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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Shandong Guanxian 2*15MW Biomass Power Plant Project

Version of Document: Version 3.0,

Date of Document：31/03 /2008

A.2. Description of the project activity:

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The Shandong Guanxian Biomass Power Plant Project (hereafter, the proposed Project) developed by China Guodian Corporation (hereafter referred to as the Project Developer) is a biomass collection and utilization project to be constructed at the site of a demolished brick factory located at Guanxian, Liaocheng city, Shandong Province, P.R.China. The proposed project will generate electrical power using a 2x15MW generator unit by directly combusting biomass fuels such as wheat stalks and corn straws etc. No heat supply is considered in the proposed project activity due to less heat users and less heat demands at present and in the near future around the project site.

The electricity produced by the proposed project shall be supplied to the public North China Power Grid (NCPG)system through Shandong provincial power grid. The project will replace the power generated by coal-fired power plants connect to the grid. The proposed project will reduce the greenhouse gas emissions from biomass caused by natural decay and uncontrolled burning and emissions related to the burning of fossil fuel for power production as well.

Guanxian, Liaocheng City, Shandong, the project site is an agricultural county with a abundant biomass resources produces from a 75,000 hectare cultivated acreage. The biomass residues would be left for decay, dumped or uncontrolled burning at the fields if the proposed project were not implemented. The decay or uncontrolled burning of biomass residues causes a serious environmental pollution and a waste of reusable energy recourses.

The total amounts of biomass fuels to be used annually in the proposed project are 172,700 tonnes, which are collected from farmers' fields in 15 km radius from plant and transport to the plant by heavy trucks. The annual power net output to the grid is 139GWh and the annual estimated amount of greenhouse gas emissions reduction is 151,717 tonnes of CO2e.

China is under a situation of a perpetual shortage of energy and highly dependent on the coal-fired power generation and this is making a various problems of environmental pollution. China is aiming at a goal of 15% share of renewable energy in total power generation by 2020. Thus, the proposed project shall contribute to the goal's realization and more specifically

- provides a new renewable energy resource instead of the traditional coal fired power generation which is usually causes a serious environmental problems such as air pollution.

- provides new opportunities of more than two hundred direct employments and other indirect employments in the area of the proposed project site.

- provides an attractive business chance for local formers to sell the almost unused biomass resources, which were usually burnt in an uncontrolled manner or decayed in the field without any management.

- provides a valuable chance for local government to promote a development of clean and highly efficient technology in local power plants

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
China (host)	China Guodian Corporation	No

Project participants:

China Guodian Corporation, one of the five largest nationwide power generation groups approved by the State Council of China in the power industry restructuring. It is a pilot state holding enterprise approved by the State council to carry out the state-authorized investment and established in 2002 with the registered capital of 12 billion RMB Yuan (equivalent to 1.5 billion US Dollar). The power sources owned by China Guodian cover 29 provinces (autonomous regions and municipalities) with the total generation assets of 188billion RMB Yuan (equivalent to 23.5 billion US Dollar).

CDM consultants

Japan Research Institute, Co., Ltd. (JRI) is a leading company of the consulting services in the economy, energy, environment and IT area. Headquarter is located in Tokyo, Japan.

Tepia Corporation Japan, Co., Ltd. (TEPIA) is a company which headquarters is located in Osaka, Japan. TEPIA has been developed CDM projects in China from 2005 and has contributed actively to emission reduction through industrial energy efficiency improvement and renewable energy utilization projects all over China.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party (ies):

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People's Republic of China

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

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Shandong Province

A.4.1.3. City/Town/Community etc:

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Guanxian, Liaocheng 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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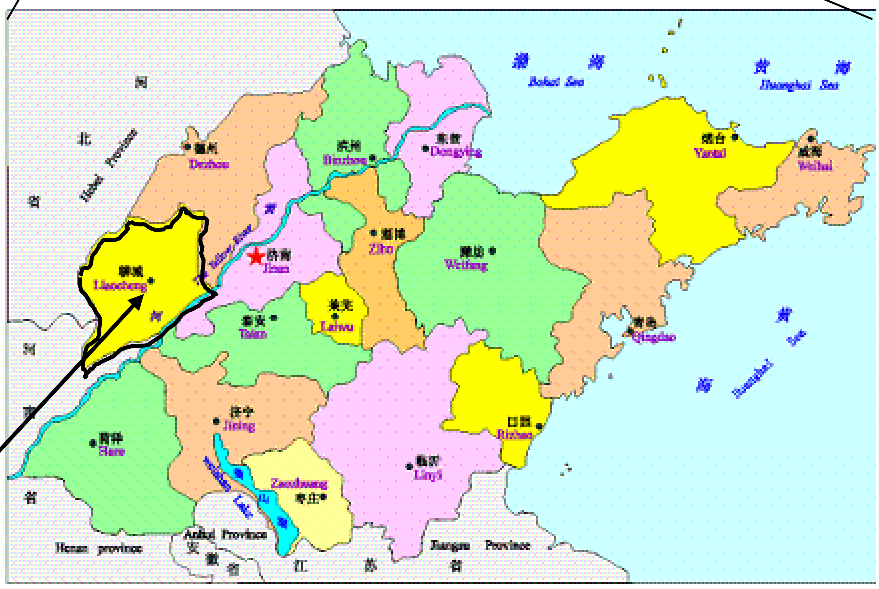
The proposed project activity is located at Guanxian, in the west of Shandong province. The longitude is 115°26′17″and the latitude is 36°28′28′. Dingyuanzhai village which is 20km to the east of Guanxian downtown area and is basically located in the middle of fuel-supply area. The project ‘s east is adjacent to Majia River, north is adjacent to National Highway of 309 and south is adjacent to Zhangwa village.

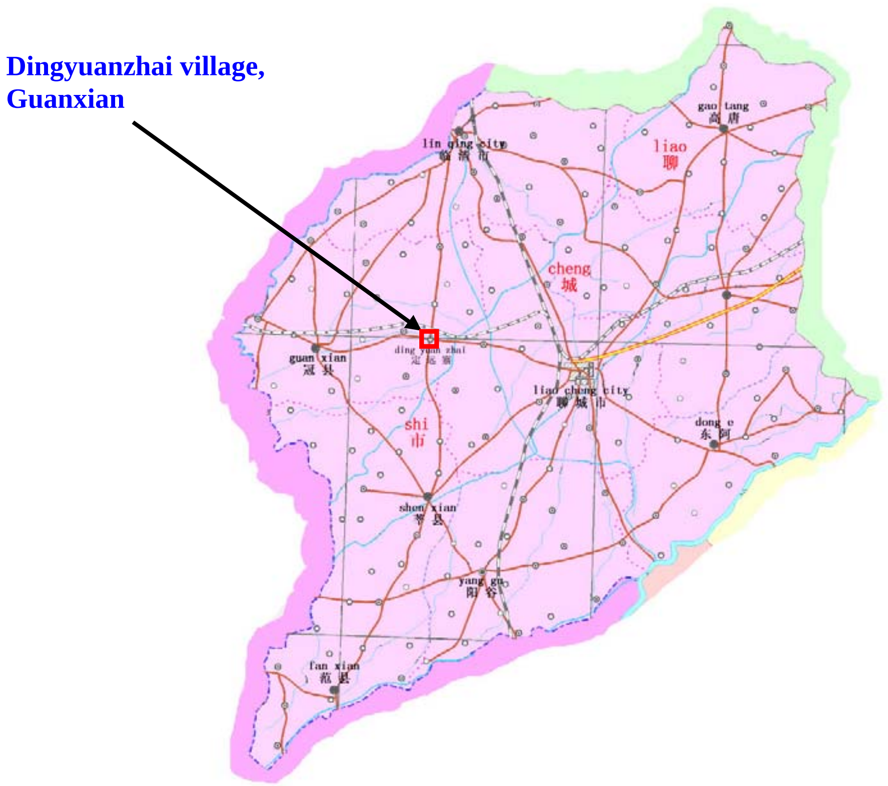
Figure 1.The map of Shandong Province

Figure 2.The map of Liaocheng city



Liaocheng city in Shandong province

Figure 3.The proposed project in the map of Guanxian, Liaocheng City



Project Location :Dingyuanzhai village, Guanxian, Liaocheng City

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

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Sectoral Scope 1: Energy Industries (renewable sources)
Category: Renewable electricity in grid connected applications

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

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The proposed project will combust the biomass fuels such as wheat stalks and corn straws to generate electrical power. The annual consumption of biomass is about 172,700ton and electricity generated from the project is about 139GWh to deliver to annually to North China Power Grid (NCPG) through Shandong provincial power grid.

The main fuel supply is corn straw (it is anticipated that wheat straw and leaves will only account for a small percentage of total fuel supply), which is bought from local farmers directly. In the project region corn straw is considered to be abundant resources and is only utilized to a very limited degree at the present time. According to the Feasibility Study Report, the harvest residues of corn straw resources in 15 km radius from plant is 395, 300 tons / year, and the owed residues is 322,100 tons / year which is obviously more than the need of 172,700 tons of annual plant consumption. The power plant fuel is guaranteed. Ten individual collection points are planned to be constructed in the township government within 20 km radius from plant. Straw will be packed and sent to the plant after farmers send them to the nearest collecting station.

In plant, straw packets are stored in warehouse located in front of boiler, then straw packets will be put on the conveyor chain by automatically grab crane and entered the feed system of boiler, and then be transported automatically to grate through the spiral feeder. In the boiler, the fuel firstly is landed in front of the grate, then dried on the bed surface, ignited, and moving forward with the grate's vibration at the same time, scattered, and then unburned completely in the surface of end grate stoker with the final ash residue is discharged out through the tap hole.

The electricity is supplied to users by distribution equipment through transmission line. The steam in the steam turbine is changed into water through condenser, and is sent to boiler for circulation. The circulating cooling water supplied to condenser is circularly used after the cooling tower. The flue gas from boiler is inhaled firstly to bag dust catcher by wind-leader after it through superheater, coal-saving, air- preheater, and then is inhaled to 80-meter-high chimney for emission. Boiler ash is treated in dry-style and is transported by car outside for comprehensive utilization.

The system consists of 2x15MW condensing steam turbines and 2x75t/h water-cooling boiler with medium temperature and medium pressure, and QF-15-2 type air-cooling generator. The equipments including all the auxiliary equipments will be supplied by the advanced domestic manufacturer. No international technology transfer involved in the proposed project. Followings are technical parameters of major equipments:

1) **Boilers（2 sets）**

Type: single, vibrating chain type middle-temperature, middle-pressure boiler, and steam circulation by forced-air cooling
Rated evaporation: 75t/h
Rated steam temperature: 450 ℃
Rated steam pressure: 3.82Mpa
Water temperature: 150℃
Efficiency: ≥88%

2) **steam turbine (2sets)**

Type: N15-3.43/435, single, middle-temperature, middle-pressure, extraction steam
Capacity: 15MW
Rated Inlet steam pressure: 3.43MPa
Rated Inlet steam temperature : 435 ℃

3) **generator（2 sets）**

Type: QF-K15-2
Capacity: 15MW
Rated voltage: 6.3kV

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

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An estimation of emissions reductions expected over the crediting period (01/06/2008- 31/05/2015) is provided in the table below.

Years	Annual estimation of emission reductions in tonnes of CO2e
2008	88,502

2009	151,717
2010	151,717
2011	151,717
2012	151,717
2013	151,717
2014	151,717
2015	63,215
Total estimated reductions (tonnes of CO2e)	**1,062,019**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	**151,717**

A.4.5. Public funding of the project activity:

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No ODA of annex I country is involved in this project activity.

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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ACM0006 "Consolidated Baseline Methodology for grid-connected electricity generation from biomass residues"(Version 06, EB33), in conjunction with "Consolidated monitoring methodology for grid-connected electricity generation from biomass residues".

ACM0006 refers to the ACM 0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"(Version 07, EB36) and the latest version of the "Tool for the demonstration and assessment of additionality" （Version 04, EB36） .

More information about the methodology can be found on the website:
http://cdm.unfccc.int/methodologies/approved.

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 mainly based on two complementary activities as following:

- The collection and acted as biomass resources for power generation
- The generation and supplying of electricity to the regional grid system, thus displacing a certain amount of fossil fuels used for electricity generation

Therefore, this Guanxian Biomass power plant project obviously belongs to the **Greenfield Power Projects**, which listed in the first of the four activities on the methodology ACM0006.

The methodology ACM0006 allows for development of projects falling under 4 conditions:

- Condition 1: No other biomass types than biomass residues (Defined as biomass that is a by-product, residue or waste stream from agriculture, forestry and related industries), as defined above, are used in the project plant and these biomass residues are the predominant fuel used in the project plant;
- Condition 2: For projects that use biomass residues from a production process, the implementation of the project should not result in an increase of the processing capacity of raw input or in other substantial changes in process;
- Condition 3: The biomass used by project facility should not be stored for more than one year;
- Condition 4: No significant energy quantities, except from transportation of the biomass, are required to prepare the biomass residues for fuel combustion.

The situations of proposed Guanxian biomass direct burning power plant are as following:

- The biomass which will be utilized in the proposed power plant are mostly from the dumped or uncontrolled burning in the field, and only the biomass straws are utilized as the predominant fuel supplying for the power plant. Therefore, this is fulfilling the condition 1;
- The biomass residues are directly from the agriculture, but not the production process, therefore it fulfils the condition 2;
- Mainly based on the requirements of moisture and ash contents of biomass , the storage time of the biomass residues will not be over 1 year, therefore , it fulfils the condition 3;
- There is not significant energy quantities, except from transportation of the biomass are required to prepare the biomass residues for fuel combustion, which also fulfils the condition 4.

Based on the above analysis, it can be conclude that the project therefore fulfils all the conditions as defined above, hence ACM0006 was thought to be the most appropriate methodology for this project.

In this case a baseline methodology for electricity and or thermal energy displaced shall be an approved one used which is ACM 0006 as explained before, including the ACM 0002 "Consolidated Methodology for Grid-Connected Power Generation from Renewable Sources".

The proposed project can meet the applicability criteria of the baseline methodology (ACM0002), therefore, the methodology is applicable to the proposed project.

