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 Wudi Biomass Generation Project
Version number of the document: 4
Date: November 6th, 2007

A.2. Description of the project activity:

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The Shandong Wudi Biomass Generation Project (hereafter refers to the proposed project), located in Wudi County, Shandong Province, P. R. China, is a biomass utilization project that is to use local straw from cotton for electricity generation. The proposed project involves the installation of two biomass combustion boilers and two power generators driven by steam turbine. The installed capacity of the proposed project is 24 MW and the power supply is 112,086 MWh per annum. The advanced technology of biomass cogeneration in China is employed in the proposed project, which will assist in the innovation of advanced biomass technology in China.

The proposed project's contribution to China's energy supply and sustainable development strategy is shown specifically as follows:

1.GHG emission reduction
The electricity generated by the proposed project will be sold to Shandong provincial power gird that is a part of the North China Power Grid to replace the capacity of coal-fired power plants. Furthermore, the proposed project will accomplish an extra benefit of greenhouse gas (GHG) mitigation derived from a reduction of methane emissions from straw dumping or uncontrolled burning of biomass. The estimated emission reduction of the proposed project will be 113,433 tCO2e per year.

2. Comprehensive utilization of resources
Wudi County, with rich agricultural resources, is the cotton bases in Shandong Province. The implementation of the proposed project will utilize 123,600 tonne waste cotton and realize biomass comprehensive utilization in the province and serve as a demonstration project in China.

3. Providing job opportunities and alleviating poverty
The newly installed capacity by the proposed project will directly benefit the local region by creating new jobs and investment opportunities. The income of local residents will be increased through the sales of straws as by-product of crops. The proposed project will play an important role to help local residents casting off poverty and becoming better off.

4. Contribution to environment protection
The proposed project will avoid uncontrolled burning of part of unused biomass in the region, which avoids air pollution and subsequent smoke impacts to local road transportation.

A.3. Project participants:

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Name of Party involved ((host) indicates a host	Private and/or public entity (ies)	Kindly indicate if the Party involved

Party)	**project participants (as applicable)**	**wishes to be considered as project participant (Yes/No)**
Peoples' Republic of China (host)	Guodian Technology & Environment Group Co., Ltd.	No
UK	Shell Trading International Limited	No

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Host Country: **People's Republic of China,** which has ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change in August 2002

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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Wudi County

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 Shidi Development Zone, Liubao Town, southwest of Wudi County, north of Shandong Province, P. R. China. Geographical location of the project is shown in Figure A1. The project has geographical coordinates with east longitude of 117°46′36″and north latitude of 37°57′49″.

Figure A1. The proposed project in the map of Shandong Province

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

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Category: Renewable electricity in grid connected applications
Sectoral Scope: 1 Energy industries

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

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The technology employed by the proposed project is from domestic advanced technology. Two biomass combustion boilers (75t/h in capacity for each) with medium temperature and medium pressure which are made in China, two 12MW steam turbines and two suited generators will be applied in the proposed project. The steam turbine employed is medium temperature and medium pressure condensing steam turbine. The total installed capacity of the proposed project is 24MW and the power supply is 112,086MWh per year. The suited power generator will be domestic made with a total installed capacity of 24MW. The electricity output will be transmitted through an 110kV transformer at the site to Dayang 110kV substation, and then connected to Shandong Provincial Power Grid that is an integral part of North China Power Grid.

The project developer will set up some stations for straws collection and storage temporarily near the straw resource. Then the straw will be transported to the plant according to dispatch scheme. The proposed radius for biomass collection is 30km around the site of the power plant. After the straws are transported into the storehouse in the plant, they will be weighted by platform balance and crushed. Around ten crushing machines will be employed by the power plant with each capacity of 6 to 8 t/h. The crushed biomass will be fed into fuel entering system to the boiler, and then sent to the boiler for combustion. The steam generated is used for power generation. At the same time, the soot and smog are captured by the hop-pocket dust catcher, and then carried into ash storeroom.

Table 1. The main equipments adopted by the proposed project

Name	Amount and Capacity	Model or Style	Manufacturer
Circulating fluidized bed boiler	2×75t/h	Medium temperature and Medium pressure	Taishan Group Co. Ltd.
Steam turbines	2×12MW	C12-3.43/0.981	outsourcing
Generators	2×15MW	QF-15-2	outsourcing

The boiler is the key part project adopts the biomass technology of Taishan Group Co. Ltd, which is advanced domestically manufacturer. The parameters of the boilers are listed in the table below:

Table2 The parameters of the circulating fluidized bed boilers by the proposed project

Parameter	Evaporation amount	Rating load temperature of vapour	Output water temperature	Efficiency
circulating fluidized bed boilers	75t/h	450℃	150℃	88%

Although the project adopts innovative domestic biomass combustion technology, which has not be applied yet and has relatively high uncertainty on the performance. However, Taishan Group Co. Ltd. has experiences in manufacturing traditional fossil fuel combustion boilers and could well control the risk of safety issues. A few boilers they have manufactured recently are listed in the following:

- TG35-3.82/450-M boiler for Shandong Luneng New energy Co., Ltd
- TG-35/3.82-QJ boiler for Henan Yingqing Chemical Co., Ltd.
- TG75/3.82-M boiler for Shandong Aluminum Co., Ltd.
- TG-75/5.29-M Boiler for Luxi Chemical Co., Ltd.

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

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A crediting period of 7 (seven) years (renewable twice) is selected for the project activity. An estimation of emissions reductions expected over the crediting period is provided in the table below.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2008	**113,433**
2009	**113,433**
2010	**113,433**
2011	**113,433**

2012	**113,433**
2013	**113,433**
2014	**113,433**
Total estimated reductions (tonnes of CO_2e)	**794,034**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**113,433**

A.4.5. Public funding of the project activity:

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There is no public funding for this project.

SECTION B. Application of a baseline and monitoring methodology:

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

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The approved baseline and monitoring methodology applied in the proposed project activity is ACM0006 Version 4–"Consolidated methodology for grid-connected electricity generation from biomass residues". For more information regarding the methodology please refer to http://cdm.unfccc.int/metholdogies/approved.

In line with the application of the methodology the project draws on element of the following tools and methodologies:
Version 3 of Tool for the Demonstration and Assessment of Additionality
Version 6 of ACM0002: Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources

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

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The approved consolidated methodology: ACM0006 is applied here to determine the baseline of the proposed project. The project activity is a newly installed electricity capacity from biomass residues in the North China Power Grid. The proposed project activity includes the installation of a new power generation plant at a site where currently no power generation occurs. Therefore, it is a "power green field" project.

The proposed project meets all applicability conditions of methodology ACM0006 which are listed as follows:

1) **No other biomass types than biomass residues are used in the project plant and these biomass residues are the predominant fuel used in the project plant:** Biomass from local agricultural residues of cotton in Wudi County will be the predominant fuel in the proposed project. Only a very little amount of diesel will be used to help the start-ups of the boilers.

2) **The implementation of the project shall not increase the biomass production in the facility:** According to a survey[1], the annual output of cotton straws in Wudi County is 206,000 tonnes, and the total production of cotton straws within 30 kilometres away around the site of the proposed project is 356,400 tonnes per year. Cotton straws are planned to be utilized as main fuel of the proposed project. Currently, only 71,280 tonnes of the biomass resource per year is utilized for household fuel, forage and cooking etc. The implementation of the project needs a supply of 123,600 tonnes of biomass residues per year. The biomass supply of the region to the proposed project is sufficient and no need to increase biomass production for the proposed of implementation of the proposed project. The huge surplus biomass residues supply comparing to the limited demand from the proposed project is expected not to be changed significantly in the lifetime of the proposed project. Therefore, the implementation of the project will not increase the biomass production in the area.

[1] Source: Feasibility Study of the proposed project

3) **The biomass stored at the project facility should not be stored for more than one year:** There is a biomass storage place at the site of the proposed project, however, the storage time of the biomass is not meant to surpass half year. If the biomass is stored for more than a year, the NCV (net calorific value) decreases to a level in which it becomes improper to be used as the fuel in the boiler of the project.

4) **No significant energy quantities, except for transportation or mechanical treatment for the biomass, is required to prepare biomass residues for fuel combustion:** The major fossil fuel consumption of proposed project are transportation and crushing of biomass and boiler start-ups. This is exactly the case with the proposed project activity.

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

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	Source	Gas	Included or not	Justification / Explanation
Baseline	Grid electricity generation	CO_2	Yes	Main emission source
		CH_4	No	According to methodology, it is excluded for simplification. This is conservative.
		N_2O	No	According to methodology, it is excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Yes	Included, since B1 and B3 is the most likely baseline scenario.
		N_2O	No	According to methodology, it is excluded for simplification. This is conservative.
Project Activity	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	CO_2	Yes	May be an important emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small according to methodology.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small according to methodology
	Ttransportation of biomass	CO_2	Yes	Included as emission sources by project activity
		CH_4	No	According to methodology, it is excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	According to methodology, it is excluded for simplification. This emission source is assumed to be very small.
	Combustion of biomass for electricity and / or heat generation	CO_2	No	According to methodology, it is excluded for simplification. This emission source is assumed to be very small.
		CH_4	Yes	CH_4 emissions will be caused during the course of power/heat generation.

		N_2O	No	According to methodology, it is excluded for simplification. This emission source is assumed to be very small.
	Biomass storage	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	According to methodology, it is excluded for simplification. Since biomass is stored for not longer than one year, this emission source is assumed to be small.
		N_2O	No	According to methodology, it is excluded for simplification. This emission source is assumed to be very small.

The spatial extent of the project boundary encompasses the power plant at the project site, the means for transportation of biomass to the project site, and all power plants connected physically to North China Power Grid that the proposed project connected to. This is in line with the default definition of the boundary given in the baseline methodology ACM0002, which is used for determining the emissions associated with grid electricity generation. The proposed project is connected to North China Power Gird (including Beijing, Tianjin, Heibei Province, Shanxi Province, Shandong Province and Inner Mongolian Autonomous Region.

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

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The reasonable and feasible baseline scenarios of the proposed project are identified through the following analysis:

Alternatives to power generation:

In absence of the proposed project, reasonable and credible power generation alternatives include:

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

P2 The proposed project activity fired with the same type of biomass residues but with a lower efficiency of electrical generation;

P3 The generation of power in an existing plant, on-site or nearby the project site, using only fossil fuels;

P4 Supply of equivalent power output by the Grid where the proposed project is connected **;**

P5 The continuation of power generation in an existing power plant, fired with the same type of biomass residues as (co-) fired in the project activity, and implementation of the project activity, not undertaken as a CDM project activity, at the end of the lifetime of the existing plant;

P6 The continuation of power generation in an existing power plant, fired with the same type of biomass residues as (co-) fired in the project activity and, at the end of the lifetime of the existing plant, replacement of that plant by a similar new plant.

Specific analysis on the six alternative scenarios in absence of the proposed project is as follows:

P1 According to Chinese law, the development of a new biomass energy project of the same capacity without CDM is feasible. Therefore, the Alternative P1 can be considered as an alternative.

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, Alternative P2 can't become the most realistic baseline alternative for power generation.

P3 There are no fossil fuel fired power plants around the project site.[2] Therefore, Alternative P3 can't become the most realistic baseline alternative for power generation.

P4 The installed capacity of the North China Power Grid keeps increasing for many years. Wudi County has connected to North China Power Grid. Since the electricity supply is far less from the electricity demand in Wudi County, Wudi County has been purchasing electricity from North China Power Grid for many years. Hence, the Alternative P4 is a feasible alternative. As a result, power from North China Power Grid is selected as the baseline for the proposed project.

