeting thermal demands of industrial facilities, and the surplus heat is released to the atmosphere in the cooling water.

In this case, steam for power generation is surplus and there are no other uses in Sinochem Fuling. On the other hand, as stated in the section A.4.3 and the above Barrier Analysis, HRS has essential distinctions from traditional technique and as it stands now, HRS still faces high risks at the time of its investment as well as understanding for technological requirements. So the similar to the project activity is identified as the activity with HRS system.

Till the end of December of 2006, there is no similar activity in Chongqing. Around China, There are no other cases but two: one is waste heat recovery using HRS system for power generation in Twolion Refine Chemicals Co. Ltd. (Zhangjiagang), the other is waste heat recovery using HRS system for cogeneration in Yihua Group. They are both applying for registration as a CDM project.

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

As stated in *Sub-step 4a*, there is no similar activity as the project activity in China. No further discussion in this sub-step is necessary.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

[5] 'Waste Heat recovery and utilization from sulphuric acid production' Mr. Yu Xiangdong Nanjing Chemical Design Institute 'Sulphuric Acid' Volume 3 2000

>> In accordance with the calculating steps and formulas provided in ACM0004 and ACM0002, the emission reductions of the project activity are calculated as follow:

1. **Calculation of Project Emissions**

The calculation of the Project Emissions will use the following formula:

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i \quad (1)$$

where:

- PE_y is Project Emissions in year *y* in tCO_2,
- Q_i is mass or volume unit of fuel *i* consumed in t or m^3,
- NCV_i is net calorific value per mass or volume unit of fuel *i* in TJ/t or m^3,
- EF_i is carbon emissions factor per unit of energy of the fuel *i* in tC/TJ,
- $OXID_i$ is oxidation factor of the fuel *i*.

No auxiliary fuels are used in the process of heat recovery and power generation of the project activity, therefore, the Project Emissions PE_y is 0.

2. Calculation of Baseline Emissions

The baseline emissions are calculated with the formula given as:

$$BE_y = EG_y \times EF_y \quad (2)$$

where:

- BE_y is the baseline emissions during the year y in tCO_2,
- EGy is net quantity of electricity supply by the project during the year y in MWh,
- EFy is CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y in tCO_2/MWh.

Refer to analysis in B.4, the baseline scenario for the project activity is importing the electricity from Central China Power Grid, thus, the calculation of method of ACM0002 shall be used according to ACM0004 to determine the Emission Factor EFy.

➢ **Calculation of EG_y**

According to the monitoring methodology of ACM0004, the net electricity supply of the project activity EGy equals to the electricity generation EG_{GEN} minus the auxiliary electricity consumption EG_{AUX} in the project boundary. Namely:

$$EGy = EG_{GEN} - EG_{AUX} \quad (3)$$

Where:

- EGy is net quantity of electricity supply by the project during the year y in MWh,
- EG_{GEN} is Total electricity generation by the project during the year y in MWh,
- EG_{AUX} is Auxiliary electricity consumption in the project boundary during the year y in

MWh.

- **Calculation of EF_y**

According to the announcement of Grid Boundary by DNA of China, *Central China Power Grid covers six provinces (Hunan, Hubei, Henan, Jiangxi, Sichuan, Chongqing)*[6], the project activity is located in Chongqing and it is appropriate to select the Central China Power Grid as project system boundary.
According to ACM0002, the baseline emission factor ($EF_{,y}$) is calculated as a combined margin (CM) of $EF_{OM,y}$ and $EF_{BM,y}$, based on the following three steps:

Step 1: Calculation the Operating Margin emission factor ($EF_{OM,y}$***)***
Calculation of OM emission factor should be based on one of the following four methods:
(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

Each method is analyzed as below.

Method (c) Dispatch data analysis OM

If the dispatch data is available, method (c) should be the first choice. This method requires the dispatch order of each power plant and the dispatched electricity generation of all the power plants in the power grid during every operation hour period. Since the dispatch data, power plants operation data are considered as confidential materials and only for internal usage not available publicly. Thus, method (c) is not applicable for the proposed project activity.

Method (b) Simple adjusted OM

The application of simple adjusted OM method requires the annual load duration curve of the power grid and the load data of every hour data during the whole year on the basis of the time order. As mentioned above, the dispatch data and detailed load curve data were not available publicly. Therefore, method (b) is not applicable for the proposed project as well.

Method (d) Average OM

Method (d) will only be used when (1) low-cost/must run resources constitute more than 50% of total grid generation and detailed data to apply method (b) is not available, and (2) where detailed data to apply option (c) above is unavailable. From 2000 to 2004, the low-cost/ must run resources constitute less than 50% of total amount grid generation output.(see Table B.6). Hence method (d) is not applicable for the project activity.

Method (a) Simple OM

The simple OM method 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 normal for hydroelectricity production. Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants. From 2000 to 2004, the low cost must run resources constitute less than 50% of total

[6] http://cdm.ccchina.gov.cn/web/index.asp

amount grid generation output.(see Table B.6). Therefore, method (a) is applicable for the project.

Table B.6 2000-2004 Central China Grid Electricity Generation[7]

Year	Electricity generation(GWh)				
	total	Hydropower	thermal	other	% low-cost/must run
2000	256356.4	97428.1	158928.4	0.0	38.00
2001	281710.0	103554.0	178156.0	0.0	36.76
2002	312787.0	112440.0	200347.0	0.0	35.95
2003	367287.0	126448.0	240839.0	0.0	34.43
2004	439940.0	169094.0	270846.0	725	38.54

Source: China Electric Power Yearbook (editions 2001, 2002, 2003, 2004 and 2005)

In conclusion, method (a) is the only reasonable and feasible method among the four methods for calculating the Operating Margin emission factor ($EF_{OM, y}$) of the Central China Power Grid.

According to the ACM0002, the Simple OM emission factor ($EF_{OM, simple, y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants, the detailed formulas are as following:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j,y}}{\sum_{j} GEN_{j,y}} \quad (4)$$

Where:

- $F_{i, j, y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y,
- j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid,
- $COEF_{i, j, y}$ is the CO2 emission coefficient of fuel i (tCO2/ mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y , and
- $GEN_{j, y}$ is the electricity (MWh) delivered to the grid by sources j.