- The proposed project is a grid-connected zero-emission renewable power generation activity from biomass source;
- The proposed project is not an activity that involves switching from fossil fuels to renewable energy at the proposed project site.
- The power grid (the North China Power Grid) which the proposed project is to be connected to is clearly identified and information on the characteristics of this grid is publicly available.
- The additionality of the proposed project can be verified using “Tools for the demonstration and assessment of additionality” requested by the baseline methodology (ACM0002).
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B.3. Description of the sources and gases included in the project boundary

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According to ACM0006, for the purpose of determining GHG emissions of the **project activity**, project participants shall include the following emissions sources:

• CO2 emissions from on-site fossil fuel and electricity consumption that is attributable to the project activity. This includes fossil fuels co-fired in the project plant, fossil fuels used for on-site transportation or fossil fuels or electricity used for the preparation of the biomass residues, e.g., the operation of shredders or other equipment, as well as any other sources that are attributable to the project activity; and

• CO2 emissions from off-site transportation of biomass residues that are combusted in the project plant;and

• where applicable, CH4 emissions from anaerobic treatment of wastes originating from the treatment of the biomass residues prior to their combustion.

The **spatial extent** of the project boundary encompasses:

• the power plant at the project site;
• the means for transportation of biomass residues to the project site (e.g. vehicles);
• all power plants connected physically to the electricity system that the CDM project power plant is connected to. The spatial extent of the project electricity system, including issues related to the calculation of the build margin (BM) and operating margin (OM), is further defined in the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002).
• The site where the biomass residues would have been left for decay or dumped. This is applicable only to cases where the biomass residues would in the absence of the project activity be dumped or left to decay.

The project boundary is as follows:

- biomass power plant located at the proposed project site
- trucks transporting biomass from filed to the project site
- North China Power Grid (NCPG), Shandong Power Grid
- biomass residues decayed or combusted on the filed

Table 1. Overview on emissions sources included in or excluded from the project boundary

	Source	Gas		Justification / Explanation
Baseline	Electricity generation	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH4	Included	Project participants decide to include this emission source, since the case B1 has been identified as the most likely baseline scenario.
		N_2O	Excluded	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources.
Project Activity	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	CO_2	Included	An important emission source.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass	CO_2	Included	An important emission source. About349tone.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

	Combustion of biomass residues for electricity and / or heat generation	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Included	This emission source must be included if CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario are included.
		N_2O	Excluded	Excluded for simplification as per the methodology applied. This emission source is assumed to be very small.
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

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

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The methodology will be applied using **Green Field Power** Project activity and all the four conditions listed under the ACM 0006 are fulfilled.

Based on the ACM0006, realistic and credible alternatives should be separately determined regarding:

- How **Power** would be generated in the absence of the CDM project activity;
- What would happen to the **Biomass** in the absence of the project activity;

Baseline Scenario

The proposed project only generates electricity, and then the alternatives of proposed project activity should be determined as follows:

Power Generation

For **power** generation, the realistic and credible alternatives may include, inter alia:

P1 The proposed project activity not undertaken as a CDM project activity.

P2 The continuation of power generation in an existing biomass residue fired power plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the project activity.

P3 The generation of power in an existing captive power plant, using only fossil fuels.

P4 The generation of power in the grid.

P5 The installation of a new biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.

P6 The installation of a new biomass residue fired power plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity. Therefore, the power output is the same as in the project case.

P7 The retrofitting of an existing biomass residue fired power, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.

P8 The retrofitting of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity.

P9 The installation of a **new** fossil fuel fired captive power plant at the project site.

As for P1, if the proposed project activity is not undertaken as a CDM project activity, it will be faced with investment barriers and technical barriers and cannot be run commercially. Thus, P1 can NOT be the most realistic baseline alternative for power generation.

As for P2, at present, the technology of biomass power generation just starts, even if the biomass power plants with lower power generation efficiency are not common practice in China. Therefore, P2 can NOT become a most realistic baseline alternative for power generation.

As for P3, there are none of fossil fuel fired power plants around project site, so, P3 is excluded.
As for P4, the current installed capacity newly added capacity of NCPG that the proposed project is connected will meet the requirement of national law and regulations, also financially viable. The same electricity generation with the proposed project is likely to be from the existing and /or newly built grid connected power plants.

As for P5 to P8, there are none of biomass power plants in the nearby local area. Therefore, the scenario from P5 to P8 is excluded.
In conclusion, the most realistic and credible alternative for power generation is P4

Use of Biomass

For the use of **biomass residues**, the realistic and credible alternative(s) may include, *inter alia*:

B1 The biomass residues are dumped or left to decay under mainly aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.

B2 The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled2 or left to decay on fields.

B3 The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.

B4 The biomass residues are used for heat and/or electricity generation at the project site

B5 The biomass residues are used for power generation, including cogeneration, in other existing or **new** grid-connected power plants3

B6 The biomass residues are used for heat generation in other existing or new boilers at other sites[4]

B7 The biomass residues are used for other energy purposes, such as the generation of biofuels

B8 The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry)

The proposed project will utilize the waste straws, which are otherwise burned in an uncontrolled manner or dumped or decayed in an open air without utilizing them for energy purposes. There is no similar cogeneration project using straws as fuel and also the straw resources will not be used by any other plant due to the cost consideration. Therefore, the local biomass are not utilized for energy purposes as B4,B5B6 and B7. Thus, the four alternatives are excluded from baseline scenario.

Secondly, the straws consumed by the proposed project activity are 172,700tons, only accounting for 23% of the biomass dumped or left to decay or burned in an uncontrolled manner. Considering there are still biomass around the City 744,000tons supplied per year, the straws used by the proposed project will not impropriate the biomass as fertilizer. In other words, the proposed project will not change the use of biomass as fertilizer. Therefore, B6 is excluded.

There are abundant straw resources around project site. In Liaocheng city, the annual straw resources are one million tons. Presently, only few percentages of them are used for cooking, heating, fertilizers and feedstock etc. With the rapid development of China's rural economy, and with farmers' increasing incomes, the commercial energy such as coal and LPG (liquefied petroleum gas) has become the main energy for cooking and heating. According to FSR of the proposed project, major biomass residues used for generation are wheat and corn straws, more than 90% of the straws are dumped or left to decay or burned without any control in the fields.
Therefore, B2 is excluded.

In conclusion, for the use of biomass, the realistic and credible was chosen as **B1 and B3: The biomass residues are dumped or left to decay under mainly aerobic conditions and burnt in an uncontrolled manner without utilizing it for energy purposes.** According to the biomass resource investigation done as a part of feasibility study of the project by China Guodian Corporation and local authority, the current biomass utilization structure will not change after the proposed project operation.

Therefore, we could find that **Scenario 2** which is listed in ACM 0006 Table 1: **Combinations of project types and baseline scenarios applicable to this methodology, is the right scenario for this project**. It is described like following:

- The project activity involves the installation of a new power plant at a site where currently no power generation occurs;
- The power generated by the project plant is fed into grid and would in the absence of the project activity be purchased from the grid;
- The biomass would be in the absence of the project activity be dumped or left decay or burned in an uncontrolled manner without utilizing for energy purposes;

Table 2: Identification of Scenario combined with Power, use of biomass and heat generation method for Guanxian 2*15MW biomass power plant

Scenario	Project Type	Baseline Scenario		
		Power Generation	Use of biomass	Heat Generation
2	Power Greenfield Project	P4	B1, B3	No Heat

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): >>

Approved *Tool for the Demonstration and Assessment of Additionality* is used to demonstrate and assess the additionality of the proposed project in the following steps:

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

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

Sub Step 1a. Define alternatives to the project activity

Alternatives to power generation:

1. Construction of a coal firing plant with the same power generation capacity equivalent to the proposed project activity.

Based on this scenario assumed, the dominating newly installed power generation is coming from the thermal firing plants which are the normal project behavior at present time in North China Power Grid system. From the new addition power capacity from 2002 to 2004 which are the most present statistics, the new addition power generation is over 90% from thermal plants. Furthermore, it is not possible to build the power plant with the same scale under the current Chinese existing new power addition regulatory framework. Since it is not allowed to build the coal firing power plant smaller than 135MW under the current Chinese legislations. Therefore, the alternative fossil fuel power plant building with the same power generation capacity is not possible to happen under the current Chinese laws and legislations for power plants.

2. Supply of equivalent annual power output by the Grid where the proposed project is connected to.

There is power addition annually from 2002 to 2004 in North China Grid Network; therefore it is mostly from the thermal generation. The alternative is a feasible scenario to be selected as the baseline for the proposed project.

3. The proposed project activity not undertaken as a CDM project activity.

The IRR of project is too low if there is no income from CERs. So this alternative is not applicable.

According to ACM0006 “Baseline Scenario” for power generation, the realistic and credible alternatives may include P1 to P9. The practical and feasible baseline scenarios for power generation are the alternative P1 The proposed project activity not undertake as a CDM project activity and the alternative P4 Supply of equivalent power output by the Grid where the proposed project is connected.

Alternatives to biomass usage:

The proposed project utilizes the current dumped biomass straws for power generation. According to the identified baseline scenario will the biomass utilized in the proposed power plant alternatively be used in an uncontrolled way such as dumped and left to decay or burned in open air.

For the use of biomass residues, the realistic and credible alternative(s) may include B1 toB8, the only practical and feasible baseline scenario for unused biomass residues is the Alternative B1 biomass residues are dumped or left to decay and Alternative B3 biomass residues are burnt in an uncontrolled manner.

Sub Step 1b. Consistency with mandatory laws and regulation

For the scenario 1, it will not occur under the current applicable laws and regulations in force. Detailed reference is the China Power Yearbook 2003, 2004 and 2005 and relative rules for the new establishing power plants.

Scenario 2 is clearly consistent with the prevailing laws and regulations, since there in the North China Grid is a demand for new power addition to ensure the growing industrial and commercial purposes in this area.

As for power generation, P1and P4 is consistent with related laws and regulations in China.

As for biomass use, related policies and regulations have been issued, such as Renewable Energy Promotion Law and Renewable Energy.

Step 2 Investment analyses

According to the identified additionality assessment tool for the proposed project, this step has to determine whether it is financially less attractive than other alternatives without the revenues deriving from CERs payment.

Sub Step 2a Determine appropriate analysis method

The three analysis methods suggested by *Tool for the Demonstration and Assessment of Additionality* are:

In "Tool for the demonstration and assessment of additionally", three options can be applied for the investment analysis: the simple cost analysis, the investment comparison analysis and the benchmark analysis.

Option I simple cost analysis	Since there are both revenues of power price and CERs payment, this option is not appropriate to calculate. 。
Option II investment comparison analysis	This option is only applicable to the case where the alternative baseline scenario is similar to the proposed project, so that the comparative analysis can be conducted. However, the proposed baseline scenario is the North China Power Grid which is not similar to the suggested project.
Option III benchmark analysis	When both benchmark IRR and total investment IRR of proposed project are available, this method can be used.

The simple cost analysis is not applicable for the proposed project because it will produce economic benefit (from electricity sale) other than CERs' income.

Due to alternative (b) is NCPG, which is an existing grid and not a new-built project, the investment comparison analysis is also not applicable for the proposed project.

Then the benchmark analysis will be used to identify whether the financial indicators, i.e., Financial Internal Return Rate (FIRR) in this project is better than relevant benchmark value or not.

Sub Step 2b Apply benchmark analysis

According to the "*Project economic assessment and key parameters (version 3)(2006, joint issued by NDRC and Ministry of Construction)*", the proposed project will be financially acceptable when the FIRR is better than the sectoral benchmark FIRR..
The sectoral benchmark FIRR on total investment for power industrial projects is 8 %(before tax).

Sub Step 2c Calculation and comparison of financial indicators

Table3. Main parameters for financial Analysis

Items	Unit	Value	Source
Power generation capacity	MW	2x15	FSR (feasibility study report)
Annual power net output	GWh	139	FSR (feasibility study report)
Project lifetime	year, including 1 year construction time	Total 21years	FSR (feasibility study report)
Total project investment	Million RMByuan	293.30	FSR (feasibility study report)
Tariff	RMB Yuan/KWh (excluding VAT)	0.60245	FSR (feasibility study report)
Biomass purchasing price	RMB/tonne	260	FSR (feasibility study report)
Annual Operating hours	hours/year	5500	FSR (feasibility study report)
IncomeTax		33%	FSR (feasibility study report)
Expected CERs price	$\$/tCO_2$	10eq or above	
Emission reduction crediting period	Year	21	

Table4. Financial indicators of the Guanxian Biomass Generation Project

Capacity	2x15	MW
Total production	139,000	MWh/year
Emission Factor	1.03025	tonnes CO2/MWh
Without CERs IRR(before tax)		**6.97%**
With CERs IRR		**11.38%**

The above table shows the critical financial benchmark indicators and compares the situations with and without CER revenues. The financial indicators (FIRR) without revenues from CERs are 6.97% is lower than the benchmark rate 8%. Account into the CERs revenue, the FIRR of the proposed project is increased to 11.38%, higher than the benchmark and the financial attraction will be dramatically improved.

Sub Step 2d Sensitivity analysis

Three impact factors are considered in the following sensitivity analysis:

1) Total investment.

2) Operation and Maintenance Cost.

3) Delivered electricity.

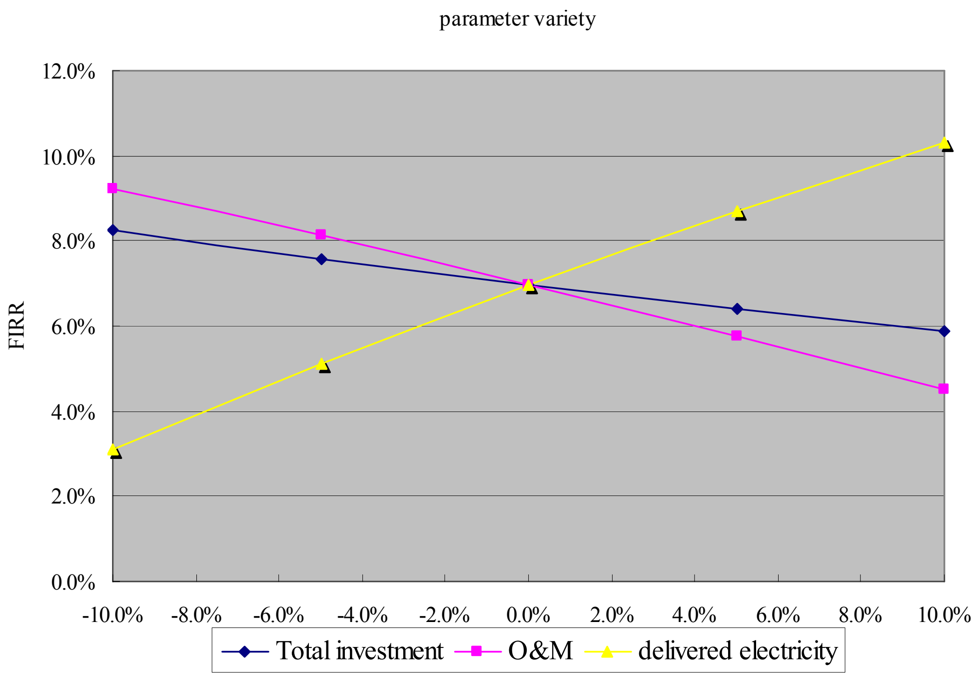
Total investment、O&M、Delivered electricity **Variation of +/- 5% +/- 10%**

Table5. Sensitivity analysis of the project total investment FIRR

vary	-10.00%	-5.00%	0.00%	5.00%	10.00%
Total investment	8.26%	7.59%	6.97%	6.39%	5.86%
O&M	9.22%	8.12%	6.97%	5.76%	4.49%
delivered electricity	3.09%	5.12%	6.97%	8.69%	10.32%

*Ref.*Project economic assessment and key parameters (version 3)*

Figure 4. Sensitivity analysis of the project total investment



Based on the different but reasonable variations of the three critical financial parameters is can be concluded that there has to be either a 5% increase in the production of power (145.95 GWh/year) or 5% or 10% decrease in O&M cost of total investment in order to make the project financial attractive for the investor if the revenue from CERs is not included.