P5 There are none of biomass power plants in the local areas. Therefore, the Alternative P5 cannot be considered as an alternative.

P6 There are none of biomass power plants in the local areas. Therefore, the Alternative P6 cannot be considered as an alternative.

In conclusion, the practical and feasible baseline scenarios for power generation are Alternative P1 and Alternative P4. Besides, the baseline applied in this project corresponds to scenario 2 of methodology.

Alternatives to unused biomass:

In absence of the proposed project, reasonable and credible unused biomass residues alternatives that are include:

B1 The biomass residues are dumped or left to decay under mainly aerobic conditions. 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;

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 plants;

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

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.

The proposed project uses biomass from agricultural residues, mainly straws from cotton. Without the proposed project activity, the baseline scenario is that a huge amount of straws are left unused in Wudi County annually. Agriculture is the main industry and economy driving force of Wudi County. With technology improvements in agriculture, per unit crop production keeps increasing gradually but steadily when no new lands for agriculture are explored. Meanwhile, without foreseeable technology innovation for biomass comprehensive utilization, the demand for straws is not expected to increase significantly by other sources as well.

Specific analysis on the eight alternative scenarios in absence of the proposed project is as follows:

B1 This is the scenario that happens around the site of the proposed project, and a certain number of surplus biomass residues would be dumped or left to decay. Alternative B1 is a realistic baseline alternative for unused biomass.

[2] Local grid company

B2 This applies, for example, to deep landfills with more than 5 meters. There is no landfill around the site of the proposed project. This does not apply to biomass residues that are stock-piled or left to decay on fields. Alternative B2 is not a realistic baseline alternative for unused biomass.

B3 This is the scenario that happens around the site of the proposed project, and a certain number of surplus biomass residues would be burnt in an uncontrolled manner without utilizing it for energy purposes. Alternative B3 is a realistic baseline alternative for unused biomass.

B4 There is no heat or power generation project around at the project site that uses biomass residues as fuel. Alternative B4 is not a realistic baseline alternative for unused biomass.

B5 There is no generation or cogeneration project using biomass residues as fuel close to proposed project. Considering the cost of biomass transpiration, other existing or new grid-connected power plants will not use these surplus biomass residues. Alternative B5 is not a realistic baseline alternative for unused biomass.

B6 There is no biomass boiler using biomass residues as fuel close to proposed project. Considering the cost of biomass transportation, other existing or new boilers at other places will not use these surplus biomass residues. Alternative B6 is not a realistic baseline alternative for unused biomass.

B7 There is no other energy generation project that has needs to the surplus biomass residues consumed by the proposed project. Alternative B7 is not a realistic baseline alternative for unused biomass.

B8 There is a little biomass has been used as fertilizer around the project site, however, the biomass used by the proposed project will not impropriate the biomass as fertilizer or other industry process needs, since the biomass consumption of the proposed project is from the local surplus biomass residues of the area. Alternative B8 is not a realistic baseline alternative for unused biomass.

In conclusion, 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. According to methodology, the baseline is determined based on the scenario that biomass residues are burnt in an uncontrolled manner.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality): >>

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The additionality of the proposed project is demonstrated and assessed by the approved Tool for the Demonstration and Assessment of Additionality. Following steps include:

Step1. 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:

In absence of the proposed project, reasonable and credible power generation alternatives include:

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

P2 The proposed project activity fired with the same type of biomass residues but with a lower efficiency of electrical generation;

P3 The generation of power in an existing plant, on-site or nearby the project site, using only fossil fuels;

P4 Supply of equivalent power output by the Grid where the proposed project is connected**;**
P5 The continuation of power generation in an existing power plant, fired with the same type of biomass residues as (co-) fired in the project activity, and implementation of the project activity, not undertaken as a CDM project activity, at the end of the lifetime of the existing plant;
P6 The continuation of power generation in an existing power plant, fired with the same type of biomass residues as (co-) fired in the project activity and, at the end of the lifetime of the existing plant, replacement of that plant by a similar new plant.

As it is discussed in Section B4, the practical and feasible baseline scenarios for power generation are the alternative P1 The proposed project activity not undertaken 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 unused biomass:

The proposed project uses biomass from agricultural residues, mainly straws from cotton. Without the proposed project activity, the baseline scenario is that a huge amount of straws are left unused in Wudi County annually, since there is no driving forces to utilize these biomass residues. In absence of the proposed project, reasonable and credible unused biomass alternatives include:

B1 The biomass residues are dumped or left to decay under mainly aerobic conditions. 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;
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 plants;
B6 The biomass residues are used for heat generation in other existing or new boilers at other sites;
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.

As it is discussed in Section B4, 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. Enforcement of applicable laws and regulations:
The *B4* contains the confrontation of the alternatives with China's applicable laws and regulations, and practical and feasible alternatives to power supply, used biomass and heat supply have been selected.

A further argument is that the project activity is consistent with the national policies for environmental protection, energy conservation and sustainable development. However, there exist no binding legal and regulatory requirements to enforce the proposed project developer to develop this type of projects yet.

It could be concluded that all the selected alternatives are in line with the existing Chinese laws and regulations.

Step 2. Investment analysis
The purpose of this step is to determine whether the proposed project activity is economically or financially less attractive than other alternatives without an additional funding that may be derived from the CDM project activities. The investment analysis was conducted in the following steps:

Sub-step 2a. Determine appropriate analysis method

The three analysis methods suggested by *Tools for the demonstration and assessment of additionality* are simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III). Since the proposed project will earn revenues from not only the CDM but also the electricity output, the simple cost analysis method is not appropriate. Investment comparative analysis method is only applicable to the case that alternative baseline scenario is similar to the proposed projects, so that comparative analysis can be conducted. The alternative baseline scenario of the proposed project is the North China Power Grid rather than a new investment project. Therefore option 2 is not an appropriate method either. The proposed project will use benchmark analysis method based on total investment IRR.

Sub-step 2b –Apply benchmark analysis (Option III)

With reference to *Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects,* the financial benchmark rate of return of Chinese power industry is 8% of the total investment, which has been used widely for Feasibility Studies of the power project investments.

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

Based on the above-mentioned benchmark, the calculation and comparative analysis of financial indicators for the proposed project are carried out in sub-step 2c.

(1) Basic parameters for calculation of financial indicators

Based on the Feasibility Study Report of the proposed project, basic parameters for calculation of financial indicators are as follows[3]:

Installed capacity: 24MW
Annual output: 112,086 MWh
Project lifetime: 22 Year (1 year of construction and 21 years of operation).
Total investment: 247.7447 million yuan (equity/debt ratio: 30/70)
Tariff: 0. 595 yuan/kWh [4]
Price of Biomass: 200 yuan/ton[5]
Operational cost: 31.92 million yuan
Tax: 17% (VAT), 33% (income tax)
Crediting period: 21 Years
Expected CERs price: Euro 8/t CO_2e

Note: In the benchmark analysis, the data used for project financial scenario has been updated according to real circumstances after the Feasibility Study had been conducted resulting from the barriers of the proposed project.

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

In accordance with the benchmark analysis (Option III), the proposed project will not be considered as financially attractive if its financial indicators (such as IRR) are lower than the benchmark rate.

Table B2 shows the fluctuating situation of IRR of the proposed project based on current status under the condition of with and without CDM revenues. Without the CDM revenue, the IRR of total investment is

[3] Source: feasibility study of the proposed project

[4] In line with the guidelines of the Chinese Renewable Energy Law

[5] Local biomass straw price, evidence from other biomass power plant in the region has provided

lower than the benchmark rate of 8%. Thus the proposed project does not look financially attractive to the investors. However, with the CDM revenue, IRR of total investment is significantly improved and exceeds the benchmark rate. Therefore, the proposed project with the CDM revenue can be considered as financially viable to the investors.

Table B2. Financial indicators of the Shandong Wudi Biomass Generation Project

	IRR (Total investment, benchmark=8%)
Without CDM revenue	6.36%
With CDM revenue	9.88%

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

The purpose of the sensitivity analysis is to examine whether the conclusion regarding the financial viability of the proposed project is sound and tenable with those reasonable variations in the assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive.

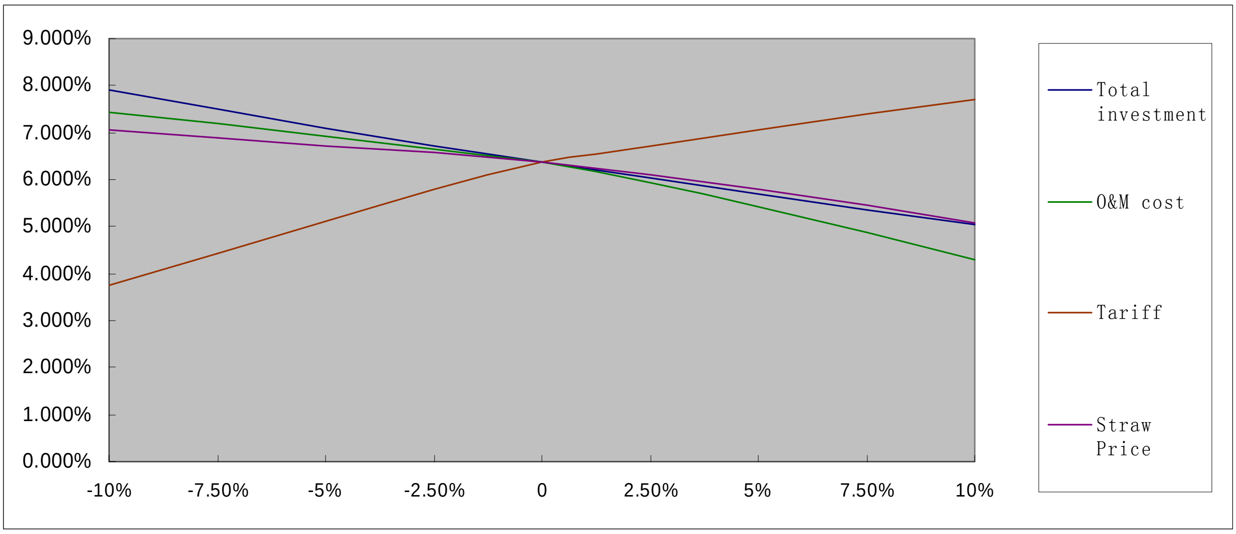
Four financial parameters including: total investment, tariff (excluding VAT), annual O&M cost and straw price were identified as the main variable factors for sensitive analysis of financial attractiveness. Their impacts on IRR of total investment were analyzed in this step.

For detailed results of sensitive analysis of the first four indicators, please see Table B3 and Figure B1.

Table B3. Sensitivity of total investment IRR to different financial parameters

Range / Parameters	-10.00%	-7.50%	-5.00%	-2.50%	0.00%	2.50%	5.00%	7.50%	10.00%
Total investment	7.980%	7.580%	7.190%	6.810%	6.450%	6.110%	5.780%	5.460%	5.150%
O&M cost	7.590%	7.330%	7.050%	6.760%	6.450%	6.030%	5.510%	4.970%	4.420%
Tariff	3.870%	4.560%	5.230%	5.900%	6.450%	6.810%	7.140%	7.470%	7.790%
Straw Price	7.210%	7.030%	6.850%	6.680%	6.450%	6.180%	5.890%	5.550%	5.200%

Figure B1. Sensitivity of total investment IRR to different financial parameters



As shown in Table B3 and Figure B1, the IRR of total investment of the proposed project varies to different extents, when the above four financial indicators fluctuated within the range from -10% to +10%. In comparison, the impact of the tariff on IRR is most significant. When the tariff increases by 10%, the IRR of total investment exceeds the benchmark. However, the tariff of the proposed project is not possible to increase, since it is already much higher than the average grid-connected power generation tariff in the province. It's displayed in the graphics that the IRR of total investment approaches the benchmark when the total investment decreases by 10%. As a matter of fact, the actual total investment has already increased due to the increasing of construction material cost and the equipment cost, etc. The IRR of total investment exceeds the benchmark when the annual O&M cost is lowered by 10%. However, considering the increasing trend of the straw price and the risk related to the application of new technology, the annual O&M cost will most likely be increased. For the straw price, it's displayed in the graphics that the IRR of straw price vary from -10% to 10%, the IRR is below benchmark.