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_{i,j,y} = NCV_i \times EF_{CO2,i} \times OXID_i \quad (5)$$

Where:

- NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i , (TJ/ mass or volume unit），
- $OXID_i$ is the oxidation factor of the fuel i (see page 1.29 in the 2006 IPCC Guidelines for default values),
- $EF_{CO2, i}$ is the CO_2 emission factor per unit of energy of the fuel i (tCO2e/TJ).

In the project activity, the data of net calorific values of the fuels is from the China Energy Statistical Yearbook and the data of the oxidation factors and emission factors of the fuels are from IPCC default.

The Simple OM Emission Factor ($EF_{OM, simple,y}$) of the project activity is calculated ex ant on the basis of the fuel consumption data from Central China Power Grid, excluding those of low

operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the *China Electric Power Yearbook* (2002~2004, published annually) and *China Energy Statistical Yearbook* (2000~2004). Based on these data, the Simple OM Emission Factor ($EF_{OM,\ simple,y}$) of the Central China Power Grid is calculated as 1.2778 tCO2e/MWh (see Annex 3 for details).

Step2: Calculation the Build Margin emission factor ($EF_{BM,\ y}$)

According to ACM0002, $EF_{BM,y}$ is determined by the formula as follow:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \quad (6)$$

Where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method in step 1 for plants m.

ACM0002 provides two options for sample group m:
(1) The five power plants that have been built most recently, or
(2) The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The one with larger annual generation should be used.

However, 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 plant owners. Taking notice of this situation, EB accepts the following deviation in methodology application[8]:

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

In this PDD, as required, capacity additions of the Central China Power Grid during 2000~2004 were used for estimating the Build Margin emission factor for grid electricity and the 600 MW sub-critical coal-fired power generator was used as the proxy of efficiency level of the best technology in China[9]. Based on these data, the build margin emission factor ($EF_{BM,y}$) of the Central china Grid is calculated ex ante as 0.6347 tCO_2e/MWh (see Annex 3 for details).

Step3. Calculate the baseline emission factor EF_y

Based on ACM0002, the baseline emission factor EF_y should be calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission

[7]Numbers are calculated on the basis of data for Hunan, Hubei, Henan, Jiangxi, Sichuan, Chongqing. Low cost / must run resources in Table B.6 are composed of "Hydro" and "Others". The category "Others" is mainly composed of wind power and is therefore included as part of low cost / must run.

[8] Http://cdm.unfccc.int/Projects/Deviations.

[9] Http://www.ccchina.gov.cn/source/fa/fa2002082803.html.

factor($EF_{BM,y}$), where the weights w_{OM} and w_{BM}, are 50%(i.e. $w_{OM} = w_{BM} = 0.5$) by default, and ($EF_{OM,y}$) and ($EF_{BM,y}$) are calculated as described in Step 1 and 2.
EF_y= 0.5*1.2778+0.5*0.6347=0.9563 (tCO_2e/MWh)

The value of EF_y calculated ex-ante will be used and won't be updated during the fixed crediting period.

3. Calculation of Leakage

In accordance with ACM0004， no leakage is considered.

4. Calculation of Emission Reductions

The emission reductions (*ERy*) by the project activity during the year *y* is the difference between the baseline emissions (*BEy*) and project emissions (*PEy*), the Emission Reductions is calculated as follows:

$$ER_y = BE_y - PE_y \qquad (7)$$

where:
ER_y is the emissions reductions of the project activity during the year *y* (tCO_2), and
BE_y is the baseline emissions due to displacement of electricity during the year *y* (tCO_2), and
PE_y is the project emissions during the year *y* (tCO_2).

According to the description above, the PE_y is 0, so we know that,

$$ER_y = BE_y \qquad (8)$$

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

Data / Parameter:	$F_{i,j,y}$
Data unit:	t/m^3
Description:	Total amount of fuel *i* (in a mass or volume unit) consumed by all the relevant power sources *j* in year of y.
Source of data used:	China Energy Statistic Yearbook
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The detailed data of fuels consumed by power plants are not available publicly, so the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	Electricity imported to the grid by power source *j* in year of *y*..
Source of data used:	China Electric Power Yearbook
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The detailed data of fuels consumed by power plants are not available publicly, so the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ/t(ce), TJ/m^3(ce)
Description:	Net calorific value per mass or volume unit of a fuel *i.*
Source of data used:	China Electric Power Yearbook
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	
Description:	oxidation factor of the fuel *i*
Source of data used:	IPCC default value in 2006 IPCC Guideline for National Greenhouse Gas Inventories.
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor per unit of energy of the fuel *i*.
Source of data used:	IPCC default value in 2006 IPCC Guideline for National Greenhouse Gas Inventories.
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$COEF_i$
Data unit:	$tCO_2/t(m^3)$
Description:	CO_2 emission coefficient of fuel *i*.
Source of data used:	Calculated
Value applied:	Please refer to 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:

>> As described in B.6.1, ex-ante calculation of emission reductions is as follow:

Project Activity Emissions in the Crediting Period

The emission of the proposed project in crediting period is 0.

Baseline emissions in the crediting period

The formula of baseline emission calculation is as follow:

$$BE_y = EG_y \times EF_y \qquad (9)$$

I. Calculation of EG_y

According to the feasibility study report of the project activity, Table B.7 presents the calculation of $EG_{y.}$

Table B.7 Net power supply of the project activity

EG_{GEN} (MWh/y)	EG_{AUX} (MWh/y)		EG_y (MWh/y)
A	B[10]		C=A-B
240,000	HRS	Generator	225,920
	2,880	11,200	

II. Calculation of EF_y

Calculate the Operating Margin Emission Factor ($EF_{OM,y}$)

The result of $EF_{OM,y}$ is1.2778tCO_2e/MWh. Detailed calculation can be referred in Annex 3.

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

The result of $EF_{BM,y}$ is 0.6347 tCO_2e/MWh. Detailed calculation can be referred in Annex 3.

Calculate the Baseline Emission Factor (EF_y)

EF_y= 0.5*1.2778+0.5*0.6347=0.9563 (tCO_2e/MWh)

Leakage in crediting period

There is no leakage in the proposed project activity.