The total investment and O&M **Variation of –5% and - 10%,** the financial indicators (FIRR) without revenues from CERs are 7.59 % ,8.26 % and 8.12 % ,9.22% respectively. And delivered electricity **Variation of +5% or + 10%,** the financial indicators (FIRR) without revenues from CERs are 8.69% and 10.32% respectively, are almost equal to or higher than the benchmark rate 8%. However, the total output of biomass power plant is generally small and seasonal variation of fuel supply is intensive. Moreover, a collective and storable system of fuel is necessary for the biomass collection and storage and thus the unit cost of the biomass power plant is two times and more the common thermal power generation plan. In addition, the cost of fuel collection shall be increase with the increase of oil price and other materials. Thus, the increase of delivered electricity and decrease of total investment and O&M over 5% during the future operation is NOT a realistic scenario to exist.

Step 3 Barrier analyses

This step is skipped because of the adoption of Step 2.

Step 4 Common practice analyses

The main purpose of this analysis is to compare the proposed project activity with the current common practice and to analyze whether the proposed project is not common practice in China.

Sub Step 4a Analyze other activities similar to the proposed project

There are seven similar projects in Shandong Province listed as in Table 6 and all of them are supported by CDM except Boxing, Binzhou City, which is an only one under construction without any CDM support. However, Boxing, Binzhou City is a foreign –owned enterprise and nor permitted to implemented as CDM project by the regulations of Chinese DNA.

Table 6. Biomass Power Plant project in Shandong Province

Location	Yucheng City	Shanxian, Heze City	Gaotan, Liaocheng City	Kenli, Dongying city	Juye, Heze city	Wuli, Binzhou City	Boxing, Binzhou city
Unit	1X15MW	1X30MW	1X30MW	1X30MW	2X12MW	2X12MW	
Progress of project	Connected to Grid on 2006 and started operation	Connected to Grid on 2006 and started operation 01/12/2006	Connected to Grid on 2006 and started operation 29/01/2007	Connected to Grid on 2006 and started operation 29/03/2007	Phase 1 construction started on 26/03/2007	Under construction, to be completed on 2008	Construction started on 06/2007
Progress of CDM	Registered	Registered	Approved by Chinese DNA	Approved by Chinese DNA	Approved by Chinese DNA	Approve By Chinese DNA	Foreign – owned enterprise
Remarks	Cogeneration	Cogeneration				Cogeneration	Cogeneration

Sub-step 4b. Discuss any similar options that accruing.

According to the analyses on previous section, it can be easily known that the proposed project is NOT an activity of business as usual (BAU).

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Emission Reduction

The project activity mainly reduces CO_2 emissions through substitution of power and heat generation with fossil fuels by energy generation with biomass residues. The emission reduction ER_y by the project activity during a given year *y* is the difference between the emission reductions through substitution of electricity generation with fossil fuels ($ER_{electricity,y}$), the emission reductions through substitution of heat generation with fossil fuels ($ER_{heat,y}$), project emissions (PE_y), emissions due to leakage (L_y) and, where this emission source is included in the project boundary and relevant, baseline emissions due to the natural decay or burning of anthropogenic sources of biomass residues ($BE_{biomass,y}$), as follows:

$$ER_y = ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$$

Where:

ER_y = Emissions reductions of the project activity during the year *y* (tCO_2/yr)

$ER_{electricity,y}$ = Emission reductions due to displacement of electricity during the year *y* (tCO_2/yr)
$BE_{biomass,y}$ = Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y* (tCO_2e/yr)
PE_y = Project emissions during the year *y* (tCO_2/yr)
L_y = Leakage emissions during the year *y* (tCO_2/yr)

1. Project emissions

Project emissions include

- CO_2 emissions from transportation of biomass residues to the project site (PET_y),
- CO_2 emissions from on-site consumption of fossil fuels due to the project activity ($PEFF_y$),
- CH_4 emissions from consumption of biomass ($PE_{Biomass,Ch4,y}$)
- CO_2 emissions during the year *y* due to electricity consumption at the project site

Project emissions are calculated as follows:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH4} \cdot (PE_{Biomass,CH4,y} + PE_{WW,CH4,y})$$

Where:

PET_y = CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2/yr)
$PEFF_{,y}$ = CO_2 emissions during the year *y* due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity (tCO_2/yr)
$PE_{EC,y}$ = CO_2 emissions during the year *y* due to electricity consumption at the project site that is attributable to the project activity (tCO_2/yr)
GWP_{CH4} = Global Warming Potential for methane valid for the relevant commitment period
$PE_{Biomass,CH4,y}$ = CH_4 emissions from the combustion of biomass residues during the year *y* (tCH_4/yr)
$PE_{WW,CH4,y}$ = CH_4 emissions from waste water generated from the treatment of biomass residues in year *y* (tCH_4/yr)

GHG resources formulae	Factors	Explanations
PEy=PETy + $PEFF_{CO2,y}$ + $PE_{EC,y}$ +$GWP_{CH4} \times PE_{BiomassCH4,y}$	PE_y are project emission. PET_y are the CO_2 emissions during the year y due to transport of the biomass to the project plant in tonnes of CO_2, $PE_{EC,y}$ are the CO_2 emissions during the year y due to electricity consumption at project site that is attributable to project activity, $PEFF_{CO2,y}$ are the CO_2 emissions during the year y due to fossil fuels co-fired by the generation facility in tonnes of CO_2, GWP_{CH4} is the Global Warming Potential for methane valid for the relevant commitment period, $PE_{Biomass, CH4,y}$ are the CH4 emissions from the combustion of biomass during the year y.	According to IPCC 2006 guidelines, the CO_2 emissions from the biomass combustion process are thought to the neutral carbon as the CO_2 absorbed in the planting when planting. However, methane emission can not be ignored although the quantity is not large amount.

PETy= $\frac{\sum_i BF_{i,y}}{TL_y}$ * $AVD_y * EF_{km,CO2}$	PET_y: Project emissions from biomass transportation from collection points to the power plant(tCO_2/year) $BF_{i,y}$: Biomass type I purchased for the power plant (tonnes/year) TL_y: Average truck load of transportation biomass(tonnes) AVD_y: Average transportation distance from collection point to power plant (km) $EF_{km,CO2}$: CO_2 emission factor for the fuel combustion in the transportation(tCO_2/km)	The transportation from the collection points to power plant is monitored both the distance and emission factor for fuel consumption for the transportation.
PEFFy $= \sum_i (FF_{projectplant,i,y} + FF_{projectsite,i,y}) * NCV_i * COEF_i$		
	$PEFF_y$: Project emissions from fossil fuel used for start up at the power plant(tCO_2/year) $FF_{project\ plant,\ i,y}$: Quantity of fossil fuel i combusted in the biomass residue fired power plant during the year y (tonne/year) $FF_{project\ site,\ i,y}$: Quantity of fossil fuel i combusted at the project site for other purposes that are attributable to project activity during the year y (tonne/year) NCV_i: Net Calorific Value of fossil fuel type i (GJ/tonne). $COEF_{CO2,i}$: CO_2 emissions from type I fossil fuels utilized in power plant (tCO_2/GJ)	Very small amount of additional auxiliary fossil fuel is needed for the boiler starting up, and this will not happen very frequently after the first starting up phase.
$PE_{EC,y} = EC_{PJ,y} * EF_{grid,y}$	$PE_{EC,y}$ are the CO_2 emissions during the year y due to electricity consumption at project site that is attributable to project activity $EC_{PJ,y}$:Onsite electricity consumption attributable to project activity during the year y, $EF_{grid,y}$: CO_2 emission factor for grid electricity during the year y.	
$PE_{Biomass,CH4} = EF_{CH4} * \sum_i BF_{i,y} * NCV_i$	$PE_{Biomass,CH4}$: Project emissions from the power plant(tCO_2/year) EF_{CH4}: Biomass methane emission factor (tCH4/TJ) $BF_{i,y}$: Biomass type i utilized in power plant (tonnes/year) NCV_i: Net Calorific Value of type I biomass (TJ/tonnes)	

2. Emission reductions due to displacement of electricity

$ER_{electricity,\ y} = EG_y \times EF_{electricity,\ y}$

Where:
$ER_{electricity,y}$ are the emission reductions due to displacement of electricity during the year y in tonnes of CO_2,
EGy is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh,
EFelectricity,y is the CO_2 emission factor for the electricity displaced due to the project activity during the year y in tonnesCO_2/MWh.

Step 1: Determination of EFelectricity,y
The project activity displaces electricity from other grid-connected sources (P4). Apart from co-firing fossil fuels in the project plant, where relevant, electricity is not generated with fossil fuels at the project site. The emission factor for the displacement of electricity should correspond to the grid emission factor (EFelectricity,y = EFgrid,y) and EFgrid,y shall be calculated as a combined margin (CM) consisting of operating margin (OM) and building margin (BM) factors, following the guidance in the section "Baselines" in the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002), because the power generation capacity of this proposed biomass power plant is of more than 15MW.

Sub step 1a ***Calculate the Operating Margin emission factor ($EF_{OM,y}$)***

According to the Methodology, four alternatives could be used to calculate the OM:

(a) Simple OM

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

Dispatch data analysis (c) should be the first methodological choice. Where this option is not selected project participants shall justify why and may use the simple OM, the simple adjusted OM or the average emission rate method taking into account the provisions outlined hereafter.

The Simple OM method (a) can only be used where low-cost/must run resources constitute[1] 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.

The average emission rate method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation and detailed data to apply option (b) is not available, and where detailed data to apply option (c) above is unavailable.

The Simple OM, simple-adjusted OM, and average OM emission factors can be calculated using either of the two following data vintages for years(s) y:

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[1] 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.

For China, due to the relative data is not available, the share excluding the fossil electricity (coal, oil and natural gas) are assumed as Low operating cost and must run resources is conservative, which is named "others" in annex 3.

- (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- The year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring.

For The Project, the simple OM (a) emission factor was chosen based on the following two reasons:

1. **Dispatch data analysis (c) is not applicable**. Because in China, the State Grid Corporation runs the interregional dispatch system and each regional grid corporation run the intraregional dispatch system. The dispatch information is regarded as business secrets and not available to the public.

2. **The simple-adjusted OM (b) is not applicable**. Because the data of load curve are not available similarly as the reason of dispatch data analysis(c).

3. **Average OM (d) is not applicable**. For the most recent 5 years (2001-2005) of NCPG, the low-cost/must run resources constitute less than 50% of total: 0.85%, 0.89%, 0.86%, 0.76% and 0.75% (named "others" in table A3-1 of annex 3) for 2001, 2002, 2003, 2004 and 2005. The average is 0.82%, much less than 50%.

As a result, the simple OM method can be used.

For the purpose of determining the Operating Margin (OM) emission factor, as described below, use one of the following options to determine the CO_2 emission factor(s) for net electricity imports from a connected electricity system within the same host country (ies):

(a) 0 tCO2/MWh, or

(b) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or

(c) The average emission rate of the exporting grid, if and only if net imports do not exceed 20% of total generation in the project electricity system, or

(d) The emission factor of the exporting grid, determined as described in steps 1,2 imports exceed 20% of the total generation in the project electricity system.

For the import electricity from ENCPG, the import electricity is less than 5% percent of the total NCPG in recent years (2003~2005). Therefore, option (c) of the average emission grid factor of ENCPG is adopted from China DNA publication[2], which is detailed from table A3-1 to table A3-3 of annex 3.

Table 7 share of import electricity from ENCPG (2003~2005)

		2003	2004	2005
import from ENCPG	MWh	4,244,380	4,514,550	23,423,000
total of ECPG	MWh	460,375,781	554,332,148	674,805,425
share of import	%	0.92	0.81	3.47

Source: China Energy Statistical Yearbook 2004~2006

The OM in this PDD is also calculated ex-ante based on the most recent 3 years data and fixed during the credit period.

[2] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

The Simple OM emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (1)$$

Where,

$F_{i,j,y}$ is the amount of fuel *i* consumed (ton for solid and liquid fuel, m^3 for gas fuel) by relevant power sources *j* in years *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[3] to the grid.

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/t for solid and liquid fuel, tCO_2/m^3 for gas fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in years *y*, and,

$GEN_{j,y}$ is the electricity (MWh) delivered by source *j*.

The CO_2 emission coefficient *COEFi* is obtained as

$$COEF_i = NCV_i \cdot EFCO_{2,i} \cdot OXID_i \qquad (2)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel $_i$, and country-specific values are preferable

$OXID_i$ is the oxidation factor of the fuel,

$EFCO_{2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

Where available, local values of NCV_i and $EFCO_{2,i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC worldwide default values.

According to "China energy year book (2004~2006)" and "China electricity year book (2004~2006) ", delivered electricity, fossil fuel consumption and *NCVi* can be obtained and the *OXIDi* will use the IPCC 2006 default value.

For the import electricity from ENCPG, the import electricity is less than 5% percent of the total NCPG in recent years, and the average emission grid factor of ENCPG is adopted.

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[3] As described above, an import from a connected electricity system should be considered as one power source j..

The Chinese DNA published $EF_{OM,y}$ of NCPG will of be adopted in this PDD and its value is 1.1208 (tCO_2/MWh) and the detail calculation is shown as Annex 3.

Sub Step 1b ***Calculate the Build Margin emission factor ($EF_{BM,y}$)***

According to ACM0002, the BM is calculated as the generation-weighted average emission factor of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \quad (3)$$

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

ACM0002 has provided two options to determinate the OM.

- 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..
- 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.

The BM in this PDD is also calculated ex-ante and fixed during the credit period.

Because some data are not available, the BM calculation in this PDD adopts the deviation method (*Application of AM0005 and AMS-I.D in China* requested by DNV) agreed by the CDM EB[4].