After above sensitive analysis, when financial indicators change within reasonable range, the proposed project is not financially feasible without CDM support.

Step 3. Barrier analysis
If this step is used, it determines whether the proposed project activity faces barriers that:
(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives.

Use the following sub-steps:

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:
There are barriers that would prevent the implementation of the type of proposed project activity from being carried out if the project activity was not registered as a CDM activity. Such barriers may include, among others:

Investment barriers

Despite the fact that China possesses rich biomass residues and is facing high demand for electricity, biomass generation power is not considered to be an attractive power generation technology in China comparing to dominated coal fired power generation. As a new technology in China, the performance of the biomass combustion to power system has not been proved, which brings risks to the operation and maintenance of the power plant, and thus the investment return. These cause an even higher investment risk to project developers. Construction of large-scale biomass combustion cogeneration power project is still at the stage of preliminary development.

The proposed project will be one of the first biomass combustion cogeneration power projects in the province, which evidently representing a technological breakthrough. This innovation implies higher development and operational risks, which are ultimately translated into a higher financial risk for the proposed project.

Technology barriers

As a key part of the whole system, the biomass combustion boiler will be researched and developed in China, which was not applied in any other projects. That will cause high risk to the proposed project during the construction, operation and maintenance. As a new technology, this first attempting effort will imply a high technology challenge to the project developer.

The biomass residues of the proposed project are to be collected from local farmers. The project developer has to establish a large collecting and management system to organize the process of the biomass residues supply, including collecting, packing, storage, transportation and dispatch management, etc. This is one of the essential elements for the proposed project, which involves the communication with local individual farmers and presents as a no-easy mission to the inexperienced project developer. This management risk in collecting biomass residues by the project developer is expected during the operational phase of the project.

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

Alternatives to power generation:
Among the 6 alternatives to power generation analyzed in ***Sub-step 1a***， only Alternative P1 and Alternative P4 can be considered as alternative scenarios. Because of the existence of investment barriers and technology barriers, Alternative P1 is not feasible in China. The Alternative P4 is that the generation of power is from in existing and/or new grid-connected power plants. The power plants in the grid connected by the proposed project are dominated by coal power plants. In this scenario, the power output from the grid is mainly from the coal fuel power source. The coal-fired plant in China is a well-commercialized and matured technology, and the coal resource in China is very rich as well. Therefore the investment barrier and technology barrier mentioned above of the proposed project will not be applicable to existing or new coal-fired plants power generation in the Grid.

Alternatives to unused biomass:
The alternatives to unused biomass is that such biomass would be dumped, left to decay or burned in an uncontrolled manner without utilizing it for energy purposes. It is obvious that the biomass usage alternative will not incur any barrier.

Step 4. Common practice analysis

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

The large-scale grid-connected biomass combustion power generation in Shandong Province is a new technology. In Dec 2006, the first biomass power generation project with similar installed capacity as proposed project was developed in China - Shandong Shanxian biomass cogeneration project. However, this project was developed with the support from CDM[6]. Therefore, the proposed project is evidently not a common practice in the region and even in China.

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

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

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the baseline methodology analysis in Section B4, the baseline scenario that would apply to the proposed project activity is shown below:

Table B1. Combination of baseline scenarios for the Shandong Wudi Biomass Generation Project

Scenario	Project type	Baseline scenario		
		Power generation	Use of biomass	Heat generation
2	Power Greenfield projects	P4	B1 or B3	NO

Baseline Emissions

The GHG emission reductions of the proposed project are from two major sources: CO_2 emission reductions through the substitution of electricity generation in North China Power Grid, CH_4 emission reductions from a reduction of direct dumping or uncontrolled burning of biomass.

According to the above, the baseline emissions for year *y* can be calculated according to the following formula:

$$ER_{baseline,y} = ER_{electricity,y} + BE_{biomass,y}$$

$ER_{baseline,y}$: Emissions reductions of the project activity during the year *y* (tco_2e/yr)
$ER_{electricity,y}$: Emission reductions due to displacement of electricity during the year *y* (tco_2e/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)

Unused biomass baseline

The agriculture industry is the biggest industry in China, which generates significant amounts of biomass each year. Without effective technology and attractive incentives, the biomass residues from agriculture

[6] http://cdm.ccchina.gov.cn/

industry can not be well utilized. According to the survey conducted by the project developer in Wudi County, most of the local biomass residues are left decay and / or sometimes burned in open air.

Showing no indication that the large excess biomass will be reduced in the foreseeable future, the methodology therefore takes the baseline of unused biomass as emissions from uncontrolled open-air burning of the equivalent amount of biomass that the proposed project will consume. Considering that when biomass is left to decay it emits more of the carbon it contains as methane than when it is burned in open air, as the GWP of methane as a type of GHG is much greater, the above assumption is regarded as conservative. These baseline emissions are notably significant given. Therefore, the proposed project understates baseline emissions and keeps the baseline conservative by selecting the scenario of open-air burning of all currently unused biomass but ignoring the baseline methane emission from decaying biomass.

The emissions from avoided disposal of the biomass to be used by the project activity in year *y* can be calculated as:

$$BE_{biomass,y} = GWP_{CH4} \cdot \sum_{k} BF_{PJ,k,y} \cdot NCV_k \cdot EF_{burning,CH4,k,y}$$

where:

$BE_{biomass,y}$: Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y* (tco_2e/yr)

GWP_{CH4} : Global Warming Potential of methane valid for the commitment period (tco_2e/tCH_4)

$BF_{PJ,k,y}$: Incremental quantity of biomass residue type *k* used as a result of the project activity in the project plant during the year *y* (tons of dry matter or liter)

NCV_k : Net calorific value of the biomass residue type *k* (GJ/ton of dry matter or GJ/liter)

$EF_{burning,CH4,k,y}$: CH_4 emission factor for uncontrolled burning of the biomass residue type *k* during the year *y* (tCH_4/GJ)

The biomass mix and the corresponding weighed average Net Calorific Value will be used to calculate these baseline emissions.

Electricity generation baseline

According to the methodology of ACM0006, the GHG emission calculation from electricity generation of the proposed project should follow the instruction of ACM0002. All the dada employed in the calculation is based on available data from North China Power Grid. The baseline emission factor (EF_y) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors according to the following three steps:

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

Calculation of the Operating Margin should be based on one of the four following methods according to the instruction of ACM0002:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

Although Dispatch Data Analysis should be considered the first methodology choice as required in the ACM0002, unavailability of detailed information in China, such as the dispatch data make method (c) not feasible for the calculation in China.

In China, specific data from the grid or each power plant is treated as business confidential and thus not publicly available. Therefore, the Simple adjusted OM (b) cannot be possibly used for the proposed project either.

Without any nuclear source, the North China Power Grid only possesses 0.76% of its total electricity generation that come from renewable energy sources in 2004, 0.86% in 2003, 0.89% in 2002, 0.81% in 2001, and 1.1% in 2000[7]. Hence, the low operating cost/must run sources is much less than 50% of the total grid generation, which accords with the defined condition of method (a), but not method (d). Consequently, Simple OM method is selected to calculate the Operating Margin emission factor of the proposed project.

Simple OM method is selected to calculate the Operating Margin emission factor of the proposed project.

The Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tco_2e/MWh) of all generating sources serving in the system, excluding low-operating cost and must-run power plants:

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

Where:

$F_{i,j,y}$: the amount of fuel i consumed by relevant power sources j in year(s) y.

$COEF_{i,j,y}$: the CO_2 emission coefficient of fuel i, taking into account the carbon content of fuels used by relevant power sources j and the percentage oxidation of the fuel in year(s) y;

$GEN_{j,y}$: the electricity delivered to the grid by source j in year y.

The CO_2 emission coefficient is equal to the net calorific value of fuel i, multiplied by the oxidation factor of the fuel i and the CO_2 emission factor per unit of energy of the fuel i.

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i$$

NCV_i : is the net calorific value of fuel *i* that is specified by countries;

$OXID_i$: is the oxidation factor of the fuel. IPCC default values are used.

$EF_{CO2,i}$, : is the CO_2 emission factor per unit of energy of the fuel *i* (tco_2e/TJ). IPCC default values are used.

STEP 2. Calculate the Build Margin emission factor ($EF_{BM,y}$)

The Build Margin Emission Factor is calculated as the generation-weighted average emission factor (measured in tco_2e/MWh) of a sample of m power plants:

[7] Source: China Power Year Book

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

Where
$F_{i,m,y}$: the amount of fuel i consumed by relevant power sources m in year(s) y.
$COEF_{i,m,y}$: the CO_2 emission coefficient of fuel i, taking into account the carbon content of fuels used by relevant power sources m and the percentage oxidation of the fuel in year(s) y;
$GEN_{m,y}$: the electricity delivered to the grid by source m in year y.

ACM0002 provides two options for calculating $EF_{BM,y}$,and both options have the same requirement on sample group *m:* either the five power plants built most recently or the power plants capacity additions in the electricity system comprising 20% of the system generation (in MWh) and that have been built most recently.

However, it is very difficult to obtain the data of the five power plants built most recently because these data are considered as confidential information by the company itself and the Grid in China. The calculation applied here follows the method of a relevant deviation of methodology approved by the EB, calculating the new capacity additions and the proportion of each component. Then the capacity weight of each component can be worked out. Based on the efficiency factor representing best technology commercially available for fossil fuel fired power plants, the Build Margin emission factor of the proposed project will be calculated.

Deviated Calculation of Build Margin (BM):

Sub-step 1. Calculation of weights of CO_2 emissions of solid, liquid and gas fuel in total emissions for power generation

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

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

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

Where:

$F_{i,j,y}$: the consumption of fuel i for province j in year y (tce);

$COEF_{i,j,y}$: the emission factor (tco_2e/tce) of fuel i, taking into account the carbon content of fuel i and the percentage of oxidation of the fuel in year y;

COAL,OIL and GAS respectively refers to the group of solid, liquid, and gas fuels.

Sub-step 2: Calculation of Emission Factor of Relevant Thermal Power

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$$

Where: $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ respectively refers to the emission factor representing best technology commercially available for fuel of coal, oil or gas fired power plants.

Sub-step 3: Calculation of BM of the Grid

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

Where:
CAP_{Total} is the total of new capacity additions;
$CAP_{Thermal}$ is the new capacity addition of thermal power.

STEP 3. Calculate the baseline emission factor EF_y
The Baseline Emission Factor is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin.

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$

The defaults weights are used, i.e. each of the Operating Margin and Build Margin is weighted equally.

$w_{OM} = w_{BM} = 0.5$

Baseline Emissions of electricity displacement are calculated as the ex-ante Baseline Emission Factor multiplied by annual power supply.

$$ER_{electricity,y} = EG_y \cdot EF_y$$

Where:
$ER_{electricity,y}$: the baseline emission of North China Power Grid in year y;
EG_y : the amount of power generated by the project and supplied to the grid;
EF_y : ex-ante emission factor calculated according to the above formulas.