Estimation of Emission Reductions in the Crediting Period

Table B.8 estimated Baseline Emission

EG_y	EF_y	BE_y

[10] ‘ Feasibility Study Report ’, Page 43, Section 5.2

(MWh/y)	(tCO_2e/MWh)	(tCO_2e/y)
A	B	C = A * B
225,920	0.9563	216,047

From Table B.8, we can conclude that $ER_y = BE_y$=216,030 tCO_2e/y

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

Table B.9 ex-ante estimation of emission reductions

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)**
2008	0	216,047	0	216,047
2009	0	216,047	0	216,047
2010	0	216,047	0	216,047
2011	0	216,047	0	216,047
2012	0	216,047	0	216,047
2013	0	216,047	0	216,047
2014	0	216,047	0	216,047
2015	0	216,047	0	216,047
2016	0	216,047	0	216,047
2017	0	216,047	0	216,047
Total (tonnes of CO_2e)	0	2,160,470	0	2,160,470

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

B.7.1 Data and parameters monitored:

In the project activity, the net power supply equals to the power generation EG_{GEN} minus the power auxiliary consumption EG_{AUX} . EG_{GEN} is the sum of EG_{GEN1} and EG_{GEN2} and EG_{AUX} is the summation of EG_{AUX1} to EG_{AUX5} . Date and parameters monitored are listed as follows:

Data / Parameter:	EG_{GEN1}
Data unit:	MWh/y
Description:	Power generation by No.1 generator in the project activity
Source of data to be used:	Accumulative value of electricity supplied will be shown on electricity meter and DCS

Value of data applied for the purpose of calculating expected emission reductions in section B.5	120,000
Description of measurement methods and procedures to be applied:	Measurement equipment: the electronic electricity meter (DSSD135 model by Jiangyin Changyi Group). Accuracy degree: 1. Measurement methods: Online continuous measurement, the value of electricity generation can be accumulated and saved by the electricity meter and shown on DCS. Recording frequency: Continuously. The recorded data will be archived in electronic, and will be kept in Credit period + 2 yrs. Emergency measures: Data can not be measured because of calibration or the electricity meter is out of order in the crediting period, then emergency measures should be taken. Please refer to section B.7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibration procedure: Both main meter and backup meter are calibrated by Fuling Technique Supervision Bureau once a year. A calibration report will be provided by Fuling Technique Supervision Bureau and kept by Sinochem Fuling. CDM manager is responsible for regular calibration of the meter. QA/QC for Data: (1) Sinochem Fuling cannot unseal electricity meters in the absence of Fuling Technique Supervision Bureau(or its authorized delegates) (2) Sinochem Fuling will arrange operators recording the data of DCS every hour. (3) The running parameters of generators can be used to verify the power generation data from the meters, details see B.7.2
Any comment:	

Data / Parameter:	EG_{GEN2}
Data unit:	MWh/y
Description:	Power generation by No.2 generator in the project activity
Source of data to be used:	Accumulative value of electricity supplied will be shown on electricity meter and DCS

Value of data applied for the purpose of calculating expected emission reductions in section B.5	120,000
Description of measurement methods and procedures to be applied:	Measurement equipment: the electronic electricity meter (DSSD135 model by Jiangyin Changyi Group). Accuracy degree: 1. Measurement methods: Online continuous measurement, the value of electricity generation can be accumulated and saved by the electricity meter and shown on DCS. Recording frequency: Continuously. The recorded data will be archived in electronic, and will be kept in Credit period + 2 yrs. Emergency measures: Data can not be measured because of calibration or the electricity meter is out of order in the crediting period, then emergency measures should be taken. Please refer to section B.7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibration procedure: Both main meter and backup meter are calibrated by Fuling Technique Supervision Bureau once a year. A calibration report will be provided by Fuling Technique Supervision Bureau and kept by Sinochem Fuling. CDM manager is responsible for regular calibration of the meter. QA/QC for Data: (1) Sinochem Fuling cannot unseal electricity meters in the absence of Fuling Technique Supervision Bureau(or its authorized delegates) (2) Sinochem Fuling will arrange operators recording the data of DCS every hour. (3) The running parameters of generators can be used to verify the power generation data from the meters, details see B.7.2
Any comment:	

Data / Parameter:	EG_{AUX1}
Data unit:	MWh/y
Description:	Auxiliary electricity consumption by No.1 power generation system

Source of data to be used:	Accumulative value of electricity consumed will be showed on electricity meters (EG_{AUX1}) and on DCS[11]
Value of data applied for the purpose of calculating expected emission reductions in section B.5	5100
Description of measurement methods and procedures to be applied:	Measurement equipment: The electronic electricity meter(DSSD135 model by Jiangyin Changyi Group). Accuracy degree: 1. Measurement methods: Online continuous measurement, the value of electricity supply can be accumulated and saved by the electricity meter and shown on DCS. Recording frequency: Continuously. The recorded data will be archived in electronic, and will be kept in Credit period + 2 yrs. Emergency measures: Data can not be measured because of calibration or the electricity meter out of order in the crediting period, then emergency measures should be taken. Please refer to section B.7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibration procedure: Both main meter and backup meter are calibrated by Fuling Technique Supervision Bureau once a year. A calibration report will be provided by Fuling Technique Supervision Bureau and kept by Sinochem Fuling. CDM manager is responsible for regular calibration of the meter. QA/QC for Data: (1) Sinochem Fuling cannot unseal electricity meters in the absence of Fuling Technique Supervision Bureau(or its authorized delegates) (2) Sinochem Fuling will arrange operators recording the data of DCS every hour. (3) The running parameters of generators can be used to verify the power generation data from the meters, details see B.7.2
Any comment:	