Firstly, calculate the new installed capacity and its power generation technology mix. Secondly, calculate the weights of new capacity in each generation technology. and finally, calculate the BM emission factor at the commercialized best efficiency performance of each generation technology.

Because the installed capacity of the coal-fired, oil-fired and gas-fired technology can not be extracted directly from the existing statistical data, the BM calculation in this PDD adopts the following method: First, use the available data in the energy balance sheets on the most recent year to calculate the share of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions. Second, use the proportions as the weights, based on the emission factors at the commercialized best efficiency performance of each generation technology, calculate the emission factor of the thermal power in grid. Thirdly, this thermal emission factor is multiplied by the proportion of thermal power in the new 20% capacity. Finally the BM emission factor is got.

The detail calculation steps are as follows:

Step (1): Calculation of the share of CO_2 emissions from solid, liquid and gaseous fuels.

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

4 http://cdm.unfccc.int/Projects/Deviations/index.html

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

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

Where:

$F_{i,j,y}$ is the amount of fuel i (tce) consumed by plant m in year y;

$COEF_{i,j}$ is the CO_2 emission coefficient (tCO_2e / tce) of fuel i, taking into account the carbon content of the fuels used and the oxidation percent of the fuel in year y;

Coal, Oil and Gas is the foot-index for solid fuels, liquid fuels and gas fuels.

Step (2): Calculation the emission factor of thermal power.

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

$EF_{Coal,Adv}$、$EF_{Oil,Adv}$、$E_{FGas,Adv}$ represent the emission factors of the best efficient and commercial coal-fired, oil-fuel and gas-fuel generation technologies.

According to China DNA[5], the optimum commercial, coal-fired power supply generation efficiency 35.82%, oil and gas generation efficiency is 47.67% the relative emission factor as following table

type	vary	efficiency	Emission Factor (tc/TJ)	Oxidation Rate (%)	Emission Factor (tCO2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Co-fired	$EF_{coal,Adv}$	35.82	25.8	1	0.9508
Gas-fuel	$EF_{gas,Adv}$	47.67	15.3	1	0.4237
Oil-fuel	$EF_{oil,Adv}$	47.67	21.1	1	0.5843

Step (3): Calculation BM in the grid.

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

Where:

[5] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

CAP_{Total} is the total added installed capacity;

$CAP_{Thermal}$ is the total added installed capacity for thermal power.

Same as the OM, The Chinese DNA published $EF_{BM,y}$ of NCPG will be adopted in this PDD and its value is 0.9397 (tCO_2/MWh) and the detail calculation is shown as Annex 3.

Sub Step 1c *Calculate the Baseline emission factor (EF_y)*

The baseline emission factor is calculated as the weighted average of the OM ($EF_{OM,y}$) and the BM ($EF_{BM,y}$):

$$EF_y = \omega_{OM} \times EF_{OM,y} + \omega_{BM} \times EF_{BM,y} , \quad (9)$$

Where the weight w_{OM} and w_{BM} by default are 50%, then, the EF_y is1.03025 tCO_2/MWh.

Step 2: Determination of EGy
According to the scenario identified for this proposed project as showed before, EGy corresponds to the net quantity of electricity generation in the project plant (EGy = EGproject plant,y), which is the same amount as the power fed into the grid by the proposed project activity. The plant own consumption and electricity imported from grid are already taken into the calculation of this parameter.

3. Baseline emissions

This methodology assumes that the biomass would have been burned in an uncontrolled manner for both baseline scenarios, natural decay or uncontrolled burning. The baseline emissions are calculated by multiplying the quantity of biomass that would not be used in the absence of the project activity with the net calorific value and an appropriate emission factor as following:

$$BE_{Biomass,y} = GWP_{CH4} \bullet \sum_i BF_{i,y} \bullet NCV_i \bullet EF_{burning,CH4,i}$$

There is no evident indication that large portion of the biomass resource would be reduced in the foreseeable future, the selected methodology uses the baseline emission as unused biomass open air burning which equals to the amount of biomass consumed in the proposed power plant. The baseline emission calculation is considered to be conservative because the methane emission from the natural decay processing of those equivalent biomass residues would cause greater GHG effect than CO2 emissions GHG effect from open air burning process.

The more detailed calculation of baseline emission of unused biomass residues is in Annex 3.

4. Leakage Estimation
Based on the ACM0006, the following two alternatives are shown to estimate the leakage of the proposed project:

Alternative 1: Demonstrate that the biomass consumption of power plant will not result in increased fossil fuel consumption elsewhere.	• L1:Showing the current natural decay or open air burning biomass will continue to be uncontrolled dumping without proposed project performance	Ly =0.
	• L2:Demonstrate the amount of biomass surplus is far more than the project biomass demand amount	
	• L3:Showing the biomass suppliers can not sell all their biomass to the project plant	
Alternative 2: If it is not possible to demonstrate that the biomass consumption in the proposed project will not result in a increased usage of more carbon intensive fuels then the leakage emissions must be measured and deducted from the net project emission reductions.		$L_y = EF_{CO2,LE} * \sum_i BF_{PJ,k,y} * NCV_k (tCO_2)$ The leakage emissions during the year y equals to the CO2 emission coefficient per energy unit of the most carbon intensive fuel utilized in the county multiply by the amount of type k biomass used as fuel in the project plant during the year y and multiply by the Net Calorific Value of biomass type k(per volume or mass).

Table 8 The biomass resources in 30 km radius from plant

straw name	Total straw production (1000 tonnes/year)		amount of used (1000 tonnes/year)	Total amount of residues (1000 tonnes/year)	
	harvest	owed		harvest	owed
Wheat	765	612	306	459	306
Corn	1015	846	102	913	744
Cotton	420	350	336	84	14
Peanut	165	143	116	50	28
Total	2365	1951	860	1506	1092

Table 9 The biomass resources in 15 km radius from plant

straw name	Total straw production (1000 tonnes/year)		) amount of used (1000 tonnes/year)	Total amount of residues (1000 tonnes/year)	
	harvest			harvest	owed
Wheat	405	324	306	243	162
Corn	439	366	102	395	322
Cotton	146	120	336	44	18
Peanut	72	62	116	22	12
Total	1062	872	860	704	514

Table 10 Fuel consumption

Boiler capacity	Hour consumption (t/h)	Day consumption (t/d)	Year consumption (10^4t/a)
2×75 t/h	31.4	690.8	17.27

Note: 1) the equipment used time is 5500 hours per year;
2) the equipment used time is 22hours per day;

To sum up, the harvest residues of corn straw resources in 30 km radius from plant is913, 200 tons / year, and the owed residues is 744,000 tons / year and the harvest residues of wheat straw resources is 459, 000 tons / year, and the owed residues is 306,000 tons / year. The power plant fuel is guaranteed. Then, corn straw will be the majority of bio-fuel and wheat straw is a complement.

Table 11 Corn Straw utilisation and percentages

Corn Straw	Back to the field or composting	Burning or for animal feed	Dumping and Uncontrolled	Total
Percentages for different Purposes	5%	5%	90%	100%
Biomass amount（1000 tonnes）	37.2	37.2	669.6	744

Biomass resources (100% Corn)	**Total**
Total production (30km from plant)(owed as conservative)	744,000
Total available production (30km from plant) (owed as conservative)	670,000
Project Demand (t/year)	172,700
Project Demand of total available production (%)	23%

Source of data used ：Feasibility study

The approach L2 for estimate the leakage is utilized in the proposed project for demonstrating that the quantity of available main biomass residue in the region is at least 25% larger than the quantity of available main residues that are utilized. The investigation of the biomass residues shows that there is a total production of residues of almost 1 mill tonnes per year. It is assumed that corn straw will be preferred as the primary fuel, and it is estimated that there in a 30 km radius around the plant in Guanxian is approximately 740,000 tonnes cotton straw per year, and according to the research that 90% of the resource are not utilized but dumped or burned in open air. This makes 670,000 tonnes available for the power plant each year.

Base on 5500 operation hours per year with 30 MW power productions is estimated that 172,700 tonnes of corn straw is need per year at the power plant, and this corresponds to only 23% of the available amount.

The conclusion is that the proposed power plant will not influence the present biomass utilization and therefore not create any leakage

It is at the same time anticipated that the current utilization of residues will drop over the power plants life time due to increase income level for the local farmers and inhabitants around the plant.

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

Data / Parameter:	**GWP_{CH4}**
Data unit:	$tCO_{2e}/tCH4$
Description:	Global Warming Potential for CH4
Source of data used:	IPCC 2006 default value
Value applied:	21 for the first commitment period.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment: :	Shall be updated according to any future COP/MOP decisions.

Data / Parameter:	**EF_{OM}**
Data unit:	tCO2/MWh
Description:	Operating Margin Emission factor
Source of data used:	China National Development and Reformation Commission Climate Change Office Notice of Chinese Regional Grid Emission Factor.
Value applied:	1.1208
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Shall be updated according to DNA's official data updating.

Data / Parameter:	**EF_{BM}**
Data unit:	tCO2/MWh
Description:	Building Margin Emission Factor
Source of data used:	China National Development and Reformation Commission Climate Change Office Notice of Chinese Regional Grid Emission Factor.
Value applied:	0.9397
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Shall be updated according to DNA's official data updating.

Data / Parameter:	**NCV_{maize}**
Data unit:	GJ/tonne

Description:	Net Calorific Value of type i biomass utilized in power plant
Source of data used:	China Energy Statistical Yearbook 2005 p. 366
Value applied:	0.015472
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value for corn is used. Because corn will constitute the majority of bio-fuel delivered to the plant based on feasibility study report.
Any comment:	Shall be updated according to China Energy Statistical Yearbook new version.

Data / Parameter:	$\mathbf{NCV_{wheat}}$
Data unit:	GJ/tonne
Description:	Net Calorific Value of type i biomass utilized in power plant
Source of data used:	China Energy Statistical Yearbook 2005 p. 366
Value applied:	0.014635
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Value for wheat straw is utilized from the China Energy Statistical Yearbook 2005. Since wheat straw could be utilized in the plant operation.
Any comment:	Shall be updated according to China Energy Statistical Yearbook new version.

Data / Parameter:	$\mathbf{NCV_{cotton}}$
Data unit:	GJ/tonne
Description:	Net Calorific Value of type i biomass utilized in power plant
Source of data used:	China Energy Statistical Yearbook 2005 p. 366
Value applied:	0.01589
Justification of the choice of data or description of measurement methods and procedures actually applied :	Cotton straw might be utilized in the proposed project activity according to feasibility study report.
Any comment:	Shall be updated according to China Energy Statistical Yearbook new version.

Data / Parameter:	$\mathbf{NCV_{paddy,rice}}$
Data unit:	GJ/tonne
Description:	Net Calorific Value of type i biomass utilized in power plant
Source of data used:	China Energy Statistical Yearbook 2005 p. 366
Value applied:	0.012545
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Value for paddy rice straw is utilized from the China Energy Statistical Yearbook 2005. Since paddy rice could be utilized in the plant operation according to feasibility study report.

Any comment:	Shall be updated according to China Energy Statistical Yearbook new version.

Data / Parameter:	**$EF_{CH4,i}$**
Data unit:	$KgCH_4/TJ$
Description:	Methane emission from biomass combusted in power plant
Source of data used:	IPCC 2006 default value
Value applied:	30 for the first commitment period.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	IPCC value from the latest version published will be utilized

Data / Parameter:	**$EF_{burning,CH4,k,y}$**
Data unit:	KgCH4/TJ
Description:	CH_4 emission factor for uncontrolled burning of the biomass residue type k during the year y
Source of data used:	IPCC 2006 default value
Value applied:	300 for the first commitment period.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	IPCC value from the latest version published will be utilized

Data / Parameter:	**$EF_{km,co2}$**
Data unit:	kg CO_2/km
Description:	Average CO_2 emission factor for transportation of biomass with trucks
Source of data used:	IPCC 2006 default value from the Moderate Control index for the US heavy Duty Diesel Vehicle
Value applied:	1.011 for the first commitment period.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	IPCC value from the latest version published will be utilized

Data / Parameter:	**$EF_{co2,FF,i}$**
Data unit:	tCO_2/tonne
Description:	CO_2 emission factor for the fossil fuel type i combusted in plant
Source of data used:	Latest version of China Energy Statistics
Value applied:	

Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	**This parameter is not taken into consideration.** Because for the onsite fuel consumption calculation the Net Calorific Value and carbon content are utilized instead, furthermore for biomass transportation emission calculation the Emission Factor per kilometre is utilized instead. Detailed calculation in Annex 3.

Data / Parameter:	**$EF_{co2,LE}$**
Data unit:	tCO_2/tonne
Description:	CO_2 emission factor of the most carbon intensive fuel J in the calculation of CM with the ACM0002
Source of data used:	Latest version of China Energy Statistics
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	Local or national data should be preferred. Default values from the China Energy Statistics or IPCC 2006 will be used alternatively and should be chosen in a most conservative manner. Otherwise, this parameter is not taken into the leakage calculation.
Any comment:	Minimal of two years after last issuance of CERs whenever the leakage exist.

Data / Parameter:	**Net Calorific Value (NCVi) of fossil fuel combusted in plant**
Data unit:	TJ/tonne
Description:	Net Calorific Value (NCVi) of fossil fuel combusted in plant
Source of data used:	Feasibility Study
Value applied:	0.04187
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value for Diesel is used. But other values will be applied if other fuels are used.
Any comment:	The project entity appointed a third party laboratory under the supervision of Shandong Power Design Institution for the power plant.

Data / Parameter:	**Fossil fuel carbon content (diesel)**
Data unit:	tC/TJ
Description:	Fossil fuel carbon content (diesel)
Source of data used:	IPCC 2006 default value
Value applied:	20.2 for the first commitment period.
Justification of the choice of data or description of measurement methods	

and procedures actually applied :	
Any comment:	IPCC value from the latest version published will be utilized

Data / Parameter:	**Oxidation Rate**
Data unit:	
Description:	Oxidation Rate
Source of data used:	IPCC 1996 default value
Value applied:	0.99 for the first commitment period.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**Moisture Content**
Data unit:	
Description:	Biomass moisture content
Source of data used:	Project feasibility study report P15
Value applied:	0.0961 for the first commitment period.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	The moisture content of the biomass residues are taken into consideration in all the calculations of Proposed Project emission reduction.