Project Emissions

The anthropogenic emissions by sources of GHGs of the project activity in year *y* PE_y can be determined as follows:

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

where:
PE_y : Total project CO_2 emissions during the year *y*(tco_2e/yr);
PET_y : CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant (tco_2e/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_2e/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_2e/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)

Emissions from biomass controlled burning in the power plant:

Consistent with IPCC Guidelines, CO_2 emissions from biomass combustion at the project site is equal to the release of the CO_2 absorbed on a sustainable basis by plants that is replanted every year. The same treatment is not extended to methane emissions. When biomass is combusted in a well-controlled manner at the project, methane emissions are small in quantity but still not zero.

$$PE_{Biomass,CH4,y} = EF_{CH4,BF} \cdot \sum_k BF_{k,y} \cdot NCV_k$$

where:
$PE_{biomass,CH4,y}$: Project emissions from biomass controlled burning (tco_2eq/year)
$BF_{k,y}$: Quantity of biomass residue type *k* combusted in the project plant during the year *y* (ton)
NCV_k : Net calorific value of the biomass residue type *k* (GJ/ton)
$EF_{CH4,BF}$; CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)

According to the chosen baseline methodology, the project proponent will monitor the consumption and Net Calorific Values of each type of biomass consumed in the power plant. However, given that the amounts of each type of biomass remain constant in time (homogeneous biomass mix); this PDD will consider applying the biomass mix and the corresponding weighted average Net Calorific Value for emission reduction calculations.

Emissions from biomass transportation to the power plant:

Transporting biomass from the suppliers to the proposed project site is normally done by trucks, which results in direct GHG emissions. The emissions related to biomass transportation to the plant in year *y* can be calculated as follows:

$$PET_y = \frac{\sum_k BF_{k,y}}{TL_y} \cdot AVD_y \cdot EF_{km,CO2,y}$$

where:
PET_y : CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant (tco_2e/yr)

AVD_y : Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year *y* (km)

$EF_{km,CO2,y}$: Average CO_2 emission factor for the trucks measured during the year *y* (tco_2e/km)

$BF_{k,y}$: Quantity of biomass residue type *k* combusted in the project plant during the year *y* (ton)

TL_y : Average truck load of the trucks used (ton) during the year y.

Emissions from fossil fuel consumption in the power plant:

The boiler needs a small amount of fossil fuel (diesel) for start-ups, which is the major fossil fuel consumption source expected within the power plant. However, the diesel consumption is not expected to be large, as start-ups do not happen frequently in a year. If any other equipments or machines at the proposed project site consume fossil fuel, the amount of fossil fuel consumption will result emissions. This additional consumption of fossil fuel in the power plant generates GHG emissions, which in year *y* can be estimated as follows:

$$PEFF_y = \sum_i (FF_{project\ plant,i,y} + FF_{project\ site,i,y}) \cdot NCV_i \cdot COEF_i$$

where:

$FF_{project\ plant,i,y}$: Quantity of fossil fuel type *i* combusted in the biomass residue fired power plant during the year *y* (ton/year)

$FF_{project\ site,i,y}$: Quantity of fossil fuel type *i* combusted at the project site for other purposes that are attributable to the project activity during the year *y* (ton/year)

NCV_i : Net calorific value of fossil fuel type *i* (GJ/ton)

$COEF_i$: CO_2 emission factor for the fossil fuel type *i* (tco$_2$e/ GJ).

Emissions from electricity consumption

When the power generator stops operating for maintenance or other purpose, the proposed project may need a certain electricity supply from the gird. The total amount of this electricity consumption is expected to be small, which in year *y* can be estimated as follows:

$$PE_{EC,y} = EC_{PJ,y} \cdot EF_{grid,y}$$

where:

$PE_{EC,y}$: CO_2 emissions from on-site electricity consumption attributable to the project activity (tco$_2$e/yr)

$EC_{PJ,y}$: On-site electricity consumption attributable to the project activity during the year *y* (MWh)

$EF_{grid,y}$: CO_2 emission factor for grid electricity during the year *y* (tco$_2$e/MWh)

Leakage

The main source of potential leakage is that the project diverts biomass from other consumers and by-so-doing causes an increase of fossil fuel usage in the surrounding area. According to the baseline methodology applied to this project activity, there are two alternatives to estimate leakage emissions:

Alternative A: Demonstrate that the biomass consumption of the power plant will not result in increased fossil fuel consumption elsewhere. To do so, the baseline methodology presents three options:

1. Show that biomass is not used at all, but burned or left for decay and that this situation would continue without the implementation of the project activity.
2. Show that there is a considerable surplus of biomass in the area, which is not utilized. It is necessary to demonstrate that the quantity of available biomass in the region is at least 25% larger

than the quantity of biomass that is utilized (e.g. for energy generation or as feedstock), including the project plant.

3. Show that biomass suppliers in the area are not able to sell all their biomass in the project area.

If the project proponent can prove the adequacy of biomass through any of these options, leakage is assumed zero.

$L_y = 0$

It will be shown in following sections of this PDD, that the proposed project activity does not increase the consumption of fossil fuels due to the diversion of biomass from other users in the power plant area. Option 2 is selected to demonstrate the leakage from the project activity is zero.

Alternative B: If the project proponent is not able to demonstrate that the biomass consumption of the power plant will not result in increased fossil fuel consumption else where, then leakage must be monitored and deducted from the net project emissions. Leakage effects in year *y* are given by:

$$L_y = EF_{CO2,LE} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k$$

where:

L_y : Leakage emissions during the year *y* (tco_2e/yr)

$EF_{CO2,LE}$: CO_2 emission factor of the most carbon intensive fuel used in the country (tco_2e/GJ)

$BF_{PJ,k,y}$: Incremental quantity of biomass residue type *k* used as a result of the project activity in the project plant during the year *y* (ton or liter)

k : Types of biomass residues for which leakage effects could not be ruled out with one of the approaches L_1, L_2 or L_3 above

NCV_k : Net calorific value of the biomass residue type *k* (GJ/ton or GJ/liter)

Leakage emissions are calculated for each type of biomass fuel. For further details, please refer to the leakage section of the chosen methodology by the project activity.

Project Emission Reductions

The total net emission reductions from the project activity during a given year *y* can be calculated 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_2e/yr)

$ER_{electricity,y}$: Emission reductions due to displacement of electricity during the year *y* (tco_2e/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_2e/yr)

L_y : Leakage emissions during the year *y* (tco_2e/yr)

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

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Data / Parameter:	**EF_{OM}**
Data unit:	tco_2e/ MWh
Description:	Operating Margin Emission Factor
Source of data used:	Baseline Emission Factors for Power Grids in China, sourced from http://cdm.ccchina.gov.cn/
Value applied:	1.0797
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated according to the updated Baseline Emission Factors for Power Grids in China based on ACM0002 and EB guidance
Any comment:	

Data / Parameter:	**EF_{BM}**
Data unit:	tco_2e/ MWh
Description:	Build Margin Emission Factor
Source of data used:	Baseline Emission Factors for Power Grids in China, sourced from http://cdm.ccchina.gov.cn/
Value applied:	0.9066
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated according to the updated Baseline Emission Factors for Power Grids in China based on ACM0002 and EB guidance.
Any comment:	

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

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In line with Section B3, the emission reduction of the proposed project is calculated as following:

Baseline Emissions

Unused biomass baseline emissions

Due to lack of commercialized technology for biomass residues utilization in China, it has caused serious problems for agriculture industry that how the surplus biomass residues supply to demand is disposed. A part of these biomass residues are used as fertilizing, forage and cooking. However, a significant portion of the surplus resource is still left in piles for natural decay or burning. According to the selected methodology, open-air burning is the baseline alternative that can be chosen in this situation for being conservative, the PDD assumes that biomass will be burned in open-air if not used by the proposed project.

It should be noted that this is a very conservative assumption, as in reality, some of the unused biomass is left in piles for natural decay rather than being burned. However when biomass is left to decay, it will release more of the carbon it contains as methane than when it is burned in open air. This leads to significantly higher GHG emissions given the large Global Warming Potential of methane. By assuming open-air burning of all currently unused biomass and excluding from the baseline methane emission from decaying biomass, the PDD understates baseline emissions and keeps the baseline conservative. In open air burning, most of the carbon contained in the biomass is released in the form of CO_2 with only a small amount as methane. Given methane's potential for global warming, the baseline analysis addresses the amount of carbon released as methane in open-air burning.

Having no measurements for uncontrolled burning of biomass in the open-air available by the time this PDD was written, the most conservative factor for correcting the methane emission factor for combustion of biomass in agriculture was chosen, which is suggested in the baseline methodology for the proposed project activity. The specific parameters and calculations are as follows:

Table B 6.3.1 Unused Biomass Baseline Emissions

	Parameter	Unit	Amount	Source or Equation
A	Biomass burned	tonne	123,600	Feasibility Study
B	Methane Emission Factor in agriculture or forestry	tCH_4/tonne	0.0027	IPCC default value
C	Conservativeness factor		0.73	Baseline methodology
D	Global Warming Potential of CH_4		21	IPCC default value
E	Unused biomass baseline emissions	tco_2e/year	**5,116**	F=A*B*C*D*E/1000

According to this, the estimated amount of methane released by open-air burning in the absence of the Project is **5,116 tco_2e** per year. Please see Annex 3 for details.

Electricity generation baseline emissions

According to methodology ACM0002，the proposed project applies ex-ante emission factor. The parameters and calculations of Electricity Generation Baseline Emissions are as follows:

Table B 6.3.2. Electricity Generation Baseline Emissions

	Parameter	Unit	Amount	Source or Equation
A	Project installed capacity	MW	24	Feasibility Study
B	Annual electricity supplied	MWh	112,086	Feasibility Study
C	Baseline Emissions Factor	tco_2e/MWh	0.993	Official Emission Factor published by Chinese DNA
D	Electricity generation baseline emissions	tco_2e/year	111,318	D= B * C

Baseline emissions summary

Based on the calculations above, the total baseline emission amounts are as follows:

Table 6.3.3 Total Baseline Emissions

	Parameter	Unit	Amount	Source or Equation
A	Unused biomass baseline emissions	tco_2e/year	5,116	Table B 6.3.1
B	Electricity generation baseline emissions	tco_2e/year	111,318	Table B 6.3.2
C	Total baseline emissions	tco_2e/year	116,434	C=A+B

The annual total baseline emissions are **116,434 tco_2e.**

Project Emissions

GHG emissions from biomass combustion in the power plant

The IPCC default value of methane emission factor for wood or other solid biomass waste is 30 Kg/TJ. The proposed "conservativeness factor" for the correction of the methane emission factor is 1.37. The specific parameters and calculations are as follows:

Table B 6.3.4 GHG Emissions from Biomass Combustion in the Power Plant

	Parameter	Unit	Amount	Source or Equation
A	Biomass burned	tonne/year	123,600	Feasibility Study
B	Biomass Net Calorific Value (NCV)	TJ/tonne	0.0148	Feasibility Study
C	Methane Emission Factor (controlled burning)	$KgCH_4$/TJ	30	IPCC default value
D	Conservativeness factor		1.37	Baseline methodology
E	Global Warming Potential of CH_4		21	IPCC default value
F	GHG emissions from biomass combustion	tco_2e/year	**1,579**	F=A*B*C*D*E/1000

GHG emissions from On-site electricity consumption

The power plant will support all the electricity needs at the project site. When the power plant stops operating for maintenance and other purpose, some equipments and machines that consume electricity still need to be operating. A certain amount of electricity will be purchased from the Grid to support the operation. It is estimated that **1,121MWh** are expected to be purchased from the Grid per year. The specific parameters and calculations are as follows:

Table B 6.3.5 GHG emissions from On-site electricity consumption

	Parameter	Units	Amount	Source or Equation
A	On-site electricity consumption	MWh	1,121	Feasibility Study
B	Baseline Emissions Factor	tco_2e/MWh	0.993	Official Emission Factor published by

				Chinese DNA
C	GHG emissions from on-site electricity consumption	tco_2e/year	1,113	C= A * B

Hence, the On-site electricity consumption will result in **1,113 tco_2e** per year.