Data / Parameter:	EG_{AUX2}

[11] DCS is an abbreviation of Distributed Control System

Data unit:	MWh/y
Description:	Auxiliary electricity consumption by No.2 power generation system
Source of data to be used:	Accumulative value of electricity consumed will be showed on electricity meters (EG_{AUX2}) and on DCS
Value of data applied for the purpose of calculating expected emission reductions in section B.5	5100
Description of measurement methods and procedures to be applied:	Measurement equipment: The electronic electricity meter(DSSD135 model by Jiangyin Changyi Group). Accuracy degree: 1. Measurement methods: Online continuous measurement, the value of electricity supply can be accumulated and saved by the electricity meter and shown on DCS. Recording frequency: Continuously. The recorded data will be archived in electronic, and will be kept in Credit period + 2 yrs. Emergency measures: Data can not be measured because of calibration or the electricity meter out of order in the crediting period, then emergency measures should be taken. Please refer to section B.7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibration procedure: Both main meter and backup meter are calibrated by Fuling Technique Supervision Bureau once a year. A calibration report will be prov ided by Fuling Technique Supervision Bureau and kept by Sinochem Fuling. CDM manager is responsible for regular calibration of the meter. QA/QC for Data: (1) Sinochem Fuling cannot unseal electricity meters in the absence of Fuling Technique Supervision Bureau(or its authorized delegates) (2) Sinochem Fuling will arrange operators recording the data of DCS every hour. (3) The running parameters of generators can be used to verify the power generation data from the meters, details see B.7.2
Any comment:	

Data / Parameter:	EG_{AUX3}
Data unit:	MWh/y
Description:	Auxiliary electricity consumption by backup transformer
Source of data to be used:	Accumulative value of electricity consumed will be showed on electricity meters (EG_{AUX3}) and on DCS
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Measurement equipment: The electronic electricity meter(DSSD135 model by Jiangyin Changyi Group). Accuracy degree: 1. Measurement methods: Online continuous measurement, the value of electricity supply can be accumulated and saved by the electricity meter and shown on DCS. Recording frequency: Continuously. The recorded data will be archived in electronic, and will be kept in Credit period + 2 yrs. Emergency measures: Data can not be measured because of calibration or the electricity meter out of order in the crediting period, then emergency measures should be taken. Please refer to section B.7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibration procedure: Both main meter and backup meter are calibrated by Fuling Technique Supervision Bureau once a year. A calibration report will be provided by Fuling Technique Supervision Bureau and kept by Sinochem Fuling. CDM manager is responsible for regular calibration of the meter. QA/QC for Data: (1) Sinochem Fuling cannot unseal electricity meters in the absence of Fuling Technique Supervision Bureau(or its authorized delegates) (2) Sinochem Fuling will arrange operators recording the data of DCS every hour. (3) The running parameters of generators can be used to verify the power generation data from the meters, details see B.7.2

Any comment:	

Data / Parameter:	EG_{AUX4}
Data unit:	MWh/y
Description:	Auxiliary electricity consumption by No.1 HRS system
Source of data to be used:	Accumulative value of electricity consumed will be showed on electricity meters (EG_{AUX4}) and on DCS
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1440
Description of measurement methods and procedures to be applied:	Measurement equipment: The electronic electricity meter(DSSD135 model by Jiangyin Changyi Group). Accuracy degree: 1. Measurement methods: Online continuous measurement, the value of electricity supply can be accumulated and saved by the electricity meter and shown on DCS. Recording frequency: Continuously. The recorded data will be archived in electronic, and will be kept in Credit period + 2 yrs. Emergency measures: Data can not be measured because of calibration or the electricity meter out of order in the crediting period, then emergency measures should be taken. Please refer to section B.7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibration procedure: Both main meter and backup meter are calibrated by Fuling Technique Supervision Bureau once a year. A calibration report will be provided by Fuling Technique Supervision Bureau and kept by Sinochem Fuling. CDM manager is responsible for regular calibration of the meter. QA/QC for Data: (1) Sinochem Fuling cannot unseal electricity meters in the absence of Fuling Technique Supervision Bureau(or its authorized delegates) (2) Sinochem Fuling will arrange operators recording the data of DCS every hour. (3) The running parameters of generators can be used to verify the

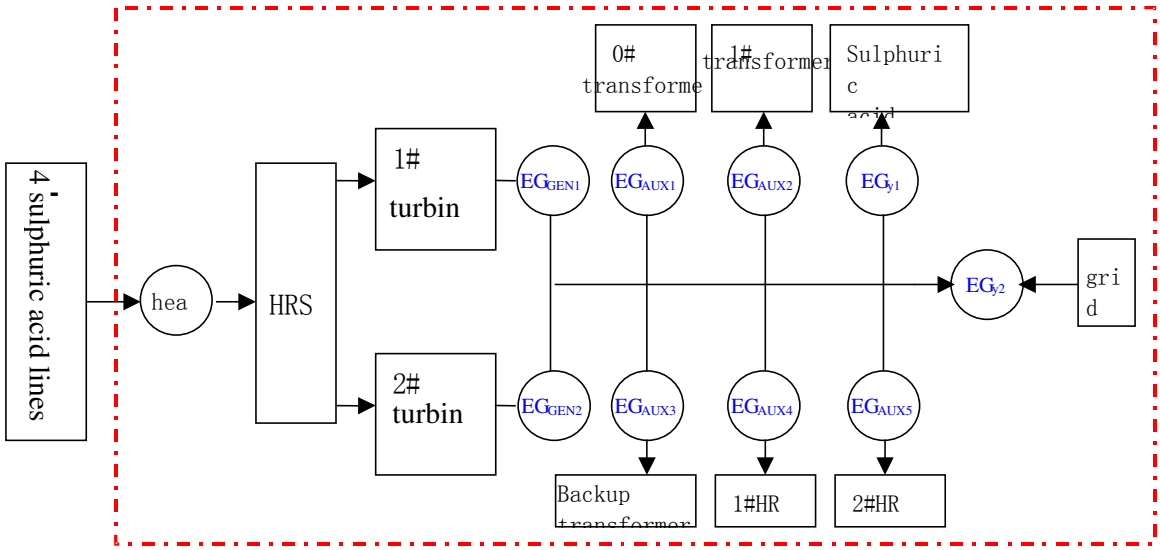
	power generation data from the meters, details see B.7.2
Any comment:	