Data / Parameter:	**CO_2/C Factor**
Data unit:	
Description:	CO_2/C Factor
Source of data used:	IPCC 2006 default value
Value applied:	3.67
Justification of the choice of data or description of measurement methods and procedures actually applied :	44/12=3.67 based on molecule and atom weight of carbon and carbon dioxide.
Any comment:	

Data / Parameter:	**Quantity of corn residues that are utilized in the defined geographical**
Data unit:	Tonnes
Description:	Quantity of corn residues that are utilized (eg for energy generation or as feedstock and all kinds of losts, etc) in the defined geographical region (102,000 tonnes in section B.6)

Source of data used:	Surveys or statistics and project feasibility study report
Value applied:	
Measurement procedures (if any):	Annually
QA/QC procedures:	
Any comment:	This parameter is applicable since approach L_2 is utilized to rule out leakage.

Data / Parameter:	Quantity of corn residues in the region
Data unit:	Tonnes
Description:	Quantity of corn residues in the region
Source of data used:	Surveys or statistics and project feasibility study report
Value applied:	744,000 tonnes in section B.6
Measurement procedures (if any):	Annually
QA/QC procedures:	
Any comment:	This parameter is applicable since approach L_2 is utilized to rule out leakage.

B.6.3 Ex-ante calculation of emission reductions:

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The emission reductions by the proposed project are calculated as follows:

$$ER_y = ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$$

Emission reduction due to displacement of electricity

The annual power supply by the project to the North China Power Grid is **139,000** MWh

The combined baseline emission factor of the North China Grid network is calculated as **1.03025**tCO_2/MWh,

Therefore the baseline emission of equivalent power generation is: **143,205** tCO_2.

Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues

Although there is abundance of biomass residues all over China, the mature commercialized biomass technology has not been well developed until recently. Normally the local farmers just leave the biomass for natural decay or burn it in open air only a small percentage of them use it for cooking, fertilizing or forage purposes.

Based on the fact that a large portion of the uncontrolled dumped biomass is naturally decayed or burned in the open air, the open air burning was selected as the most conservative alternative in the baseline calculation.

The natural decaying process of biomass will emit more carbon intensive gas, which will cause higher GHG effects, compared to open air burning. Thus, to keep the baseline calculation of the proposed project conservative, it is assumed that all the uncontrolled dumped biomass is directly burned in the open air. By the time the PDD is prepared and submitted, the calculated methane amount emitted to the atmosphere due to open air burning of the biomass residues in the absence of the proposed project is **11,649 t**CO_2/year (see Annex 3 for details.)

Total baseline emission

Therefore, the annual total baseline emissions are **154,854** tCO_2

Project Emissions

As described in the baseline information in Annex 3, the following greenhouse gas emissions are considered for the project activity:
1) Methane emissions from biomass utilized in the power plant
2) Biomass transportation emissions from collection points to power plant site
3) Carbon dioxide emissions from electricity consumption at the power plant
4) Emission from start-up/auxiliary fuel combustion in the boiler of the power plant onsite
The above project emissions are calculated using the algorithms provided in the baseline methodology.
An illustration of calculation methods is given in the following context.
$PE_y = PET_y + PEFF_{co2,\,y} + PE_{EC\,,\,y} + GWP_{CH\,4} \times PE_{BiomassCH\,4,\,y}$ (tCO2/year)

The total Project emissions PEy are sum of project emissions from biomass combustion, transportation emissions, power consumption onsite and auxiliary fuel utilization in boiler as listed in the above equation. The detailed calculation explanation is demonstrated individually in the following sector.

Project emission from biomass combustion

It is estimated that approximately 31.4 tonnes biomass residues will be combusted in the boiler per hour, and annual biomass combustion amount is 172,700tonnes with a Net Calorific Value of 16.86 GJ/tonne for the mix fuel. Therefore, the assumed biomass combustion in the proposed power plant will result in the methane emissions of **2,306** $\mathbf{tCO_2}$ annually.

Methane emission factor is chosen same of wood/wood waste as biomass residues combustion in industrial stoker boiler is 30 Kg/TJ as IPCC 2006 default value.

Project emission from transportation process

There is around 5-7 days storage capacity for biomass in the power plant, and 10 collection points surround the power plant within the longest distance **15** km. The collection sites are chosen based on a balance between distance and resource availability. The distance from the collection points to the power plant is all within **15**km. The transportation of biomass from collection point to power plant ended up in the direct emission from the combustion of fuel in trucks.

In order to calculate the CO2-emissions from the transportation of bio-fuel the longest return trip is chosen as the simplest and most conservative estimation. Thus **2x15** km is used as the average transportation distance. The truck load will roughly be **10** tonnes. The carbon emission factors for large heavy load transportation truck in IPCC 2006 guideline is 1.011kg/km, which is selected from the Moderate Control Index for the US Heavy Duty Diesel Vehicle.

The estimated GHG emissions from biomass transportation are **524** $\mathbf{tCO_2}$ annually. Detailed calculation tables are in Annex 3.

Carbon dioxide emissions from electricity consumption at the power plant

It is assumed that there are no power consumption onsite exported from the local grid at this stage, therefore this value is thought to be 0 for PDD calculation in Annex 3. However, the power meter is installed onsite to measure the actual power purchased from the grid.

Project emission from diesel combustion in the boiler in plant

It is expected that no more than **100** tonnes additional diesel per year would be required on site for starting up the boiler or for other purposes.

The estimated emission from auxiliary diesel utilization on site is **307tCO_2** annually. Detailed calculation tables are in Annex 3.

The quantity of auxiliary diesel is limited in the power plant mainly due to high heating value of biomass and high cost of diesel in market. The emission from the diesel combustion is quite small compared with other project emissions, but it is still taken into the calculations to keep it most conservative.

Total project emission

Therefore, the project Aativity emission, PEY = EM p, y = **3,137tCO_2 per year**

Leakage

According to the methodology selected: Project Activity Emissions y = EMp, y + Lp, y
It is estimated that there is no leakage of the project: Lp,y =0
Net proposed project emission reduction

Net proposed project emission reduction=Total baseline emissions - Total project emissions
The annual total baseline emissions are: **154,854 tCO_2**
The annual total project emissions are: **3,137 tCO_2**
The annual net emission reductions are: **151,717 tCO_2**
The total net emission reductions in the first crediting period are: **1,062,019 tCO_2**

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

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Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2008	1,830	90,332	0	88,502
2009	3,137	154,854	0	151,717
2010	3,137	154,854	0	151,717
2011	3,137	154,854	0	151,717
2012	3,137	154,854	0	151,717
2013	3,137	154,854	0	151,717
2014	3,137	154,854	0	151,717
2015	1,307	64,522	0	63,215
Total (tonnes of CO_2e)	**21,959**	**1,083,978**	**0**	**1,062,019**

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

The monitoring methodology applied for this project activity is ACM 0006 "Consolidated Monitoring methodology for grid-connected electricity generation from biomass residues". This monitoring methodology could be found: http://cdm.unfccc.int/methodologies/approved.

Approved consolidated monitoring methodology ACM0006, "Consolidated monitoring methodology for grid-connected electricity generation from biomass residues" is selected as the monitoring methodology in UNFCCC EB website.
Option D.2.1 will be selected as option in this project.

All the data collected for monitoring purpose are consist of generated power billing records, baseline emission parameters, and project emissions etc will be archived electronically and be kept at least 2 years after the end of the last crediting period of time.

B.7.1 Data and parameters monitored:

Data / Parameter:	**BFk,y**
Data unit:	tonne
Description:	Quantity of biomass type k combusted in the project plant during the year y
Source of data to be used:	Project Records from Project Procurement department of plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The annual biomass combustion amount is 172,700 tonnes/year.
Description of measurement methods and procedures to be applied:	Use gravity meters.
QA/QC procedures to be applied:	Trucks carrying biomass will be weighed twice, upon entry and exit. Meters at the weighing station will undergo maintenance subject to national standard JJG907-2003. Any direct measurement with mass or volume meters at the plant site should be cross checked with an annual energy balance which again is based on purchased quantities.
Any comment:	The quantity of biomass type i combusted in the project plant is recorded equal as the quantity of biomass purchased. The different types of biomass combusted will be collected separately in the collection points. The data will be kept for minimum two years after last issuance of CERs

Data / Parameter:	**Moisture content of the biomass residues**
Data unit:	% water content
Description:	Moisture content of each biomass residue type k
Source of data to be	On-site measurements

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value is taken into the consideration in the calculation already because in the project feasibility report about biomass collection, packaging and transportation investigation section, it is mentioned that moisture content of biomass residues are manually measured before purchasing. High quality and accuracy moisture analyzers are utilized to measure the moisture contents of different biomass residues. The accuracies of each type are ±1% and ±0.5% individually. And the analyzers will be calibrated annually.
Description of measurement methods and procedures to be applied:	Continuously monitored by moisture analyzer. Moisture content of the biomass residues will be both measured in collection point and in power plant.
QA/QC procedures to be applied:	
Any comment:	The moisture content of the biomass residues are taken into consideration in all the calculations of Proposed Project emission reduction.

Data / Parameter:	**FFproject,plant,i,y**
Data unit:	tonne
Description:	Fossil fuels utilized for boiler
Source of data to be used:	Project Records from Project Procurement department of plant and stored volume.
Value of data applied for the purpose of calculating expected	100tonne/year
emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The amount of fossil fuels utilized in the power plant will be based on purchase receipts from relevant plant office and the amount of stored fuel on site in the beginning and end of verification period.
QA/QC procedures to be applied:	The receipts from the fuel suppliers for the on site fossil fuel consumption will be checked with the data from the accounting department. The volume indicator will be manually checked.
Any comment:	Minimal of two years after last issuance of CERs

Data / Parameter:	**AVDy**
Data unit:	km
Description:	Average transport distance for a return trip from collection point to power plant site.
Source of data to be used:	Transport operator records and records in power plants gate reception
Value of data applied for the purpose of calculating expected emission reductions in	2x15 km

section B.5	
Description of measurement methods and procedures to be applied:	Distance travelled will be continuously recorded during the reception of the biomass trucks. The collection point from where the individual trucks are coming will be noted
QA/QC procedures to be applied:	The records submitted by the trucks will be compared to the distance between the plant and the biomass collection points and the record from the reception.
Any comment:	Minimal of two years after last issuance of CERs

Data / Parameter:	**Ny**
Data unit:	-
Description:	Number of trucks for the transportation of biomass
Source of data to be used:	Transport operator records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Since the transportation distance of each truck is continuously recorded on the plant reception by the individual invoice from each coming collection point, therefore the total amount of truck numbers are recorded continuously correspondingly.
QA/QC procedures to be applied:	The number of trucks will be checked with the record from the gate reception and the collection points.
Any comment:	This parameter is taken into consideration for calculating the emission from transportation process.

Data / Parameter:	**TLy**
Data unit:	tonne
Description:	Average truck load of the trucks used for transportation of biomass
Source of data to be used:	Transport operator records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Transport operator records
QA/QC procedures to be applied:	
Any comment:	**This parameter is not taken into the consideration due to the reason that**

	AVDy and Ny are enough to determine the project emissions from transportation process as showed in the above tables.

Data / Parameter:	**NCVmaize**
Data unit:	GJ/tonne
Description:	Net Calorific Value of type i biomass utilized in power plant
Source of data to be used:	China Energy Statistical Yearbook 2005 p. 366
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.015472
Description of measurement methods and procedures to be applied:	The Value for maize straw is utilized from the China Energy Statistical Yearbook 2005. Because maize will constitute the majority of bio-fuel delivered to the plant.
QA/QC procedures to be applied:	
Any comment:	Shall be updated according to China Energy Statistical Yearbook new version. Minimal of two years after last issuance of CERs

Data / Parameter:	**NCVwheat**
Data unit:	GJ/tonne
Description:	Net Calorific Value of type i biomass utilized in power plant
Source of data to be used:	China Energy Statistical Yearbook 2005 p. 366
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.014635
Description of measurement methods and procedures to be applied:	The Value for wheat straw is utilized from the China Energy Statistical Yearbook 2005. Since wheat straw could be utilized in the plant operation.
QA/QC procedures to be applied:	
Any comment:	Shall be updated according to China Energy Statistical Yearbook new version. Minimal of two years after last issuance of CERs

Data / Parameter:	**NCVcotton**

Data unit:	GJ/tonne
Description:	Net Calorific Value of type i biomass utilized in power plant
Source of data to be used:	China Energy Statistical Yearbook 2005 p. 366
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.01589
Description of measurement methods and procedures to be applied:	The Value for Cotton is utilized from the China Energy Statistical Yearbook 2005. Since cotton straw could be utilized in the plant operation.
QA/QC procedures to be applied:	
Any comment:	Shall be updated according to China Energy Statistical Yearbook new version. Minimal of two years after last issuance of CERs

Data / Parameter:	**NCVpaddy,rice**
Data unit:	GJ/tonne
Description:	Net Calorific Value of type i biomass utilized in power plant
Source of data to be used:	China Energy Statistical Yearbook 2005 p. 366
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.012545
Description of measurement methods and procedures to be applied:	The Value for paddy rice straw is utilized from the China Energy Statistical Yearbook 2005. Since paddy rice straw could be utilized in the plant operation.
QA/QC procedures to be applied:	
Any comment:	Shall be updated according to China Energy Statistical Yearbook new version. Minimal of two years after last issuance of CERs

Data / Parameter:	**EFCH4,i**
Data unit:	KgCH4/TJ
Description:	Methane emission from biomass combusted in power plant
Source of data to be used:	IPCC 2006 default value
Value of data applied for the purpose of calculating expected emission reductions in	30 for the first commitment period.

section B.5	
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	Shall be updated according to IPCC latest version. Minimal of two years after last issuance of CERs

Data / Parameter:	**EFburning,CH4,k,y**
Data unit:	KgCH4/TJ
Description:	CH4 emission factor for uncontrolled burning of the biomass residue type k during the year y
Source of data to be used:	IPCC 2006 default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	300 for the first commitment period.
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	Shall be updated according to IPCC latest version. Minimal of two years after last issuance of CERs

Data / Parameter:	**EFkm,co2**
Data unit:	kg CO2/km
Description:	Average CO2 emission factor for transportation of biomass with trucks
Source of data to be used:	IPCC 2006 default value from the Moderate Control index for the US heavy Duty Diesel Vehicle
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1.011 for the first commitment period.
Description of measurement methods and procedures to be applied:	
QA/QC procedures to	

be applied:	
Any comment:	Shall be updated according to IPCC latest version. Minimal of two years after last issuance of CERs

Data / Parameter:	**EFco2,FF,i**
Data unit:	tCO2/tonne
Description:	CO2 emission factor for the fossil fuel type i combusted in plant
Source of data to be used:	Latest version of China Energy Statistics
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	**This parameter is not taken into consideration. Because for the onsite fuel** consumption calculation the Net Calorific Value and carbon content are utilized instead, furthermore for biomass transportation emission calculation the Emission Factor per kilometre is utilized instead. Detailed calculation in Annex 3.