GHG emissions from fossil fuel combustion
At present, it is estimated that 20 additional tonnes of diesel per year would be required to operate the power boiler, which is the main fossil fuel consumption source of the proposed project. The specific parameters and calculations are as follows:

Table B 6.3.6 GHG Emissions from Fossil Fuel (diesel) Combustion in the Power Boiler

	Parameter	Unit	Amount	Source or Equation
A	Fossil fuel (diesel) used in the boiler	tonne/year	20	Project developer
B	Fossil fuel Net Calorific Value (NCV)	TJ/tonne	0.0427	China Energy Statistical Yearbook 2005
C	Fossil fuel carbon content	tC/TJ	20.2	IPCC default value
D	Fraction of carbon oxidized		1.00	IPCC default value
E	CO_2 / C conversion factor		3.67	IPCC default value
F	GHG emissions from fossil fuel combustion	tco_2e/year	**63**	F=A*B*C*D*E

Based on the IPCC Guidelines, the estimated emissions from diesel combustion in the project power boiler are **63 tco_2e** per year. When the proposed project put into operating, any fossil fuel consumed by equipments and machines of the proposed project will be monitored and calculated as project emissions.

Although GHG emissions from this source are expected to be minimal in size, it is included in the calculations of project emissions. At current prices, fossil fuels are more expensive than biomass as fuel. Therefore, there are strong economic disincentives to use fossil fuel, except for the absolutely necessary usage for start-ups. For this reason, it is expected that the use of fossil fuel will be small in quantity.

GHG emissions from biomass transportation to the power plant
There are several local biomass collection sites planned close to the crop fields for the convenience of the farmers. Transporting biomass from the local collection sites to the proposed project site by trucks results in direct emissions. For simplicity, the calculation below uses the number of trips made by trucks per year, the average distance per trip[8] and the IPCC default emission factor for transportation truck[9] to calculate the transportation emissions. This algorithm is provided in the chosen baseline methodology as one of the two options available to calculate the transportation emissions of a biomass generation project activity. The specific parameters and calculations are as follows:

[8] For conservatism, it is assumed that trucks need to make return journeys without picking up other loads.

[9] The IPCC Guidelines provide several carbon emission factors for large trucks. This PDD uses the Moderate Control index for the US Light Duty Diesel Vehicle.

Table B 6.3.7 GHG Emissions from Biomass Transportation to the Power Plant

	Parameter	Unit	Amount	Source or Equation
A	Biomass demand	tonne/year	123,600	Feasibility Study
B	Average load per trip	tonne	10	Project developer
C	Average distance between storage site and the power plant	km	60	Project developer
D	Emission Factor of truck transportation	tco_2e/kM	0.000331	IPCC default value from the Moderate Control index for the US Heavy Duty Diesel Vehicle
E	GHG emissions from biomass transportation	tco_2e/year	**245**	E=A/B*C*D

The estimated GHG emissions from biomass transportation to the power plant are **245 tco_2e** per year.

Leakage

An important aspect of the leakage issue relates to whether the proposed project displaces current use of biomass as a fuel. If this occurs and drives current users of biomass to resort to more carbon intensive fuels, the amount of such fuel switch must be deducted from the project's emission reduction benefits.

According to a survey, the annual output of cotton straws in Wudi County is 206,000 tonnes, and the total production of cotton straws within 30 kilometres away around the site of the proposed project is 356,400 tonnes per year. Cotton straws are planned to be utilized as main fuel of the proposed project. Currently, only 71,280 tonnes of the biomass resource per year is utilized for household fuel, forage and cooking etc, which accounts for 20% of the total production of cotton straws. There is 285,120 tonnes of straws left unused annually. The implementation of the project needs a supply of 123,600 tonnes of biomass residues per year. After operation of the proposed project, the quantity of available cotton straw in the region is over 45% larger than the quantity of cotton straw is utilized including the proposed project (194,880 tonnes in total). The huge surplus biomass residues supply comparing to the limited demand from the proposed project is expected not to be changed significantly in the lifetime of the proposed project. Therefore, the biomass supply to the proposed project will be sufficient and not result leakage during the life time of the proposed project.

According to the information presented above, no significant leakage is anticipated for the proposed project activity. Therefore the leakage for the proposed project activity is zero:

$$L_{Py} = 0$$

The supply / demand status within the proposed project influence area will be periodically monitored as indicated in the chosen baseline and monitoring methodologies applied to this project activity.

Project Emission Reductions

Net emission reductions of the proposed project = Total baseline emissions – Total project emissions

The annual total baseline emissions are **116,434 tco_2e**
The annual total project emissions are **3,001 tco_2e**.
The annual reductions are estimated to be: **113,433 tco_2e**. The proposed project activity is expected to achieve **794,034** tco_2eq of net emission reductions during the first 7-year crediting period.

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

>>

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2008	**3,001**	**116,434**	**0**	**113,433**
2009	**3,001**	**116,434**	**0**	**113,433**
2010	**3,001**	**116,434**	**0**	**113,433**
2011	**3,001**	**116,434**	**0**	**113,433**
2012	**3,001**	**116,434**	**0**	**113,433**
2013	**3,001**	**116,434**	**0**	**113,433**
2014	**3,001**	**116,434**	**0**	**113,433**
Total (tonnes of CO_2e)	**21,005**	**815,039**	**0**	**794,034**

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

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	$EG_{project\ plant,y}$
Data unit:	MWh
Description:	Net electricity delivered to the grid by the proposed project during the year y
Source of data to be used:	Electricity meter reading at connection point between the proposed project and the Grid
Value of data applied for the purpose of calculating expected emission reductions in section B.5	112,086
Description of measurement methods and procedures to be applied:	The readings of electricity meter will be hourly measured and monthly recorded. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup.
QA/QC procedures to be applied:	The electricity output from the plant will be monitored and recorded at the on-site control centre using a computer system.

	The project operator is responsible for recording this set of data Receipts from electricity sales and the quantity of fuels fired will also be obtained for double check.
Any comment:	

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh
Description:	On-site electricity consumption attributable to the project activity during the year *y*. The electricity consumed by the biomass collection storage sites are counted as on-site electricity consumption, including straw crushing machine, the weighing and packaging, etc.
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,121
Description of measurement methods and procedures to be applied:	Use electricity meters. The electricity consumed at power plant and biomass collection storage sites shall be monitored by electricity meters respectively, and total on-site electricity consumption will be summed. The quantity shall be cross-checked with electricity purchase receipts. Continuously, aggregated at least annually.
QA/QC procedures to be applied:	Cross-check measurement results with invoices for purchased electricity.
Any comment:	

Data / Parameter:	$BF_{k,,y}$
Data unit:	tonne
Description:	Quantity of biomass fuel type k combusted in the project plant during the year y
Source of data to be used:	Procurement Department of the power plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	123,600
Description of measurement methods and procedures to be applied:	Use weight meters. The quantity of biomass combusted will be collected separately for each fuel type of biomass. Adjust for the moisture content in order to determine the quantity of dry biomass. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	Any direct measurements with mass or volume meters at the plant site should be cross-checked with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	

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 used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0%
Description of measurement methods and procedures to be applied:	Continuously, mean values calculated at least annually
QA/QC procedures to be applied:	Check the results with regional statistic information
Any comment:	In case of dry biomass, monitoring of this parameter is not necessary. The biomass residues in this PDD are assumed to be dry biomass residues.

Data / Parameter:	NCV_i
Data unit:	GJ / tonne
Description:	Net Calorific Value of biomass fuel type i
Source of data to be used:	Procurement Department of the power plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0148
Description of measurement methods and procedures to be applied:	Measurements shall be carried out at reputed laboratories and according to relevant international standards. Measure the NCV based on dry biomass. At least every three months, taking at least three samples for each measurement. Net Calorific Value will be determined separately for each type of biomass and will be based on measurements or reliable local or national data. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, collect additional information or conduct measurements is a feasible way.
Any comment:	

Data / Parameter:	EF_{CH4}
Data unit:	Kg CH_4 / TJ
Description:	Methane Emission Factor for combustion of biomass in the project plant
Source of data to be used:	IPCC manual
Value of data applied for the purpose of calculating expected emission reductions in section B.5	30
Description of measurement	Methane Emission Factor will be measured at the project site or

methods and procedures to be applied:	obtained from the last version of the IPCC manual. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The latest IPCC default values will be used where appropriate.
Any comment:	Conservativeness factors will also be documented.

Data / Parameter:	AVD_y
Data unit:	km
Description:	Average return trip distance between biomass fuel supply sites and the project site
Source of data to be used:	Procurement Department of the power plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	60
Description of measurement methods and procedures to be applied:	Distance travelled by trucks will be continuously monitored and recorded. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	Check consistency of distance records provided by the truckers by comparing recorded distances with information from other sources (e.g. maps).
Any comment:	If biomass is supplied from different sites, this parameter should correspond to the mean value of km travelled by trucks that supply the biomass plant

Data / Parameter:	TL_y
Data unit:	tonne
Description:	Average load of the trucks used for transportation of biomass
Source of data to be used:	Procurement Department of the power plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	10
Description of measurement methods and procedures to be applied:	Determined by averaging the weights of each truck carrying biomass to the project plant This parameter will be monitored regularly by the chief operator of the power plant. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	Average truckload capacity will be calculated and checked regularly during the year.
Any comment:	

Data / Parameter:	$EF_{km,CO2}$
Data unit:	tco_2e/km
Description:	Average CO_2 Emission Factor for transportation of biomass with trucks
Source of data to be used:	IPCC manual
Value of data applied for the purpose of calculating	0.000331

expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	IPCC default value for Moderate control US Light Duty Diesel Trucks from the IPCC manual will be used. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, conduct other measurements is a feasible way.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ / tonne
Description:	Net Calorific Value of fossil fuel type *i* consumed by the power plant
Source of data to be used:	Procurement Department of the power plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0427
Description of measurement methods and procedures to be applied:	Measurements or local / national data will be used if available. Otherwise, default IPCC values will be used. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, collect additional information or conduct measurements is a feasible way.
Any comment:	

Data / Parameter:	$EF_{CO2,FF,i}$
Data unit:	tC/TJ
Description:	CO2 Emission Factor of fossil fuel i consumed by the power plant
Source of data to be used:	IPCC default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	20.2
Description of measurement methods and procedures to be applied:	Emission factors will be applied to fuel consumption for on-site fuel consumption. Measurements or local / national data will be used if available. Otherwise, default IPCC values will be used. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, collect additional information or conduct measurements is a feasible way.
Any comment:	i refers to diesel in the proposed project

Data / Parameter:	$FF_{project\ plant,i,y}$
Data unit:	Tonne/year
Description:	Quantity of fossil fuel type *i* combusted in the biomass residue fired power plant during the y year
Source of data to be used:	Procurement Department of the power plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	20
Description of measurement methods and procedures to be applied:	Use weight meters. Any type of fossil fuel consumption in the Power Plant will be continuously monitored and recorded. The data will be crosschecked by purchase receipts. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The consistency of metered fuel consumption should be crosschecked with purchase receipts.
Any comment:	This should include fossil fuels co-fired in the project plant but not any other fuel consumption at the project site that is attributable to the project activity (e.g. for mechanical preparation of the biomass residues)

Data / Parameter:	$FF_{project\ site,i,y}$
Data unit:	Tonne/year
Description:	Quantity of fossil fuel type *i* combusted at the project site for other purposes that are attributable to the project activity during the y year
Source of data to be used:	Procurement Department of the power plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Use weight meters. Any type of fossil fuel consumption in the Power Plant will be continuously monitored and recorded. The data will be crosschecked by purchase receipts. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The consistency of metered fuel consumption should be crosschecked with purchase receipts.
Any comment:	This should not include fossil fuels co-fired in the project plant but any other fuel consumption at the project site that is attributable to the project activity (e.g. for mechanical preparation of the biomass residues). This mechanical preparation of the proposed project use electricity but not fossil fuel at this moment.