Data / Parameter:	EG_{AUX5}
Data unit:	MWh/y
Description:	Auxiliary electricity consumption by No.2 HRS system
Source of data to be used:	Accumulative value of electricity consumed will be shown on electricity meters (EG_{AUX5}) and on DCS
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1440
Description of measurement methods and procedures to be applied:	Measurement equipment: The electronic electricity meter(DSSD135 model by Jiangyin Changyi Group). Accuracy degree: 1. Measurement methods: Online continuous measurement, the value of electricity supply can be accumulated and saved by the electricity meter and shown on DCS. Recording frequency: Continuously. The recorded data will be archived in electronic, and will be kept in Credit period + 2 yrs. Emergency measures: Data can not be measured because of calibration or the electricity meter out of order in the crediting period, then emergency measures should be taken. Please refer to section B.7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibration procedure: Both main meter and backup meter are calibrated by Fuling Technique Supervision Bureau once a year. A calibration report will be provided by Fuling Technique Supervision Bureau and kept by Sinochem Fuling. CDM manager is responsible for regular calibration of the meter. QA/QC for Data: (1) Sinochem Fuling cannot unseal electricity meters in the absence of Fuling Technique Supervision Bureau(or its authorized delegates) (2) Sinochem Fuling will arrange operators recording the data of DCS every hour.

	(3) The running parameters of generators can be used to verify the power generation data from the meters, details see B.7.2
Any comment:	

B.7.2 Description of the monitoring plan:

ACM0004 monitoring methodology defines the net electricity supply is calculated by the difference between the electricity generation and the energy consumption of auxiliary equipments. Therefore, the monitoring plan is drafted to focus on the two data referred above.
The following is the sketch map for monitoring plan.



1. Monitoring Targets

(1) Monitoring of Electricity generation by the project activity(EG_{GEN})

There are two electricity meters used to monitor electricity generation by the project activity. The two electricity meters, calibrated and sealed by Fuling Technique Supervision Bureau and maintained by Sinochem Fuling, are installed in the Sinochem Fuling Control Center. Both the

main measurement system equipments and the backup measurement equipments will be operated and maintained by Sinochem Fuling. The data recorded from both meters will be shown on DCS. The project power generation EG_{GEN} equals to power generation of No.1 generator EG_{GEN1} and No.2 generator EG_{GEN2}.

(2) Monitoring of Auxiliary Electricity Consumption(EG_{AUX})

Auxiliary electricity includes electricity consumed by all equipments in the project boundary. Five electricity meters(detailed information in Table B.10) are installed by project owner in the Sinochem Fuling Central Control Center. And the data can be shown on DCS.

Table B.10 auxiliary electricity

Auxiliary power	consumer
(EG_{AUX1})	0# transformer which is used to record 1# generator consumption
(EG_{AUX2})	1# transformer which is used to record 2# generator consumption
(EG_{AUX3})	Backup transformer when 1# and 0# transformers stop.
(EG_{AUX4})	1#HRS system
(EG_{AUX5})	2#HRS system

2. Monitoring Procedures

(1) Measurement

The accumulate data for EG_{GEN} and EG_{AUX} will be measured by seven meters, which are also shown on DCS online. The accumulate data of seven meters will be recorded once every two hours on DCS and they will be export into the database.

(2) Identification

The trained operators will identify whether the data on DCS is reasonable within 24 hours. And they will frequently inspect the power plant, focusing on the meter. The process will be recorded and provided to DOE on Verification. If the operators find out the data isn't credible, emergency plan will be used. The method of data identification and the detailed procedure are defined on CDM Operational Manual.

3. Quality Assurance and Quality Control

(1) For measurement equipments——Calibration of Meters

All of electricity meters will be calibrated once a year by Fuling Technique Supervision Bureau. After calibration, calibration reports (F-2) will be provided by Fuling Technique Supervision Bureau and kept by the project owner. The procedure of calibration will be detailed defined on CDM Operational Manual. The process of Meter calibration should be reported (F-3). Seven calibrated meters will be prepared for replacement of each meter in case any of them doesn't work.

Calibration of meters are in the charge of CDM manager.

(2) For Monitoring Process——Computer Execution with Human Supervision

The Monitoring Process will be executed by computer and supervised by operators, in order to avoid artificial errors. The operation report form (F-4) would be archived. The procedures of copying data will be defined in CDM Operational Manual. If the abnormal situation happens, the emergency plan will be started up.

(3) For Emergency Situation——Backup Meters and Conservative Method

When the main meter is on calibration or out of work, the data during the calibration or malfunction period is measured by backup meter in Control Center. The starting time and the ending time should be recorded carefully; and the report (F-5) needs to be archived and provided to DOE.

When the backup meter in Control Center is on calibration or out of work, a new meter should be replaced it. The starting time and the ending time should be recorded carefully; and the report (F-5) needs to be archived and provided to DOE.

When the auxiliary electricity meter is on calibration, it should be replaced by the calibrated meter in time. The starting time and the ending time should be recorded carefully; and the report (F-5) needs to be archived and provided to DOE.

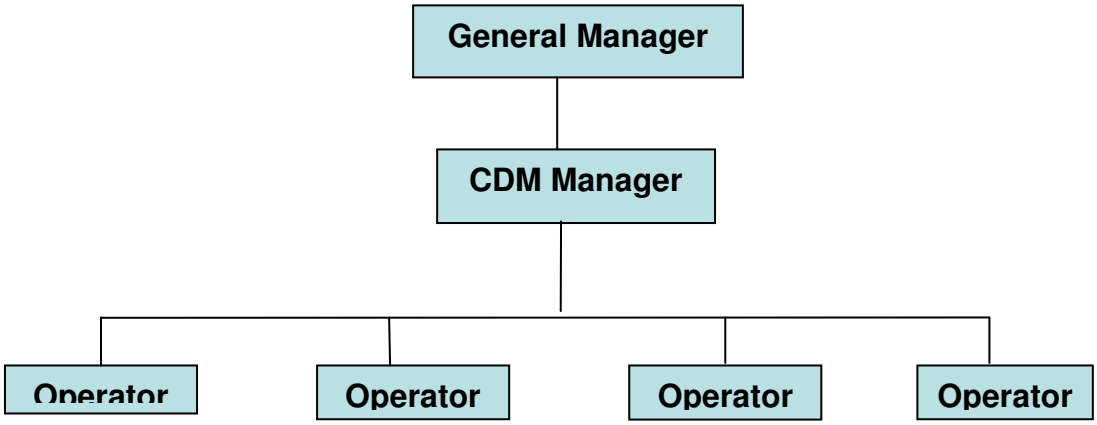
If the auxiliary electricity meter is out of work, the monitoring data is not available during the malfunction period, the largest amount consumed by auxiliary equipments is used for ER calculation as conservative considering. The starting time and the ending time of the malfunction period should be recorded carefully; and the report(F-5) needs to be archived and provided to DOE.