Data / Parameter:	**EFco2,LE**
Data unit:	tCO2/tonne
Description:	CO2 emission factor of the most carbon intensive fuel in the calculation of CM with the ACM0002
Source of data to be used:	Latest version of China Energy Statistics
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Local or national data should be preferred. Default values from the China Energy Statistics or IPCC 2006 will be used alternatively and should be chosen in a most conservative manner. Otherwise, this parameter is not taken into the leakage calculation.
QA/QC procedures to be applied:	
Any comment:	Minimal of two years after last issuance of CERs whenever the leakage exist.

Data / Parameter:	**Net Calorific Value (NCVi) of fossil fuel combusted in plant**
Data unit:	TJ/tonne

Description:	Net Calorific Value (NCVi) of fossil fuel combusted in plant
Source of data to be used:	Feasibility Study
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.04187
Description of measurement methods and procedures to be applied:	The value for Diesel is used. But other values will be applied if other fuels are used.
QA/QC procedures to be applied:	
Any comment:	Minimal of two years after last issuance of CERs.

Data / Parameter:	
Data unit:	Tons
Description:	Quantity of biomass residues of type k that are utilized (eg for energy generation or as feedstock) in the defined geographical region
Source of data to be used:	Surveys or statistics from local agricultural bureau if national statistics is not available
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Annually
QA/QC procedures to be applied:	
Any comment:	This parameter is applicable since approach L2 is utilized to rule out leakage.

Data / Parameter:	
Data unit:	Tons
Description:	Quantity of biomass residues of type k in the region
Source of data to be used:	Surveys or statistics from local agricultural bureau if national statistics is not available
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of	Annually

measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	This parameter is applicable since approach L2 is utilized to rule out leakage.

Data / Parameter:	**FTrans, I,y**
Data unit:	tonne
Description:	Fuel consumption of fuel type I used for transportation of biomass
Source of data to be used:	Transport operator records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	**This parameter is not taken into consideration based on the formula we** choose for calculating the emission from transportation process.

Data / Parameter:	**FFproject plant,I,y**
Data unit:	GJ/tonne
Description:	Onsite fossil fuel consumption of fuel type I for co-firing in the project plant
Source of data to be used:	Latest version of IPCC values
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	**This parameter is not applicable since it is not planned to co-firing other types** of fossil fuel in the proposed project.

Data / Parameter:	**Quantity of steam diverted from other boilers to the project plant**
Data unit:	MWh
Description:	Quantity of steam diverted from other boilers to the project plant
Source of data to be used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	**Not applicable due to no heating utilization in the proposed project activity.**

Data / Parameter:	**Average net efficiency of steam generation in the plant(s) from**
Data unit:	-
Description:	Average net efficiency of steam generation in the plant(s) from where steam is diverted to the project plant.
Source of data to be used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	**Not applicable due to no heating utilization in the proposed project activity.**

Data / Parameter:	**EGproject,plant,y**
Data unit:	MWh
Description:	Net quantity of electricity generated in the project plant during the year y.
Source of data to be used:	Project Records of onsite measurements.
Value of data applied for the purpose of calculating expected	139,000MWh

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	There are 5 electricity meters installed at the plant, as it is indicated and numbered in the figure in Annex 4,2 meters maintained by the local power grid to record generation and supply power, another 3 maintained by the plant to record power generation, own power consumption and purchased power. The power fed into the grid should be equal to the power generation minus own consumption and electricity purchased from the grid. The accuracy of all the power meters installed in plant is ±0.5s.
QA/QC procedures to be applied:	Meters will undergo maintenance/calibration subject to national power industry standard DL/T 448-2000. The accuracy of the meter readings will be verified by receipts issued by the purchasing power company, a national or regional authority in most cases. And the local technical and supervision bureau will calibrate and issue the authorized reports annually. Quality control of this data is beyond the control of the project operators. This involves the use of official data released by the power generating company.
Any comment:	EGproject,plant,y is the gross power supply as metered on the high voltage end of the transformer minus power taken from the grid. Minimal of two years after last issuance of CERs

Data / Parameter:	ECPJ,y
Data unit:	MWh
Description:	On-site electricity consumption attributable to the project activity during the year y
Source of data to be used:	Project Records of onsite measurements.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	**Not applicable since this parameter could be calculated by the power generation** amount, power supplied to the grid and power purchased from the grid.

Data / Parameter:	**Qproject plant, y**
Data unit:	MWh
Description:	Net quantity of heat generated from firing biomass in the project plant
Source of data to be used:	Project Records

Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	**Not applicable since there is no heat planned to utilize in the proposed project**

B.7.2 Description of the monitoring plan:

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The monitoring plan is shown as follows:

1. Monitor operational and management scheme

The project owner plans to appoint a CDM project director and a monitoring manager. The respective responsibilities are as follows:

◇CDM project director:

- Receive the report from monitoring manager;
- manage the proposed CDM project jointly with CERs buyer;
- Coordinate with the Chinese Government and stakeholders;
- Submit the monitoring report to DOE and deliver to CERs buyer.

◇Monitoring manager:

- Based on monitoring manual guideline, records the net electricity supplied monthly and aggregately annually;
- Prepare a monitoring report;

Monitoring manager is responsible to the CDM project director.

2. Measuring meters O&M and calibration

Measuring meters will be utilized and calibrated according to the requirements on B.7.1.
In addition, the project owner will train the appointed monitoring manager and monitoring engineers to operate theses meters.
The monitoring plan will incorporated into the existing monitoring system, implemented according to special monitoring manual to ensure reliable, transparent and comprehensive monitoring.

3. Deviations treatment

In case deviations in the monitoring data are found, the Monitoring Engineer will study the operating parameters to identify the reason for the deviation and take remedial measures.

4. Monitoring report

Monitoring report will be prepared by the monitoring manager and submit to CDM project director for final review, who will submit the report to DOE.

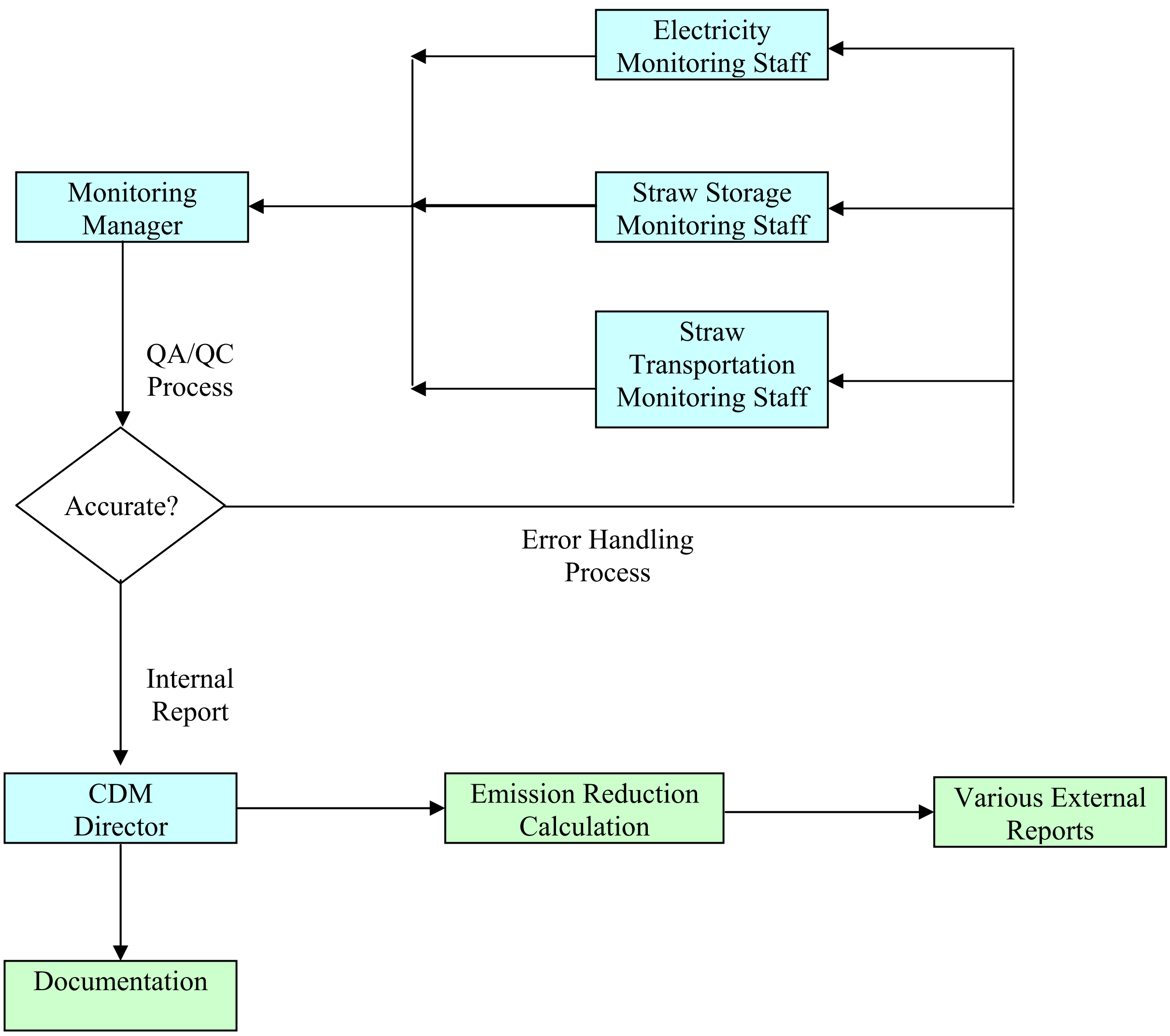
5. Monitoring data

Some monitoring data will be continually recorded and kept in the electrical archives automatically, and at same time, a paper hard copy will be created for archives, the relevant data will be kept during the crediting period and two years after. Some hard copied should be also kept in the electrical archives, he relevant data will be kept during the crediting period and two years after.

6. Monitoring points and record frequency

The net electricity output will be continuously measured and monthly recorded which will rechecked by electricity sale invoice. Record frequency for other data could be found in B.7.1.

The monitoring plan will be implemented by professional staff authorized by the project sponsor. The managing skim is illustrated as follows:



Main technical Supervision	Contact Person: Address: Phone: Email:
Data acquisition (Continuously, monthly and annually)	Contact Person: Address: Phone: Email:
Emission Reduction calculation (monthly and annually)	Contact Person: Address: Phone: Email:
Main monitoring supervision (Continuously)	Contact Person: Address: Phone: Email:

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)

>>

Data of completion:10/03/2008

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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:

>>
01/06/2008

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:

>>1/6/2008

C.2.1.2. Length of the first crediting period:

>>7 years, renewable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

>>

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

>>

the *Environmental Impact Assessment* has been done for the proposed project and approved by Shandong Environmental Protection Bureau on 31/8/2006. So D.1 is not applicable. Please refer to D.2. for details of concerned matters on *Environmental Impact Assessment*.

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 proposed project has been approved by Shandong Environmental Protection Bureau on 31/8/2006. It can not only enhance local economic strength, but also result in prominent environmental and social benefit; therefore, the proposed project is feasible. Refer to *Environmental Impact Assessment Report of Guodian Liaocheng Biomass power generation Project* prepared on July 2006 by Shandong Academy of Environmental Science.

The main sources of pollution are waste gas, waste water, solid wastes including fly ash and noise. The basic conclusions on environmental impact assessment of the proposed project are as follows:

1. Waste gas

The waste gas is mainly from the boiler's emission and those gases discharged through 80m high chimney into an open air after felted by high quality bug-filters that has 99.6% efficient rate of ash-elimination. Moreover, the contents of nitrogen and sulphur in straws and stalks is few and the temperature in the furnace during the operation of boiler is comparatively low. Thus, the concentration of fly ash, SO2 and Nox of the waste gas satisfies with the requirement of "National standard of airborne pollutants emissions in thermal power generation plant "(GB13223-2003)

2. Waste water

The wastewater in this project is mainly originated the sewage of residential and production drainage including alkali and acid water from chemical treatment ands circulatory recycled water. The wastewater is treated in the project based on the basic principle of design such as "separate flows for both clean water and polluted waste "and "one water more uses". The waste water after treatment shall satisfy with the requirement of "National comprehensive standard of waste water drainage"(GB8978-1996).

3. Noise

The noise sources of the proposed project are from steam turbine and generator, water pumps, etc., its sound level in general is 95~110dB (A). The noise will meet the demand of the environmental requirements of the "Standards for noise for industrial plant" (GB12348-90), through installing noise-silencers, noise-protectors, shock-absorbers etc.: It is predicted that no noise impact shall be spread to the residential areas,

4. Solid wastes

The total amounts of solid waste are 10.93x10^3 tonnes, in which the fly ash and biomass residue produced annually are 2.73x10^3 and 8.2x10^3 tonne respectively. The both of fly ash and biomass residue produced after combustion of fuel includes an abundant calcium, magnesium, phosphorus etc., and all those chemical elements are basically necessary for farm produces. In the proposed project, all these wastes are supplied to produce fertilizers for farmers. This results in multiple merits on the environmental improvement and economical development.

In conclusion, implement of the proposed project will comply with Chinese environmental rules and laws and give out a co-benefit effect for both power plant and farmers.

>>

SECTION E. Stakeholders' comments

>>

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

>>

The stakeholder's comments will be collected through the following means:

- Questionnaire survey

The questionnaire survey activity was carried out by Shandong CDM starter during 18/11/2007 to 28/11/2007, covering the area of 20km around the project site, including municipal government, public institute, farmers, state-owned and private enterprises. Total numbers of q delivered questionnaire are 62 and among them 60 were collected. That is, percentage of reply is 99.8%.

- Questionnaire Content

Questionnaire was made easy to answer, such as the comments on the local economy and environment impact, the biomass transportation by truck, increase of income through selling the biomass etc..

E.2. Summary of the comments received:

>>

The details of the Questionnaire results are shown in the Table s following:

- 51.677% of the respondents got the knowledge of the project from the on-site instruction and 11.67% and 5% got from mass media and Internet respectively.
- 86.67% of the respondents know the project and 100% of the respondents think that the project is necessary to construct.
- 96.67% of the respondents think it would the project facilitate to the local economic development.
- No respondents says unacceptable for any unfavourable impact on the environments if the project meets national standard demand, even 41.67% of the respondents picked up the noise as a fearful pollution issues and 23.33% and 20% did the underground water and waste gas respectively.
- No other suggestions or comments.

In conclusion, the public accept the project, as a contributable undertaking to the local economy as the surveyed results of other CDM projects registered.