Data / Parameter:	$EF_{burning,CH4,k,y}$
Data unit:	tCH_4/ton biomass
Description:	CH_4 emission factor for uncontrolled burning of the biomass

	residue type *k* during the year *y*
Source of data to be used:	IPCC Default Value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0027
Description of measurement methods and procedures to be applied:	Review of default values annually.
QA/QC procedures to be applied:	Review of default values annually.
Any comment:	The proposed project includes CH_4 emissions from biomass combustion in the project boundary. Therefore, this parameter needs to be monitored.

Data / Parameter:	$BF_{k, available}$
Data unit:	tonne
Description:	Quantity of available biomass residues of type *k* in the region
Source of data to be used:	Survey or statistics from local government
Value of data applied for the purpose of calculating expected emission reductions in section B.5	285,120
Description of measurement methods and procedures to be applied:	Data will be obtained from statistic or survey conducted by local government annually. Data will be kept for 2 years following the end of the crediting period
QA/QC procedures to be applied:	Where possible, supplementary data sources and expert judgment should be used to support findings.
Any comment:	Required by approach L_2 to rule out leakage. The proposed project will utilize cotton straw.

Data / Parameter:	$BF_{k, used}$
Data unit:	tonne
Description:	Quantity of biomass residues of type *k* that are utilized (e.g. for energy generation or as feedstock) in the defined project boundary that supply biomass residues to the proposed project
Source of data to be used:	Survey or statistics from local government
Value of data applied for the purpose of calculating expected emission reductions in section B.5	123,600
Description of measurement methods and procedures to be applied:	Data will be obtained from statistic or survey conducted by local government annually. Data will be kept for 2 years following the end of the crediting period
QA/QC procedures to be applied:	Where possible, supplementary data sources and expert judgment should be used to support findings.
Any comment:	Required by approach L_2 to rule out leakage. The proposed project

	will utilize cotton straw.

Data / Parameter:	GWP_{CH4}
Data unit:	tco_2e/tCH_4
Description:	Global warming potential for CH_4
Source of data to be used:	IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	21
Description of measurement methods and procedures to be applied:	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions.
QA/QC procedures to be applied:	Check with COP/MOP decisions after the first commitment period.
Any comment:	

Data / Parameter:	$EF_{CO2,LE}$
Data unit:	tco_2e/GJ
Description:	CO_2 emission factor of the most carbon intensive fuel used in the country
Source of data to be used:	Identify the most carbon intensive fuel type from official sources. Conduct survey with the support from local government If available, use national default values for the CO_2 emission factor. Otherwise, IPCC default values may be used.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not necessary in this PDD
Description of measurement methods and procedures to be applied:	Conduct survey with the support from local government to identify this value annually if any leakage occurs.
QA/QC procedures to be applied:	Access this value from governmental sources to check. Check the survey identified value with national values and IPCC default values.
Any comment:	This parameter applies only if leakage effects are identified

B.7.2. Description of the monitoring plan:

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This Monitoring plan will set out a number of monitoring tasks in order to ensure that all aspects of projected greenhouse gas (GHG) emission reductions for the proposed project are controlled and reported. This requires an on going monitoring of the project to ensure performance according to its design and that claimed Certified Emission Reductions (CERs) are actually achieved.

The monitoring plan of the proposed project is a guidance document that provides the set of procedures for preparing key project indicators, tracking and monitoring the impacts of the proposed project. The monitoring plan will be used throughout the defined crediting period for the project to determine and provide documentation of GHG emission impacts from the proposed project. This monitoring plan fulfils the requirement set out by the Kyoto Protocol that emission reductions projects under the CDM have real, measurable and long-term benefits and that the reductions in emissions are additional to any that would occur in the absence of the certified project activity.

The monitoring plan provides the requirements and instructions for:

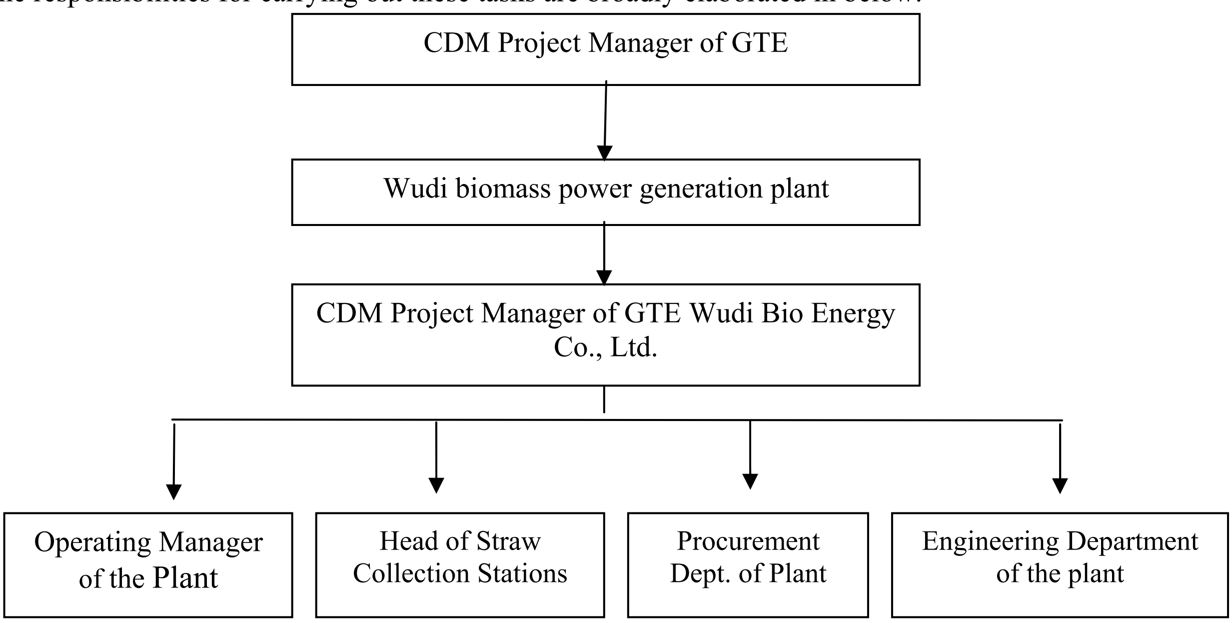
- Establishing and maintaining the appropriate monitoring systems for electricity generated by the project;
- Quality control of the measurements;
- Procedures for the periodic calculation of GHG emission reductions;
- Assigning monitoring responsibilities to personnel;
- Data storage and filing system;
- Preparing for the requirements of an independent, third party auditor or verifier.

1 User of the Monitoring Plan & Procedure

The staffs of Guodian Wudi Bio Energy Co., Ltd at the biomass residues collection sites will record the data to be monitored concerning with information of biomass residues purchased from local area. The manager of the collection sites will be responsible for quality control and summary of this information. When the biomass is transported to the site of the power plant, the data of the biomass residues collection and transportation will be recorded by the staff of National Guodian Wudi Bio Energy Co., Ltd and stored in the power plant. The summary of biomass consumption by the power plant will be calculated by the CDM Project Manager of the proposed project monthly. Another data to be recorded is the fossil fuel consumption by the power plant and on-site electricity consumption. The related responsible operators will record this data, and the CDM manager will collect the data monthly. Other related data need to be monitored are described in Section 5 below.

The CDM manager will in charge of the implementation of this Monitoring Plan and summarizing the results. The results will be checked by the General Manager of National Guodian Wudi Bio Energy Co., Ltd. ensuring the quality and accuracy of the data monitored. The monthly summary will be reported to the headquarter of Guodian Technology & Environment Group Co. in Beijing. The CDM Manager of the Guodian Technology & Environment Group Co. will calculate the emission reductions of the proposed project and develop reports with the support from Easy Carbon Consultancy Co. Ltd.

The responsibilities for carrying out these tasks are broadly elaborated in below.



Responsibilities of the proposed project in Wudi:
Operating Manager of the plant: Overall management of the implementation of the monitoring plan and quality control of data and records.
Head of Staw Collection Stations: straw collection and summarizing the data collected at the collection stations in terms of types, amount, and transportation record, etc of straws. Ensuring the biomass at the sites will not be stored over half year.
Engineering Department of the plant: in charge of the monitoring of electricity meters and calibration, biomass consumption of NCV of each kind of biomass, fossil fuel consumption within the power plant including boilers, crashing machines,etc, as well as maintenance of equipments
Procurement Dept. of the plant: cross checking the monitoring records with receipt and procurement records.

2. Calibration of Meters & Metering

2.1 Electricity output meter
An agreement should be signed between the project owner and the Grid that defines the metering arrangements and the required quality control procedures to ensure accuracy. The accuracy of the ammeter will be 0.2s. The metering equipment will be properly calibrated and checked annually for accuracy according to Technical Administrative Code of Electric Energy Metering（dl/t448-2000）. The project owner will prepare backup procedures to deal with any errors occurred to the meters. In case of any errors happens, the grid-connected electricity generated by the proposed project shall be determined by the project owner and the Grid jointly according to the error handling procedures.

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

2.2 Electricity input meter
Following the same process as listed in 2.1.

2.3 Biomass residues consumption
The project owner will conduct an energy balance analysis to verify the amounts of biomass residues collected at the collection sites, purchased at biomass procurement department of the power plant and combusted by the boilers. If significant difference among the three sources identified, the project developer will conduct further check the original records to find out reasons and correct. If the significant difference can’t be resolved, the most conservative value of biomass utilized by the proposed project will be applied as monitoring results.

3. Monitoring

3.1 Electricity Generated

Grid-connected electricity generated by the proposed project will be monitored through metering equipment at the substation continuously (interconnection facility connecting the facility to the Grid). The data can also be monitored and recorded at the on-site control center using a computer system. The meter reading will be readily accessible for DOE. Calibration tests records will be maintained for verification.

3.2 Availability of Biomass Residues
The project developer will provide evidence to DOE concerning with the availability of Biomass residues resource in the nearby counties. This will be obtained from official information yearly. If it is not available, the data will be calculated or estimated based on a survey conducted by project developer yearly.

3.3 Biomass Residues Consumption of the Power Plant
The quality and type of biomass residues burned by the power plant will be monitored during the operation of the power plant, including all the necessary parameters of the biomass residues to be monitored according to Section B.7 of this PDD. All relevant records will be maintained for verification.