(4) For Human Resource Management——Training Plan

According to version 2 of methodology ACM0004--*"Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation"*, *"Monitoring Plan", "CDM Operational Manual"* ,the training course is designed and conducted appropriately by CDM consultant. Relevant documentation (F-6) or other materials such as: the training plan, training materials, training report or test paper should be archived and provided to DOE.

The contents and procedures of quality assurance and quality control is an on-going process which will be updated in the crediting period.

4. Operational and Management Structure



(1) Responsibility of General Manager:

All the affairs related to CDM project monitoring is managed by general manager.

(2) Responsibility of CDM Manager:

In charge of Meters calibration and training affairs; Check the daily operation report forms; Archive emergency situation disposal report

(3) Responsibility of operator:

Four operators take turns to work in Sinochem Control Center during 24 hours.

In charge of data supervision, identification, and achievement; Executive emergency plan; Draft operation report forms and emergency situation disposal report.

5. Verification

It is expected that the verification of emission reductions generated from the Project will be done annually. The Table 8 below outlines the key documents relevant to monitoring and verification of the emission reductions from the Project. With all these documents compiled, the Project owner will sign a verification service agreement with specific DOE.

Table B.11. List of the key documents relevant to monitoring and verification

I.D. No.	Document Title	Main Content	Source
F-1	PDD, including the electronic spreadsheets and supporting documentation (assumptions, estimations, measurement, etc)	Calculation procedure of emission reduction and monitoring items	Sinochem Fuling, or directly download from UNFCCC website
F-2	Meter calibration Report	Equipments and national and industry standards	Fuling Technique Supervision Bureau
F-3	Process Report for calibration	Starting time and ending time of calibration, Reasons for maintenance and calibration and the precision after maintenance and calibration	Sinochem Fuling

F-4	Operation Report Forms	The data of seven meters per 2 hours, abnormal situation.	Sinochem Fuling
F-5	Emergency situation disposal report	the process of the event and the disposal method	Sinochem Fuling
F-6	Relative materials about training	the training plan, training materials, training report or test paper	Sinochem Fuling
F-7	Monitoring report	CO2 emission reduction calculation	Sinochem Fuling or CDM consultant

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)

>>

Date of completing draft of the baseline and monitoring section:

The current version of baseline and monitoring study was completed on 21 Sep. 2006.

The name of the responsible person/ entity:

Tao Kanghua, Shanghai Yangtze Delta Investment Consultancy Co., Ltd. （CDM Service Center）, which is not the project particitpant.

Address: Room 603, Guilin Road 46, Shanghai, China, 200233

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Email: khtaoc@online.sh.cn

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:

30/07/2007

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

15 years

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

C.2.1. Renewable crediting period

Not applicable

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

The project activity will be using a fixed crediting period.

C.2.2.1. Starting date:

>>01/01/2008

C.2.2.2. Length:

>>10 years

SECTION D. Environmental impacts

>>

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

>> The project activity has passed Environmental Impact Assessment (EIA) on March 19,2007 in line with the requirements of the Chinese Government. All the documents related to EIA of the project activity will be detailed in the final version of this PDD for validation. During the construction of the project activity, Manifold elements have been thought over, such as location, layout, vane and so on. No adverse impacts including trans-boundary impacts are arising due to the project activity.

During construction and running phase, the analysis of the environmental impacts and measures of the project activity is described as follows:

1. Air pollution: Dust will be suppressed by regular water sprinkling and suitable road surface treatment to ease traffic flow; Monitoring and recording system will be built up around the chimney, including the waste emission of chimney. And waste gases such as SO2 will be discharged in line with <standard on environmental air quality>. The utilizing of the waste heat will greatly reduce thermal pollution.
2. Noise pollution: Construction with big noise will be avoided during the night. And the noise caused by the activity will be restricted to be within the range of the permission of industry standard. Turbines, pumps and other equipments will be designed and specified with a view to minimize noise pollution. Adequate measures have been adopted in the project activity to ensure noise levels are maintained well within permissible industrial norms.
3. Water pollution. Effluent will be disposed before discharge. Industrial sewage will be neutralized and then sent to Chemical park sewage disposal plant with living sullage.
4. Solid waste: Parts of solid wastes are recovered to be raw materials and the remained will be innocuously disposed in solid waste disposal center.
5. Ecology impacts. There are no endangered species located in and around the plant area. There are also no landscape conservation zone and cultural relic. Therefore, it will have no impact on ecology.
6. Working security. The company's operations are managed with high safety level systems. This includes equipment shutdown procedure, use of personal protection equipments like safety helmets, emergency response plan, mock drills, training on use of fire fighting equipment etc. For ensuring safety of the workmen all moving parts of all machinery and exposed parts of machines would be provided with guards.

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 study on the project activity has revealed that there are no significant environmental risks and the impacts of the project activity on site are positive as all necessary and good measures have been adopted.

SECTION E. Stakeholders' comments

>>

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

>>

From 10th Dec. 2006 to 8th Janu.2007, the project owner conducted interviews and received comments from local stakeholders covering about 5 kilometres around. A one-page questionnaire was designed to be easily filled in with the following sections:

1. project introduction
2. basic information and education level
3. Key questions:
   - What possible positive impacts will the project activity bring to the local inhabitants?
   - What are the possible negative impacts?
   - Whether is the waste heat recovery project favourable or harmful?
   - Do you support the construction of the project?

The survey had a 100% response rate (51 questionnaires returned out of 51) and the respondents include:

1. staff of Sinochem Fuling (34 questionnaires)
2. villagers in Longqiao Town of Fuling District (15 questionnaires)
3. villagers' commission of Nan'anpu of Fuling District (2 questionnaires)
4. Fuling Environment Protection Bureau, Fuling Economy Commission and Energy-saving Office of Fuling District. (3 written opinions obtained)

Among the respondents,

Education level: Middle school 15%, Senior High school 23%, College level 27%, university 33%, others 2%.