Table 12 Questionnaire results of survey

Item	Responses	Q'ty	Percentage (%)
Knowledge of the Shandong Guanxian Biomass Power Plant Project	Know very well	3	5.00
	Know	13	21.67
	Know but not sure	36	60.00
	Don't know	8	13.33
Source of information for knowledge of the project	Mass media	7	11.67
	Internet	3	5.00
	Intruduction on site	31	51.67
	Others	19	31.67
Most fearful pollutants? （one or more choices ）	Waste gas	12	20.00
	Waste water	3	5.00
	Pollution of underground water	14	23.33
	Noise	25	41.67
	Piled up or discharge of fly ash	6	10.00
To be noteworthy facts? (one or more choices)	Waste gas treatments measure	13	21.67
	Waste water drainage	3	5.00
	Protection of underground water pollution	15	25.00
	Noise protection	22	36.67
	Solid waste treatment	7	11.67
Beneficial to local resident, especially to farmers' income plus?	Beneficial	58	96.67
	No affect	2	3.33
	Unbeneficial	0	-
The project necessary?	Very necessary	29	48.33
	necessary	31	51.67
	Unnecessary	0	-
Acceptable if any unfavourable impact on the environments? (even the project meets national standard demand)	Acceptable without doubt	25	41.67
	unacceptable	0	-
	acceptable	35	58.33
Attitude to the project	Necessary	56	93.33
	Unnecessary	0	-
	Not sure	4	6.67

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

>>

No any modifications is necessary for the project planning due to the comments received since most of responses support the construction and implementation of the project without any amendment of the mentioning in full or partial.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Seller

Organization:	China Guodian Corporation
Street/P.O.Box:	Guan town, Liaocheng City, Shandong province
Building:	
City:	Liaocheng City
State/Region:	Shandong province
Postfix/ZIP:	252512
Country:	China
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Buyer

Organization:	
Street/P.O.Box:	
Building:	
City:	
State/Region:	
Postfix/ZIP:	
Country:	
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	

Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No ODA of annex I is involved in this project activity.

Annex 3

BASELINE INFORMATION

Table A3-1 North China Power Grid(NCPG) 2001～2005 generation composition

year		Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	Fossil share	Others
	unit	TWh	TWh	TWh	TWh	TWh	TWh	TWh	%	%
2001	Total	17.67	22.18	93.19	71.10	46.55	110.44	361.12	99.15	0.85
	Fossil	17.39	22.17	92.87	69.42	45.82	110.40	358.07		
2002	Total	18.35	27.28	101.42	84.13	52.19	124.18	407.55	99.11	0.89
	Fossil	17.89	27.26	100.97	82.26	51.38	124.16	403.92		
2003	Total	19.29	32.20	108.80	95.85	65.95	139.57	461.65	99.14	0.86
	Fossil	18.61	32.19	108.26	93.96	65.11	139.55	457.68		
2004	Total	18.93	33.95	125.54	106.96	81.46	163.98	530.80	99.24	0.76
	Fossil	18.58	33.95	124.97	104.93	80.43	163.92	526.77		
2005	Total	21.48	37.00	134.68	130.96	93.68	190.00	530.80	99.25	0.75
	Fossil	20.88	36.99	134.35	128.79	92.35	189.88	526.77		

Data Source: China electricity year book 2002～2006.

Table A3-2 OM and BM

OM	tCO_2/MWh	1.1208
BM	tCO2/MWh	0.9397

Data Source: Chinese DNA, http://cdm.ccchina.gov.cn/

The detail infomation are as follows:

NCPG OM calculation

The Simple OM emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (1)$$

Where,

$F_{i,j,y}$ is the amount of fuel *i* consumed (ton for solid and liquid fuel, m^3 for gas fuel) by relevant power sources *j* in years *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[6] to the grid.

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/t for solid and liquid fuel, tCO_2/m^3 for gas fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in years *y*, and,

$GEN_{j,y}$ is the electricity (MWh) delivered by source *j*.

The CO_2 emission coefficient *COEFi* is obtained as

$$COEF_i = NCV_i \cdot EFCO_{2,i} \cdot OXID_i \qquad (2)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel $_i$, and country-specific values are preferable

$OXID_i$ is the oxidation factor of the fuel,

$EFCO_{2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

Where available, local values of NCV_i and $EFCO_{2,i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC worldwide default values.

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[6] As described above, an import from a connected electricity system should be considered as one power source j..

For the import electricity from East North China Power Grid (ENCPG), the import electricity is less than 5% percent of the total NCPG in recent years, and the average emission grid factor of ENCPG is adopted.

Table A3-3-1 NCPG simple OM calculation in 2003

fuel type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Sub-total	Emission factor	OXID	**NCV**	**emission(tCO_2e)**
									(tc/TJ)	(%)	**(MJ/t,km^3)**	**K=G*H*I*J*44/12/10000mass unit**
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	**K=G*H*I*J*44/12/1000 volume unit**
Raw coal	10*kt	714.73	1052.74	5482.64	4528.5	3949.32	6808	22535.94	25.8	100	20908	445737636.11
Washed coal	10*kt						9.41	9.41	25.8	100	26344	234510.60
Other coal	10*kt	6.31		67.28	208.21		450.9	732.7	25.8	100	8363	5796681.31
Coke	10*kt					2.8		2.8	29.5	100	28435	75318.63
Coke oven gas	100*Mm^3	0.24	1.71		0.9	0.21	0.02	3.08	12.1	100	16726	228559.67
Other oven gas	100*Mm^3	16.92		10.63		10.32	1.56	39.43	12.1	100	5227	914399.71
Crude oil	10*kt						29.68	29.68	20	100	41816	910139.18
Gasoline	10*kt						0.01	0.01	18.9	100	43070	298.48
disel	10*kt	0.29	1.35	4		2.91	5.4	13.95	20.2	100	42652	440693.26
Fuel oil	10*kt	13.95	0.02	1.11		0.65	10.07	25.8	21.1	100	41816	834672.45
LPG	10*kt							0	17.2	100	50179	0.00
Refinery gas	10*kt			0.27			0.83	1.1	18.2	100	46055	33807.44
Natural gas	100*Mm^3		0.5				1.08	1.58	15.3	100	38931	345076.60
Other oil	10*kt							0	20	100	38369	0.00
Other coke	10*kt							0	25.8	100	28435	0.00
others	10*ktce	9.83					39.21	49.04	0	100	0	0.00
											Sub-total	455551793.43

Data source: China Energy Statistical Yearbook 2004.

NCPG thermal generation in 2003								

province		**generation**	**Self consumption rate**	**Delivery generation**						**Import from ENCPG MWh**		4244380
		(MWh)	**(%)**	**(MWh)**						ENCPG emission factor		1.136558745
Beijing		18608000	7.52	17208678.4								
Tianjin		32191000	6.79	30005231.1		Total emission tCO2	429,609,286					
Hebei		108261000	6.5	101224035		Total delivery MWh	460,375,781					
Shanxi		93962000	7.69	86736322.2		**Emission factor**	1.071615					
Inner Mongolia		65106000	7.66	60118880.4								
Shandong		139547000	6.79	130071758.7								
total				425364905.8								

Data source: China Electric Power Yearbook 2004.

Table A3-3-2 NCPG simple OM calculation in 2004

fuel type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Sub-total	Emission factor	OXID	**NCV**	**emission(tCO_2e)**
									(tc/TJ)	(%)	(MJ/t,km^3)	**K=G*H*I*J*44/12/10000mass unit**
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	**K=G*H*I*J*44/12/1000 volume unit**
Raw coal	10*kt	823.09	1410	6299.8	5213.2	4932.2	8550	27228.29	25.8	100	20908	538547476.6
Washed coal	10*kt						40	40	25.8	100	26344	996856.96
Other coal	10*kt	6.48		101.04	354.17		284.22	745.91	25.8	100	8363	5901190.882
Coke	10*kt					0.22		0.22	29.5	100	28435	5917.8922
Coke oven gas	100*Mm^3	0.55		0.54	5.32	0.4	8.73	15.54	12.1	100	16726	1153187.451
Other oven gas	100*Mm^3	17.74		24.25	8.2	16.47	1.41	68.07	12.1	100	5227	1578574.385
Crude oil	10*kt							0	20	100	41816	0
Gasoline	10*kt								18.9	100	43070	0
disel	10*kt	0.39	0.84	4.66				5.89	20.2	100	42652	186070.4874
Fuel oil	10*kt	14.66		0.16				14.82	21.1	100	41816	479451.3838
LPG	10*kt							0	17.2	100	50179	0
Refinery gas	10*kt		0.55	1.42				1.97	18.2	100	46055	60546.05223
Natural gas	100*Mm^3		0.37		0.19			0.56	15.3	100	38931	122305.6296
Other oil	10*kt							0	20	100	38369	0
Other coke	10*kt							0	25.8	100	28435	0
others	10*ktce	9.41		34.64	109.73	4.48		158.26	0	100	0	0
											sub-total	549031577.7

Data source: China Energy Statistical Yearbook 2005.

NCPG thermal generation in 2004												
province		**generation**	**Self consumption rate**	**Delivery generation**						**Import from ENCPG MWh**		4514550
		(MWh)	**(%)**	**(MWh)**						ENCPG emission factor		1.174108289
Beijing		18579000	7.94	17103827.4								
Tianjin		33952000	6.35	31796048		Total emission tCO2	493,687,660					
Hebei		124970000	6.5	116846950		Total delivery MWh	554,332,148					
Shanxi		104926000	7.7	96846698		**Emission factor**	1.122840					
Inner Mongolia		80427000	7.17	74660384.1								
Shandong		163918000	7.32	151919202.4								
total				489173109.9								

Data source: China Electric Power Yearbook 2005.

Table A3-3-3 NCPG simple OM calculation in 2005

fuel type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Sub-total	Emission factor	OXID	**NCV**	**emission(tCO_2e)**
									(tc/TJ)	(%)	**(MJ/t,km^3)**	**K=G*H*I*J*44/12/10000mass unit**
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	**K=G*H*I*J*44/12/1000 volume unit**
Raw coal	10*kt	897.75	1675.2	6726.5	6176.45	6277.23	10405.4	32158.53	25.8	100	20908	636062535.8
Washed coal	10*kt						42.18	42.18	25.8	100	26344	1051185.664
Other coal	10*kt	6.57		167.45	373.65		108.69	656.36	25.8	100	8363	5192725.191
Coke	10*kt					0.21	0.11	0.32	25.8	100	28435	8607.8432
Coke oven gas	100*Mm^3	0.64	0.75	0.62	21.08	0.39		23.48	12.1	100	16726	1742396.483
Other oven gas	100*Mm^3	16.09	7.86	38.83	9.88	18.37		91.03	12.1	100	5227	2111027.27
Crude oil	10*kt					0.73		0.73	20	100	41816	22385.49867
Gasoline	10*kt			0.01				0.01	18.9	100	43070	298.4751
disel	10*kt	0.48		3.54		0.12		4.14	20.2	100	42652	130786.3867
Fuel oil	10*kt	12.25		0.23		0.06		12.54	21.1	100	41816	405689.6325
LPG	10*kt							0	17.2	100	50179	0
Refinery gas	10*kt			9.02				9.02	18.2	100	46055	277221.0107
Natural gas	100*Mm^3	0.28	0.08		2.76			3.12	15.3	100	38931	681417.0792
Other oil	10*kt							0	20	100	38369	0
Other coke	10*kt							0	25.8	100	28435	0
others	10*ktce	8.58		32.35	69.31	7.27	118.9	236.41	0	100	0	0
											sub-total	647686276.3

Data source: China Energy Statistical Yearbook 2006.

NCPG thermal generation in 2005												
province		**generation**	**Self consumption rate**	**Delivery generation**						**Import from ENCPG MWh**		23,423,000
		(MWh)	**(%)**	**(MWh)**						ENCPG emission factor		1.157799983
Beijing		20880000	7.73	19,265,976								
Tianjin		36993000	6.63	34,540,364		Total emission tCO2	584,174,013					
Hebei		134348000	6.57	125,521,336		Total delivery MWh	674,805,425					
Shanxi		128785000	7.42	119,229,153		**Emission factor**	1.155145					
Inner Mongolia		92345000	7.01	85,871,616								
Shandong		189880000	7.14	176,322,568								
total				560,751,013								

Data source: China Electric Power Yearbook 2006.

Finally, the average emission factor of the three years is: 1.1208 tCO_2/MWh.

Calculation of BM emission factor of the North China Power Grid(NCPG)

Step (1): Calculation of the share of CO_2 emissions from solid, liquid and gaseous fuels.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (3)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (4)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (5)$$

Where:

$F_{i,j,y}$ is the amount of fuel i (tce) consumed by plant m in year y;

$COEF_{i,j}$ is the CO_2 emission coefficient (tCO_2e / tce) of fuel i, taking into account the carbon content of the fuels used and the oxidation percent of the fuel in year y;

Coal, Oil and Gas is the foot-index for solid fuels, liquid fuels and gas fuels.

Step (2): Calculation the emission factor of thermal power.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (6)$$

$EF_{Coal,Adv}$、$EF_{Oil,Adv}$、$E_{FGas,Adv}$ represent the emission factors of the best efficient and commercial coal-fired, oil-fuel and gas-fuel generation technologies.

Step (3): Calculation BM in the grid.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \qquad (7)$$

Where:

CAP_{Total} is the total added installed capacity;

$CAP_{Thermal}$ is the total added installed capacity for thermal power.

Step (1): Calculation of the share of CO_2 emissions from solid, liquid and gaseous fuels. (Table A3-4-1)

		Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	total	NCV	Emission factor(tC/TJ)	OXID (%)	Emission(tCO_2e)
Fuel type	Unit	A	B	C	D	E	F	G=A+…+F	H	I	J	K=G*H*I*J*44/12/100
Raw coal	10*kt	897.75	1675.2	6726.5	6176.45	6277.23	10405.4	32158.53	25.8	20908	100	636,062,536
Washed coal	10*kt						42.18	42.18	25.8	26344	100	1,051,186
Other coal	10*kt	6.57		167.45	373.65		108.69	656.36	25.8	8363	100	5,192,725
Coke	10*kt					0.21	0.11	0.32	25.8	28435	100	8,608
Sub-total	10*kt										100	642,315,054
Crude oil	10*kt					0.73		0.73	20	41816	100	22,385
Gasoline	10*kt			0.01				0.01	18.9	43070	100	298
Kerosene	10*kt							0	19.6	43070	100	0
diesel	10*kt	0.48		3.54		0.12		4.14	20.2	42652	100	130,786
Fuel oil	10*kt	12.25		0.23		0.06		12.54	21.1	41816	100	405,690
Other oil	10*kt							0	20	38369	100	0
Sub-total											100	559,160
Natual gas	$10*M\ m^3$	0.28	0.08		2.76			3.12	15.3	38931	100	681,417
Coke oven gas	$10*M\ m^3$	0.64	0.75	0.62	21.08	0.39		23.48	12.1	16726	100	1,742,396
Other oven gas	$10*M\ m^3$	16.09	7.86	38.83	9.88	18.37		91.03	12.1	5227	100	2,111,027
LPG	10*kt							0	17.2	50179	100	0
Refinery gas	10*kt			9.02				9.02	18.2	46055	100	277,221
Sub-Total												4,812,062
total												647,686,276

Data source: China Energy Statistical Yearbook 2006.