3.4 Fossil Fuel Consumption by the boiler
Fossil Fuel Consumption by the boiler during the operation will be recorded and monitored during the operation period of the proposed project continuously. All relevant records will be maintained for verification.

3.5 Transportation of Biomass residues
The project developer of the proposed project will structure a recording and monitoring system within the biomass residues supply and management system covering all the biomass collection sites established by the proposed project. The quantity and type of biomass, transportation vehicle and transportation distance to the collection sites will be recorded by company staffs at the sites continuously. The receipts and records regarding with biomass purchase by the proposed project will be documented and summarized for verification. The transportation of the biomass from the collection sites to the power plant will be monitored and documented by the project developer to determine the fossil fuel consumption by the biomass transportation activity. The transportation records will be documented and maintained for verification.

3.6 Electricity purchased from the grid
When the generator stops working due to maintenance or other purpose, the proposed project needs a certain amount of electricity from grid. This amount will be metered, and the record be kept for examination.

The straw crushing machines, the weighing and packaging systems are planned to be located at the or close to the site of the proposed project[10]. Electricity consumed by these machines will be supplied directly from the power plant, which will be monitored calculated as part of the project emissions.

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

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[10] In case straw crushing machines, the weighing and packaging systems are located far from the power plant, electricity and energy consumption from these machines will be recorded and monitored at the sites of their locations as project emissions as well.

3.7 Leakage

Amount of biomass types consumed and Quantity of biomass types that is available in surplus in the counties that defined in Project Boundary will be monitored to check the leakage effect brought by the operation of the proposed project. This will be obtained from official information, such as agriculture statistics and survey of Counties defined within Project Boundary that supply biomass residues to the proposed project. If it is not available, the data will be calculated or estimated based on a survey conducted by project developer with the support from governmental entity. If any leakage occurs during the crediting period, the project developer will determine the parameters in terms of leakage effects according the definition in the PDD with the support from local government entity.

4. Quality Assurance and Quality Control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity. This is an on-going process that will be ensured through the CDM in terms of the need for verification of the emissions on an annual basis according to this PDD and the CDM manual.

5. Data Management System

This provides information on record keeping of the data collected during monitoring. Record keeping is the most important exercise in relation to the monitoring process. Without accurate and efficient record keeping, project emission reductions cannot be verified. Below follows an outline of how project related records would be managed.

Overall responsibility for monitoring of GHG emissions reduction will rest with the CDM responsible person of the proposed project. The CDM manual sets out the procedures for tracking information from the primary source to the end-data calculations in paper document format. It is the responsibility of the proposed project owner to provide additional necessary data and information for validation and verification requirements of respective DOE. Physical documentation such as paper-based maps, diagrams and environmental assessment will be collated in a central place, together with this monitoring plan. All paper-based information will be stored by the project owner and kept at least one copy.

6. Verification and Monitoring Results

The verification of the monitoring results of the project is a mandatory process required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported and projected in the PDD. It is expected that the verification will be done annually.

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)

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Date of completion of the application of the baseline study and monitoring methodology: 01/01/2007

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The personnel above are not Project Participants of the proposed project

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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:

>>
01/01/2007(starting date of construction)

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

>>
22 years

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

C.2.1. Renewable crediting period

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

>>
01/01/2008

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

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

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The Environment Impact Assessment Report of the proposed project was completed in Feb 2006, and approved by Shandong Environmental Protection Bureau in February. The conclusions of the analyses and measures to be taken to mitigate the environment impacts are demonstrated as the following:

Air
The main air pollution sources in construction phase are dusts from the earthwork of flatting ground and building foundations, and the exhaust gas from vehicles. In order to reduce the air pollution, several measures during construction will be applied including sprinkling water on abandoned soil in sunny or windy days to prevent dust blowing, avoiding overload when transporting abandoned soil, and in time cleaning if the abandoned soil is scattered on the way.

SO_2, dust and soot, and NO_x emissions are the major atmospheric pollutants during the operational phase. To handle the problem of dust and soot, bag-type dust remover, the efficiency of which can reach to 99.85% will be chosen. Due to the low content of sulphur, the concentration of SO_2 in the emissions is also quite low. Therefore, the emission levels of SO_2, dust and soot, and NO_x all accord with the National Emission Standard for 3 periods of time, which is the Emission Standard of Air Pollutant Applied to Thermal Power Plant (GB13223-2003).

Water
The wastewater emissions are mainly from domestic living and production. During construction, the quantity of wastewater is very little, leading to insignificant impact.

In the operational phase, wastewater emissions from both civil life and production will be treated in the wastewater treatment plant through biology-chemistry method. The emissions thus will meet the requirements of the Grade I of the Standard of Comprehensive Emissions of Wastewater (GB8978－1996). Leakage proof measures will be undertaken in all wastewater treatment facilities and the production areas to prevent the underground water from pollution.

Noise
Noises from the machine such as navvy, bulldozer, pile driver, and cement mixer are the major noise pollution sources. Several measures have been taken including avoidance of working at night, keeping the main work and resting place away from the source of high-level noise, setting up on water, and building sound proof and insulation protection. Being 1000 meters away from the nearest residents, the noise from the power plant will make very little impact to the local community provided that all the necessary solutions have been conducted.

Due to the application of low-noise equipment and necessary sound proof and insulation instruments, the noise level in operational phase can meet the Category II of the Noise Standard for the Plant of Industrial Enterprise （GB12348－90）, making very little impact to the surroundings.

Solid waste

The main solid wastes generated by the proposed project during construction are construction waste and domestic waste. The construction waste will be reused to refill as the roadbed and the domestic waste, being very little amount, will be disposed by municipal environmental and sanitary authority.

The main solid waste during operation is the ash from the boilers. The solid waste will not have any adverse impact to local environment.

The assessment report concludes that the proposed project will not have significant negative environment impact. Meanwhile air pollution caused by the biomass burning can be avoided by the comprehensive utilization of biomass residues.

In Feb. 2006, the Shandong Environmental Protection Bureau issued formal remarks for the proposed project, in which the approval of the development and construction is granted. Part of the comments is as follows:

The Project is a biomass power generation project using straw as the fuel. It follows the related national industrial policy and meets the requirements of the clean production and the development of recycling economy. After the implementation of environmental protection measures, the emissions will meet the requirements of national standards and total quantity control. From the point of view of environmental protection, it's approved that the proposed project will be built as what have been described in the assessment report in terms of designed techniques, scale, location, and instruments for environmental protection.

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 environment impacts of Shandong Wudi Biomass Generation Project are not considered significant.

SECTION E. Stakeholders' comments

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

>>

Comments on the construction of the proposed Shandong Wudi Biomass Generation Project are required by local government and the construction company through a series of means of informal discussion, hearing of witnesses and visits to guarantee a successful implementation of the proposed project with the interests of stakeholders being taken into account. The project developer published notice on Stakeholder Consultation Meeting to Wudi Biomass Generation Project on Sept 10, 2006 and sent out 100 copies of questionnaires to the surrounding area of the proposed project in Wudi County. 98 pieces of reply to questionnaires were received. Stakeholder Consultation Meeting to Wudi Biomass Generation Project on Sept 16, 2006, organized by Wudi Plan & Development Bureau of Wudi County and Guodian Wudi Bio Energy Co., Ltd. In the meeting, the proposed project was introduced to participants as well as CDM development plan. The impact by the proposed project to the environment and society etc were discussed in the meeting. Interviewees from local government entities, local grid company and local residents, etc participated in the meeting and questionnaires.

E.2. Summary of the comments received:

>>

The summary of the survey is listed as following:

Item						
Knowledge of the proposed Shandong Wudi Biomass Generation Project	Yes			No		
	87			11		
The environmental issues around the residence area	Waste gas	Waste water	Noise	Solid waste	Ecological landscape	Not know
	33	27	21	4	2	11
The method of local straw disposal	Compost	Civil fuel		Flare	discard	
	8	1		40	49	
Considerations on the environment issues on the project construction	Air pollution	Water pollution		Noise pollution	Solid waste	
	34	41		10	13	
The biggest negative impact of this project	Environmental impact		Construction safety		Social problem	
	51		38		9	
If you are required to remove for the	Agree	Worth considering	Not sure		Disagree	Others

<table>
<tr><td>project, are you willing to change your residence and your life style?</td><td>29</td><td>52</td><td>17</td><td>0</td><td>0</td></tr>
<tr><td rowspan="2">Attitude to the environmental protection measures of the project</td><td colspan="2">Satisfied</td><td colspan="2">Unsatisfied</td><td>Not sure</td></tr>
<tr><td colspan="2">86</td><td colspan="2">0</td><td>12</td></tr>
<tr><td rowspan="2">If environmental protection measures taken, any impacts will incur to you?</td><td colspan="2">Yes</td><td colspan="2">No</td><td>Not sure</td></tr>
<tr><td colspan="2">0</td><td colspan="2">79</td><td>19</td></tr>
<tr><td rowspan="2">If the proposed project will promote local economy and carry out concentrated heat supply</td><td colspan="2">Yes</td><td colspan="2">No</td><td>Not sure</td></tr>
<tr><td colspan="2">94</td><td colspan="2">0</td><td>4</td></tr>
<tr><td rowspan="2">Attitude to the project</td><td colspan="2">necessary</td><td colspan="2">Basically accept</td><td>Unnecessary</td></tr>
<tr><td colspan="2">90</td><td colspan="2">8</td><td>0</td></tr>
</table>

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

>>

It can be learned from the summary that the residents investigated positively support the construction of the project. The improvement for local economy and living condition is considered rather feasible. Since the proposed project is in the limelight around the local residence, interviewees are very concerned about the environment issues related to the proposed project. The residents are not familiar with the advanced technology and environment protection measures applied in the proposed project. Whereas, they have seen the practice of biomass burning in the fields in the past, which caused serious air pollution to local environment. That is why they are worried about the proposed project on the issue of air pollution. Meanwhile, some people propose some instructive advices on the environment protection measures, including noise abatement and waste disposal in the construction field, reinforcing the environment protection management. Actually, the advanced biomass combustion technology applied in the project can mitigate the emission significantly, and will reach the National Environment Standard, which has been clearly illustrated in the Section D1. In conclusion, the local community possesses strong supportive comments on the effects that the project activity will contribute to the local economy and living quality. There consequently has no reason to modify the plans due to comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the Shandong Wudi Biomass Generation Project.