E.2. Summary of the comments received:

>>

After collecting the questionnaires, the following are the key findings:

1. Official delegates of Fuling government think that the project activity belongs to green energy project and complies with national industry policies. The implementation of the project activity will lead to emission reductions of greenhouse gas.
2. When the project's positive impacts on the local residents are mentioned, 75% think that it will promote the development of local economy; 73% think that Sinochem Fuling's competition ability will be greatly enhanced. 87% think it will lead to energy saving; 52% think that it will create employment opportunities.
3. When asked for the comments on the project's negative impacts, 27% referred to noise and 8% referred to air pollution.
4. 96% persons support the project activity; 4% are indifferent to the project activity and nobody opposes.

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

>>

According to the comments received from the stakeholders of the project activity, local villagers show worries in a certain extent about possible noise and air pollution. Corresponding to these comments, Sinochem Fuling will take the measures as follows:

Construction with big noise will be avoided during the night. And the noise caused by the activity will be restricted to be within the range of the permission of industry standard. Turbines, pumps and other equipments will be designed and specified with a view to minimize noise pollution. Adequate measures have been adopted in the project activity to ensure noise levels are maintained well within permissible industrial norms, such as construction of isolation booth.

Monitoring and recording system will be built up around the chimney, including the waste emission of chimney. And waste gases such as SO2 will be discharged in line with <standard on environmental air quality>

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding in the project activity.

Annex 3

BASELINE INFORMATION

OM Calculation

The following tables summarize the numerical results from the equations listed in the ACM0002. The information listed in the tables includes data, data sources and the underlying computations. Table A1~A3 listed the basic data of the Central China Power Grid in the year 2002, 2003 and 2004, including installed capacities, annual electricity generation under various electricity generation technologies.

TableA1 The fossil-fired electricity generation of Central China Grid in 2002

Province	Fossil-fired power (MWh)	The proportion of Electricity use by plant (%)	Supply of Fossil-fired power (MWh)
Jiangxi	18648000	7.67	17217698
Henan	84734000	8.03	77929860
Hubei	34301000	7.73	31649533
Hunan	20058000	7.73	18507517
Chongqing	14727000	10.21	13223373
Sichuan	27879000	9.59	25205404
Sum			183733385

Data source: China Electric Power Yearbook 2003

TableA2 The fossil-fired electricity generation of Central China Grid in 2003

Province	Fossil-fired power (MWh)	The proportion of Electricity use by plant (%)	Supply of Fossil-fired power (MWh)
Jiangxi	27165000	6.43	25418291
Henan	95518000	7.68	88182218
Hubei	39532000	3.81	38025831
Hunan	29501000	4.58	28149854
Chongqing	16341000	8.97	14875212
Sichuan	32782000	4.41	31336314
Sum			225987719

Data source: China Electric Power Yearbook 2004

TableA3 The fossil-fired electricity generation of Central China Grid in 2004

Province	Fossil-fired power (MWh)	The proportion of Electricity use by plant (%)	Supply of Fossil-fired power (MWh)
Jiangxi	30127000	7.04	28006059
Henan	109352000	8.19	100396071
Hubei	43034000	6.58	40202363
Hunan	37186000	7.47	34408206
Chongqing	16520000	11.06	14692888
Sichuan	34627000	9.41	31368599
Sum			249074186

Data source: China Electric Power Yearbook 2005

TableA4 Energy consumption and CO_2 emissions of Central China Grid in 2002

Fuel Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Sum	CO_2 emission（tc/TJ）	Oxidation rate (%)	average low value Caloric（MJ/t,km^3,tce）	CO_2 emission（tCO_2e）
		A	B	C	D	E	F	G=B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/10^2
Raw coal	Mtons	1062.63	4679.02	1710	1113.78	398.57	1964.32	**10928.32**	25.8	100	20908	216150891.6
Clean coal	Mtons	2.72						**2.72**	25.8	100	26344	67786.27328
Other washed coal	Mtons	3.66	26.49			249.99		**280.14**	25.8	100	8363	2216299.036
coke	Mtons		1.15					**1.15**	29.2	100	28435	35011.06767
Coke-oven gas	10^8m^3			1.11				**1.11**	12.1	100	16726	82370.5322
Other coal gas	10^8m^3		2.16					**2.16**	12.1	100	5227	50091.3864
crude oil	Mtons		0.67	1.17			0.81	**2.65**	20	100	41816	81262.42667
diesel oil	Mtons	1	1.34	1.08	2.19	0.51	0.51	**6.63**	20.2	100	42652	209447.7642
fuel oil	Mtons	0.33	0.16	0.34	0.69		1.51	**3.03**	21.1	100	41816	98025.48536
LPG	Mtons		0.02					**0.02**	17.2	100	50179	632.9244533
Refinery gas	Mtons	0.49			1.9			**2.39**	15.7	100	46055	63364.46472
Natural gas	10^8m^3						1.75	**1.75**	15.3	100	38931	382205.0925
Other petroleum products	Mtons							**0**	20	100	38369	0
Other parched products	Mtons							**0**	25.8	100	28435	0
Other energy	Mtons coal		3.38					**3.38**	0	0	0	0
sum											小计	219437388

Data source：China Energy Statistic Yearbook (2000-2002), 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Total emission (tCO2e): 219437388