Baseing on above table and formula (4),(5) and (6), then

λ_{Coal}=99.17%，λ_{Oil}=0.08%，λ_{Gas}=0.74% .

Step (2): Calculation the emission factor of thermal power.

According to China DNA[7], the optimum commercial, coal-fired power supply generation efficiency 35.82%, oil and gas generation efficiency is 47.67% the relative emission factor as following table

Table A3-4-2 the emission factors of the best efficient and commercial coal-fired, oil-fuel and gas-fuel generation technologies

type	vary	efficiency	Emission Factor (tc/TJ)	Oxidation Rate (%)	Emission Factor (tCO2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired	$EF_{coal,Adv}$	35.82	25.8	1	0.9508
Gas-fuel	$EF_{gas,Adv}$	47.67	15.3	1	0.4237
Oil-fuel	$EF_{oil,Adv}$	47.67	21.1	1	0.5843

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,\ Adv} + \lambda_{Oil} \times EF_{Oil,\ Adv} + \lambda_{Gas} \times EF_{Gas,\ Adv} = 0.9465\ tCO_2/MWh$$

Step (3): Calculation BM in the grid.

Table A3-4-3 NCPG Installed Capacity in 2005

Installed Capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	total
thermal power	MW	3833.5	6149.9	22333.2	22246.8	19173.3	37332	111068.7
hydro	MW	1025	5	784.5	783	567.9	50.8	3216.2
nuclear	MW	0	0	0	0	0	0	0
wind farm and other	MW	24	24	48	0	208.9	30.6	335.5
		4882.5	6178.9	23165.7	23029.8	19950.2	37413.4	114620.5
total	MW	3833.5	6149.9	22333.2	22246.8	19173.3	37332	111068.7

Data source: China Electric Power Yearbook 2006.

Table A3-4-4 NCPG Installed Capacity in 2004

Installed Capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	total
thermal power	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
hydro	MW	1055.9	5	783.8	787.3	567.9	50.8	3250.7
nuclear	MW	0	0	0	0	0	0	0

[7] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

wind farm and other	MW	0	0	13.5	0	111.8	12.4	137.7
total	MW	4514.4	6013.5	20730	18480.5	14321.2	32923.6	96983.2

Data source: China Electric Power Yearbook 2005.

Table A3-4-5 NCPG Installed Capacity in 2003

Installed Capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	total
thermal power	MW	3347.5	6008.5	17698.7	15035.8	11421.7	30494.4	84006.6
hydro	MW	1058.1	5	764.3	795.7	592.1	50.8	3266
nuclear	MW	0	0	0	0	0	0	0
wind farm and other	MW	0	0	13.5	0	76.6	0	90.1
		4405.6	6013.5	18476.5	15831.5	12090.4	30545.2	87362.7
total	MW	3347.5	6008.5	17698.7	15035.8	11421.7	30494.4	84006.6

Data source: China Electric Power Yearbook 2004.

Table A3-4-6 NCPG BM calculation

	installed capacity of 2003	installed capacity of 2004	installed capacity of 2005	Newly installed capacity from 2001 to2004	Share of the Newly installed capacity
	A	B	C	D=C-A	
Thermal(MW）	84006.6	93594.9	111068.7	27062.1	99.28%
Hydro(MW）	3266.0	3250.7	3216.2	-49.8	-0.18%
Nuclear(MW）	0	0	0	0	0.00%
Windfarm(MW）	90.1	137.5	335.5	245.4	0.90%
Total (MW)	87362.7	96983.1	114620.4	27257.7	100.00%
Percent of the installed capacity of 2004	76.22%	84.61%	100%		

$EF_{BM,y}$=0.9465×99.28%=0.9397 tCO_2/MWh 。

Table A3-5. Calculation of combined emission factor

OM factor (tCO2/MWh)	1.1208
BM factor (tCO2/MWh)	0.9397
Combined Emission Factor (tCO2/MWh)	1.03025

Calculation of GHG Emission Reduction

Table A3-6. GHG emissions from biomass combustion in the power plant

	Parameter	Unit	Amount	Source or Equation
A	Biomass demond	tonne/year	172,700	Feasibility Study
B	Biomass Net calorific Factor (NCV)	TJ/tonne	0.015472	China Energy Statitical Yearbook 2005
C	Methane Emission Factor (controlled Burning)	KgCH4/TJ	30	IPCC 2006 default value
D	Conservativeness Factor		1.37	ACM0006
E	Global Warming Potential of CH4		21	IPCC 2006 default value
F	**GHG emissions from biomass combustion**	**tCO2/year**	**2,306**	**F= A*B*C*D*E/1000**

Table A 3-7. GHG emissions from biomass transportation to the power plant

	Parameter	Unit	Amount	Source or Equation
A	Biomass Demand	tonne/year	172,700	Feasibility Study
B	Average load per trip	tonne	**10**	Feasibility Study
C	Longest distance between storage site and the power plant	Km	**15**	Feasibility Study
D	Emission Factor of truck transportation	kg/km	1.011	IPCC 2006 default value from the Moderate Control index for the US heavy Duty Diesel Vehicle
E	**GHG emissions from biomass transportation**	**tCO2/year**	**524**	**E=(A/B)*C*2*D/1000**

Table A 3-8. GHG emissions from fossil fuel

	Parameter	Unit	Amount	Source or Equation

A	Fossil fuel (diesel) used in the boiler	tonne/year	100	Storage capacity, here we use 100 tonnes for conservative purpose.
B	Fossil fuel Net Calorific Value (NCV)	TJ/tonne	0.04187	The value for Diesel is used. But other values will be applied if other fuels are used.
C	Fossil Fuel carbon content	tC/TJ	20.2	IPCC 2006 default value
D	Fraction of carbon oxidized		0.99	IPCC 1996 default value
E	CO2/C conversion factor		3.67	IPCC 2006 default value
F	**GHG emissions from fossil fuel combustion**	**tCO2/year**	**307**	**F=A*B*C*D*E**

Table A 3-9. Total Project Emissions

	Parameter	Unit	Amount	Source or Equation
A	GHG emissions from biomass combustion	tCO2/year	2,306	Table A3-6
B	GHG emissions from biomass transportation	tCO2/year	524	Table A3-7
C	GHG emissions from fossil fuel combustion	tCO2/year	307	Table A3-8
D	GHG emissions from imported electricity consumption onsite	tCO2/year	0	Assumed to be equal to 0 for calculation.
E	**Total Project emissions**	**tCO2/year**	**3,137**	**E=A+B+C+D**

Table A 3-10. Electricity generation baseline emissions

	Parameter	Unit	Amount	Source of Equation
A	Project installed capacity	MW	2*15	Feasibility Study
B	Annual power generation	MWh	139,000	Feasibility Study
C	Baseline Emissions Factor	tCO2/MWh	1.03025	Table A3-13
D	**Electricity generation baseline emissions**	**tCO2/year**	**143,205**	**D=B*C**

Table A3-11 Unused biomass baseline emission

	Parameter	Unit	Amount	Source or Equation

A	Biomass demond	tonne/year	172,700	Feasibility Study
B	Biomass Net calorific Factor (NCV)* Methane Emission Factor in agriculture or forestry	tCH4//t	0.0044	ACM0006 Version04, page 40, 2006IPCC Vlume 4, Table 2.5.
C	Conservativeness factor		0.73	ACM0006 Version04, page 40.
D	Global Warming Potential of CH4		21	IPCC 2006 default value
E	Unused biomass baseline emissions	tCO2/year	**11,649**	**E= A*B*C*D**

Table A 3-12 Total Baseline emissions

	Parameter	Unit	Amount	Source or Equation
A	Electricity generation baseline emissions	tCO2/year	143,205	Table A3-18
B	Unused biomass baseline emissions	tCO2/year	11,649	Table A3-19
C	**Total Baseline emission**	**tCO2/year**	**154,854**	**C=A+B**

Table A 3-20 Project emission reduction

	Parameter	Unit	Amount	Source or Equation
A	Total Baseline emission	tCO2/year	154,854	Table A3-20
B	Total Project emissions	tCO2/year	3,137	Table A3-17
C	**Project Emission Reduction**	**tCO2/year**	**151,717**	**C=A-B**

Shandong Guanxian 2*15MW Biomass Power Plant Project

cal result	without CERs	with CERs		
IRR(before tax)	**6.97%**	**11.38%**	benchmark IRR	8% before tax
Payback period(excluing construction)	11.94	8.91		

input parameters		data source	refer to FS annex of cash flow on total investment
Basic parameters			
delivered electricity(GWh)	139.00	FS	the sales electricty
electricty tariff(Yuan/MWh)	602.45	FS	excluding VAT
delivered heat(TJ)	0.00	FS	
heat tariff(Yuan/GJ)	0.00	FS	excluding VAT
total investment(million Yuan)	293.30	FS	
active capital(million Yuan)	3.48	FS	
Depreciation period(year)	15	FS	
Construct period(year)	1	FS	
Operation period(year)	20	FS	
residue value(million Yuan)	0.00	FS	
O&M (million Yuan)	55.25	FS	
fuel cost	42.17	FS	
water cost	1.34	FS	
cost of materials	6.19	FS	
wages and welfare	3.34	FS	
repair cost	0.00	FS	
cost of sale	0.00	FS	
others	2.21	FS	
Tax			
Other tax rate(million Yuan)	0.39	FS	city tax plus education tax, basing on the VAX

sensitive indicator value	
Total investment	0
O&M	0
delivered electricit	0

CDM		
CERprice（$/tCO2e)	10	assumed
exchange rate（RMB/$)	7.5	

CAL model

IRR without CERs revenue

year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
load factor		58%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cash flow in(million Yuan)		48.85	83.74	83.74	83.74	83.74	83.74	83.74	83.74	83.74	83.74
1. income of electricity sale		48.85	83.74	83.74	83.74	83.74	83.74	83.74	83.74	83.74	83.74
2. income of heat sale		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Residue recovery											
3. active capital recovery											
Cash flow out(million Yuan)	293.30	34.75	55.86	55.64	55.64	55.64	55.64	55.64	55.64	55.64	55.64
1. initial investment	293.30										
2. active capital		2.29	0.22								
3.O&M		32.23	55.25	55.25	55.25	55.25	55.25	55.25	55.25	55.25	55.25
4 .other tax		0.23	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Net Cash flow	(293.30)	14.10	27.88	28.10	28.10	28.10	28.10	28.10	28.10	28.10	28.10
Accumulative total cash flow	(293.30)	(279.20)	(251.32)	(223.21)	(195.11)	(167.01)	(138.91)	(110.81)	(82.71)	(54.61)	(26.50)

year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
load factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cash flow in(million Yuan)	83.74	83.74	83.74	83.74	87.23	83.741	83.741	83.741	83.741	83.741	83.74
1. income of electricity sale	83.74	83.74	83.74	83.74	83.74	83.741	83.741	83.741	83.741	83.741	83.74
2. income of heat sale	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00
2. Residue recovery					0.00	0.000	0.000	0.000	0.000	0.000	0.00
3. active capital recovery					3.48	0.00	0.00	0.00	0.00	0.000	0.00
Cash flow out(million Yuan)	55.64	55.64	55.64	55.64	55.64	55.639	55.639	55.639	55.639	55.639	55.64
1. initial investment											
2. active capital											
3.O&M	55.25	55.25	55.25	55.25	55.25	55.249	55.249	55.249	55.249	55.249	55.25
4 .other tax	0.39	0.39	0.39	0.39	0.39	0.390	0.390	0.390	0.390	0.390	0.39
Net Cash flow	28.10	28.10	28.10	28.10	31.59	28.102	28.102	28.102	28.102	28.102	28.10
Accumulative total cash flow	1.60	29.70	57.80	85.90	117.49	145.591	173.692	201.794	229.895	257.997	286

Finacial indicator

IRR(before tax)	**6.97%**
Payback period(excluing construction)	11.94

CM (tCO2/MWh) 1.03025

IRR with CERs revenue

year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Electrity generation baseline emissions(tCO2/yr)		83,536	143,205	143,205	143,205	143,205	143,205	143,205	143,205	143,205	143,205
Unused biomass baseline emissions(tCO2/yr)		6,795	11,649	11,649	11,649	11,649	11,649	11,649	11,649	11,649	11,649
Total Project emissions(tCO2/yr)		1,830	3,137	3,137	3,137	3,137	3,137	3,137	3,137	3,137	3,137
Project Emission Reduction (tCO2/yr)		88,501	151,716	151,716	151,716	151,716	151,716	151,716	151,716	151,716	151,716
CERs revenue(million Yuan)		6.64	11.38	11.38	11.38	11.38	11.38	11.38	11.38	11.38	11.38
Net Cash flow	-293.30	20.74	39.26	39.48	39.48	39.48	39.48	39.48	39.48	39.48	39.48
Accumulative total cash flow	-293.30	-272.56	-233.30	-193.82	-154.34	-114.86	-75.38	-35.90	3.58	43.06	82.54

year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Electrity generation baseline emissions(tCO2/yr)	143,205	143,205	143,205	143,205	143,205	143,205	143,205	143,205	143,205	143,205	143,205
Unused biomass baseline emissions(tCO2/yr)	11,649	11,649	11,649	11,649	11,649	11,649	11,649	11,649	11,649	11,649	11,649
Total Project emissions(tCO2/yr)	3,137	3,137	3,137	3,137	3,137	3,137	3,137	3,137	3,137	3,137	3,137
Project Emission Reduction (tCO2/yr)	151,716	151,716	151,716	151,716	151,716	151,716	151,716	151,716	151,716	151,716	151,716
CERs revenue(million Yuan)	11.38	11.38	11.38	11.38	11.38	11.38	11.38	11.38	11.38	11.38	11.38
Net Cash flow	39.48	39.48	39.48	39.48	42.97	39.48	39.48	39.48	39.48	39.48	28.10
Accumulative total cash flow	122.02	161.50	200.98	240.46	283.43	322.91	362.39	401.87	441.35	480.83	286

Finacial indicator

IRR(before tax)	**11.38%**
Payback period(excluing construction)	8.91

Annex 5

MONITORING INFORMATION

Please refer to section B.7.2 of this PDD.