Total electricity exportation (MWh): 183733385

$EF_{(02)}$: 1.194325073

Table A5 Energy consumption and CO_2 emissions of Central China Grid in 2003

Fuel Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chong qing	Sichuan	Sum	CO_2 emission（tc/TJ）	Oxidation rate (%)	average low Caloric value（MJ/t,km^3,tce）	CO_2 emission（tCO_2e）
		A	B	C	D	E	F	G=B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/10^2
Raw coal	Mtons	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	**13851.66**	25.8	100	20908	273971539.9
Clean coal	Mtons							**0**	25.8	100	26344	0
Other washed coal	Mtons	2.03	39.63			106.12		**147.78**	25.8	100	8363	1169146.396
coke	Mtons				1.22			**1.22**	29.2	100	28435	37142.17613
Coke-oven gas	10^8m^3			0.93				**0.93**	12.1	100	16726	69013.1486
Other coal gas	10^8m^3							**0**	12.1	100	5227	0
crude oil	Mtons		0.5	0.24			1.2	**1.94**	20	100	41816	59490.22933
diesel oil	Mtons	0.52	2.54	0.69	1.21	0.77		**5.73**	20.2	100	42652	181015.941
fuel oil	Mtons	0.42	0.25	2.17	0.54	0.28	1.2	**4.86**	21.1	100	41816	157228.9963
LPG	Mtons							**0**	17.2	100	50179	0
Refinery gas	Mtons	1.76	6.53		0.66			**8.95**	15.7	100	46055	237285.3386
Natural gas	10^8m^3					0.04	2.2	**2.24**	15.3	100	38931	489222.5184
Other petroleum products	Mtons							**0**	20	100	38369	0
Other parched products	Mtons							**0**	25.8	100	28435	0
Other energy	Mtons coal		11.04			16.2		**27.24**	0	0	0	0
sum											小计	276371084.6

Data source：China Energy Statistic Yearbook 2004
China Energy Statistic Yearbook 2005，P365，

2006 IPCC Guidelines for National Greenhouse Gas Inventories

Total emission (tCO2e): 276371084.6
Total electricity exportation (MWh): 225987719
$EF_{(03)}$: 1.22294736

Table A6 Energy consumption and CO_2 emissions of Central China Grid in 2004

Fuel Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Sum	CO_2 emission (tc/TJ)	Oxidation rate (%)	average low Caloric value (MJ/t,km^3,tce)	CO_2 emission (tCO_2e)
		A	B	C	D	E	F	G=B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/10^2
Raw coal	Mtons	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20908	339092605.3
Clean coal	Mtons		2.34					2.34	25.8	100	26344	58316.13216
Other washed coal	Mtons	48.93	104.22			89.72		242.87	25.8	100	8363	1921441.232
coke	Mtons		109.61					109.61	29.2	100	28435	3337011.415
Coke-oven gas	10^8m^3			1.68		0.34		2.02	12.1	100	16726	149899.5271
Other coal gas	10^8m^3					2.61		2.61	12.1	100	5227	60527.0919
crude oil	Mtons		0.86	0.22				1.08	20	100	41816	33118.272
petroleum	Mtons		0.06			0.01		0.07	18.9	100	43070	2089.3257
diesel oil	Mtons	0.02	3.86	1.7	1.72	1.14		8.44	20.2	100	42652	266627.3198
fuel oil	Mtons	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41816	464893.1434
LPG	Mtons							0	17.2	100	50179	0
Refinery gas	Mtons	3.52	2.27					5.79	15.7	100	46055	153506.3811
Natural gas	10^8m^3						2.27	2.27	15.3	100	38931	495774.6057
Other petroleum products	Mtons							0	20	100	38369	0
Other parched products	Mtons							0	25.8	100	28435	0

Other energy	Mtons coal	16.92	15.2	20.95	53.07	0	0	0	0
sum								小计	346035809.7

Data source：China Energy Statistic Yearbook 2005
2006 IPCC Guidelines for National Greenhouse Gas Inventories
Total emission (tCO2e): 346035809.7
Total electricity exportation (MWh): 249074186
$EF_{(04)}$: 1.389288127

According to consolidated baseline methodology ACM0002, the Simple OM emission factors of the Central China Power Grid in the year 2002, 2003 and 2004 were calculated in A4~A6 above. The Simple OM emission factor of the Project is the average value of the Simple OM emission factors in the year 2002, 2003 and 2004, i.e. $EF_{OM, simple, y}$=1.2778 tCO2e/MWh.

BM Calculation

The conservative calculation of the build margin emission factor of the Central China Power Grid has been explained in Section B in the PDD. The data, sources and calculation process of the build margin emission factor and combined emission factor of the Central China Power Grid are shown in following Table A7 and Table A8.

According to the China Energy Statistic Yearbook 2005, λ_{coal}=99.53%, λ_{Oil}=0.22%, λ_{Gas}=0.25%(λ is the ratio of CO2 emission by burning coal, oil, gas to the total emission), it obviously shows that the amount of gas-fired and oil-fired power is very small. We consider the EF_{coal} as the $EF_{thermal}$ for facilitation, at the same time, in the conservative consideration, the 600 MW sub-critical coal-fired power generator should multiply the $\lambda_{coal.}$

Table A7 capacity additions used to determine the Build Margin of Central China Grid from 2000 to 2004

	Installed capacity in 2000 (MW)	Installed capacity in 2001 (MW)	Installed capacity in 2004 (MW)	2000-2004New capacity additions (MW)	Share of new capacity(%)
Fossil-fired power	39864.6	42569.2	53744.7	13880.1	69.80%
Hydro power	28637.8	30397	34642	6004.2	30.20%
Nuclear power	0	0	0	0	0.00%
Others(Wind)	0	0	0	0	0.00%
Sum	68502.4	72966.2	88386.7	19884.3	100.00%
Share of installed capacity in 2004 (%)	77.5%	82.55%	100%		

Data source：China Electric Power Yearbook 2003-2005.

Table A8. Calculation of build margin emission factor and combined emission factor of the Central China Grid

	Change in installed capacity (2004 compared to 2000, MW)	**Best commercially available power generation technology in China (600 MW sub-critical coal-fired power generator)**
Hydro power	13880.1	**Coal consumed by power generation:** 336.66 gCe/KWh **Emission factor:** 0.9136 tCO_2e/MWh
Fossil fuel-fired power	6004.2	
Other	0	
Total	19884.3	
Fuel-fried electricity capacity share	0.6980	
Build margin emission factor in the Central china Grid (tCO_2e/MWh)		0.6347
Combined emission factor in the Central china Grid (tCO_2e/MWh)		0.9563

The share of fuel-fired power generation capacity addition during 2000~2004 is 0.6980, therefore the build margin emission factor of the Central China Grid is calculated as 0.9136×0.9953×0.6980=0.6347 tCO2e/MWh.

Annex 4

MONITORING INFORMATION

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See in B.7