Annex 3

BASELINE INFORMATION

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All the tables related to the calculation of baseline emission reduction are presented below:

Calculation of Operating Margin (OM)

Table A1. Simple OM Emission Factor of North China Power Grid in 2002

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Emission Factor (tc/TJ)	Oxidation rate (%)	Average low Caloric value (MJ/t,km^3)	CO_2 emission (tco$_2$e) K=G*H*I*J*44 /12/10000 (unit of mass)
		A	B	C	D	E	F	G=A+B+C+D+E +F	H	I	J	K=G*H*I*J*44 /12/1000 (unit of volume)
Raw coal	10000 ton	691.84	1052.74	4988.01	4037.39	3218	5162.86	**19150.84**	25.8	100	20908	378783851.5
Cleaned coal	10000 ton						80.71	**80.71**	25.8	100	26344	2011408.131
Other washed coal	10000 ton	3.43		65.2	135.56		106.32	**310.51**	25.8	100	8363	2456568.193
Coke	10000 ton							**0**	29.2	100	28438	0
Coke oven gas	$10^8 m^3$	0.17	1.71		0.75	0.16	0.04	**2.83**	12.1	100	16726	210007.7533
Other coal gas	$10^8 m^3$	15.82		7.34		10.35		**33.51**	12.1	100	5227	777112.2029

Crude oil	10000 ton						14.98	**14.98**	20	100	41816	459362.6987
Gasoline	10000 ton						0.65	**0.65**	18.9	100	43070	19400.8815
Diesel	10000 ton	0.26	2.35	4.12		1.6	10.02	**18.35**	20.2	100	42652	579693.2841
Fuel oil	10000 ton	13.94	0.04	1.22		0.42	20.33	**35.95**	21.1	100	41816	1163041.65
LPG	10000 ton							**0**	17.2	100	50179	0
Refinery gas	10000 ton			0.27				**0.27**	15.7	100	46055	7158.32865
Natural gas	$10^8 m^3$		0.55			0.02		**0.57**	15.3	100	38931	124489.6587
Other oil product	10000 ton							**0**	20	100	38369	0
Other coking product	10000 ton							**0**	25.8	100	28435	0
Other fuel	10000 tce					1.1	15.92	**17.02**	0	0	0	0
											Subtotal	386592094.3

China Energy Statistical Yearbook 2000-2002

Table A2. Thermal Power Generation of North China Power Grid in 2002

Province	**Power Generation （MWh)**	**Ratio of Self Power Consumption of Plant （%）**	**Power Supply （MWh）**
Beijing	17886000	7.95	16464063
Tianjin	27263000	7.08	25332779.6
Hebei	100970000	6.72	94184816
Shanxi	82256000	7.98	75691971.2
Inner Mongolia	51382000	7.93	47307407.4

Shandong	124162000	6.79	115731400.2
Total			374712437.4

China Power Yearbook 2003

Table A3. Emission Factor of North China Power Grid in 2002

	Parameter	Unit	Value	Source
A	Net Import from Northeast China Power Grid to North China Power Grid (MWh)	MWh	2905200	China Power Yearbook 2003
B	Total Emissions of Northeast China Power Grid	tco_2e	157271739.8	Calculation based on data from China Power Yearbook and China Energy Statistical Yearbook
C	Total Power Supply of Northeast China Power Grid	MWh	138139812.6	China Power Yearbook 2003
D	Average Emission Factor of Northeast China Power Grid	tco_2e/MWh	1.138496838	D=B/C
E	Total Power Supply of North China Power Grid	MWh	377617637.4	E=Total Power Generation of North China Power Grid＋A
F	Total Emissions of North China Power Grid	tco_2e	389899655.3	
G	Emission Factor of North China Power Grid	tco_2e/MWh	1.032525011	G=F/E

Table A4. Simple OM Emission Factor of North China Power Grid in 2003

Fuel types	Unit	Beijing	Tianjin	Heibei	Shanxi	Inner Mongolia	Shandong	Subtotal	Emission Factor (tc/TJ)	Oxidation rate (%)	Average low Caloric value (MJ/t,km^3)	CO_2 emission (tco$_2$e) K=G*H*I*J*44 /12/10000 (unit of mass)
		A	B	C	D	E	F	G=A+B+C+D+E +F	H	I	J	K=G*H*I*J*44 /12/1000 (unit of volume)
Raw coal	10000 ton	714.73	1052.74	5482.64	4528.51	3949.32	6808	**22535.94**	25.8	100	20908	445737636.1
Cleaned coal	10000 ton						9.41	**9.41**	25.8	100	26344	234510.5998
Other washed coal	10000 ton	6.31		67.28	208.21		450.9	**732.7**	25.8	100	8363	5796681.315
Coke	10000 ton					2.8		**2.8**	29.2	100	28438	85253.33227
Coke oven gas	10^8m^3	0.24	1.71		0.9	0.21	0.02	**3.08**	12.1	100	16726	228559.6749
Other coal gas	10^8m^3	16.92		10.63		10.32	1.56	**39.43**	12.1	100	5227	914399.7064
Crude oil	10000 ton						29.68	**29.68**	20	100	41816	910139.1787
Gasoline	10000 ton						0.01	**0.01**	18.9	100	43070	298.4751
Diesel	10000 ton	0.29	1.35	4		2.91	5.4	**13.95**	20.2	100	42652	440693.2596
Fuel oil	10000 ton	13.95	0.02	1.11		0.65	10.07	**25.8**	21.1	100	41816	834672.4496
LPG	10000 ton							**0**	17.2	100	50179	0
Refinery gas	10000 ton			0.27			0.83	**1.1**	15.7	100	46055	29163.56117
Natural gas	10^8m^3		0.5				1.08	**1.58**	15.3	100	38931	345076.5978

Other oil product	10000 ton							**0**	20	100	38369	0
Other coking product	10000 ton							**0**	25.8	100	28435	0
Other fuel	10000 tce	9.83					39.21	**49.04**	0	0	0	0
											Subtotal	455557084.3

China Energy Statistical Yearbook 2004

Table A5. Thermal Power Generation of North China Power Grid in 2003

Province	Power Generation （10^8kWh)	Power Generation （MWh)	Ratio of Self Power Consumption of Plant （%）	Power Supply （MWh)
Beijing	186.08	18608000	7.52	17208678.4
Tianjin	321.91	32191000	6.79	30005231.1
Hebei	1082.61	108261000	6.5	101224035
Shanxi	939.62	93962000	7.69	86736322.2
Inner Mongolia	651.06	65106000	7.66	60118880.4
Shandong	1395.47	139547000	6.79	130071758.7
Total				425364905.8

China Power Yearbook 2004

Table A6. Emission Factor of North China Power Grid in 2003

	Parameter	Unit	Value	Source
A	Net Import from Northeast China Power	MWh	4244380	China Power Yearbook 2004

	Grid to North China Power Grid (MWh)			
B	Total Emissions of Northeast China Power Grid	tco_2e	170716049.7	Calculation based on data from China Power Yearbook and China Energy Statistical Yearbook
C	Total Power Supply of Northeast China Power Grid	MWh	153809752.1	China Power Yearbook 2004
D	Average Emission Factor of Northeast China Power Grid	tco_2e/MWh	1.132132009	D=B/C
E	Total Power Supply of North China Power Grid	MWh	429609285.8	E=Total Power Generation of North China Power Grid＋A
F	Total Emissions of North China Power Grid	tco_2e	460362282.7	
G	Emission Factor of North China Power Grid	tco_2e/MWh	1.071583641	G=F/E

Table A7. Simple OM Emission Factor of North China Power Grid in 2004

Fuel types	**Unit**	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Subtotal**	**Emission Factor （tc/TJ）**	**Oxidation rate （%）**	**Average low Caloric value （MJ/t,km^3）**	**CO_2 emission （tco_2e） K=G*H*I*J*44/12/10000（unit of mass）**

		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (unit of volume)
Raw coal	10000 ton	823.09	1410	6299.8	5213.2	4932.2	8550	**27228.29**	25.8	100	20908	538547476.6
Cleaned coal	10000 ton						40	**40**	25.8	100	26344	996856.96
Other washed coal	10000 ton	6.48		101.04	354.17		284.22	**745.91**	25.8	100	8363	5901190.882
Coke	10000 ton					0.22		**0.22**	29.2	100	28438	6698.476107
Coke oven gas	10^8m^3	0.55		0.54	5.32	0.4	8.73	**15.54**	12.1	100	16726	1153187.451
Other coal gas	10^8m^3	17.74		24.25	8.2	16.47	1.41	**68.07**	12.1	100	5227	1578574.385
Crude oil	10000 ton							**0**	20	100	41816	0
Diesel	10000 ton	0.39	0.84	4.66				**5.89**	20.2	100	42652	186070.4874
Fuel oil	10000 ton	14.66		0.16				**14.82**	21.1	100	41816	479451.3838
LPG	10000 ton							**0**	17.2	100	50179	0
Refinery gas	10000 ton		0.55	1.42				**1.97**	15.7	100	46055	52229.28682
Natural gas	10^8m^3		0.37		0.19			**0.56**	15.3	100	38931	122305.6296
Other oil product	10000 ton							**0**	20	100	38369	0
Other coking product	10000 ton							**0**	25.8	100	28435	0
Other fuel	10000 tce	9.41		34.64	109.73	4.48		**158.26**	0	0	0	0
											Subtotal	549024041.5

China Energy Statistical Yearbook 2005

Table A8. Thermal Power Generation of North China Power Grid in 2004

Province	Power	Power	Ratio of Self	Power Supply

	Generation （10^8kWh)	Generation （MWh)	Power Consumption of Plant （%）	（MWh)
Beijing	185.79	18579000	7.94	17103827.4
Tianjin	339.52	33952000	6.35	31796048
Hebei	1249.7	124970000	6.5	116846950
Shanxi	1049.26	104926000	7.7	96846698
Inner Mongolia	804.27	80427000	7.17	74660384.1
Shandong	1639.18	163918000	7.32	151919202.4
Total				489173109.9

China Power Yearbook 2005

Table A9.Emission Factor of North China Power Grid in 2004

	Parameter	Unit	Value	Source
A	Net Import from Northeast China Power Grid to North China Power Grid (MWh)	MWh	4514550	China Power Yearbook 2005
B	Total Emissions of Northeast China Power Grid	tco_2e	199708287.3	Calculation based on data from China Power Yearbook and China Energy Statistical Yearbook
C	Total Power Supply of Northeast China Power Grid	MWh	170132885.1	China Power Yearbook 2005
D	Average Emission Factor of Northeast China Power Grid	tco_2e/MWh	1.17383707	D=B/C
E	Total Power Supply of	MWh	493687659.9	E=Total Power Generation of North China Power Grid＋A

	North China Power Grid			
F	Total Emissions of North China Power Grid	tco_2e	554323387.7	
G	Emission Factor of North China Power Grid	tco_2e/MWh	1.122822045	G=F/E

Table A10. Operating Margin Emission Factor of North China Power Grid

		Year 2002	Year 2003	Year 2004	Total
A	Emissions (tco_2e/year)	389899655.3	460362282.7	554323388	1404585326
B	Power Supply (MWh)	377617637.4	429609285.8	493687660	1300914583
C	CO_2 Emission Factor (tco_2e/MWh)	C = A/B			1.0797

Calculation of Build Margin (BM):

Step 1. Calculation of weights of CO_2 emissions of solid, liquid and gas fuel in total emissions for power generation

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (2)$$

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

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

Where:

$F_{i,j,y}$: the consumption of fuel i for province j in year y (tce);

$COEF_{i,j,y}$: is the emission factor (tco_2e/tce) of fuel i, taking into account the carbon content of fuel i and the percentage of oxidation of the fuel in year y

COAL,OIL and GAS respectively refers to the group of solid, liquid, and gas fuels.

Based on China Energy Statistical Yearbook 2005, the calculation of the weights of solid, liquid, and gas fuels in North China Power Grid are: λ_{Coal} =99.30%, λ_{Oil} =0.12%, λ_{Gas} =0.58%

Step 2: Calculation of Emission Factor of Relevant Thermal Power

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (5)$$

Where: $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ respectively refers to the emission factor representing best technology commercially available for fuel of coal, oil or gas fired power plants. For specific workings, see the following:

Table A11. Emission factor representing best technology commercially available for fuel of coal, oil or gas fired power plants

	Variable	Efficiency	Emission	Oxidation Rate	Emission Factor

		of Power Supply	Coefficient of Fuel (tc/TJ)		(tco_2e/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired Power Plant	$EF_{Coal,Adv}$	36.53%	25.8	0.98	0.9136
Gas-fired Power Plant	$EF_{Gas,Adv}$	45.87%	15.3	0.995	0.4381
Oil-fired Power Plant	$EF_{Oil,Adv}$	45.87%	21.1	0.99	0.6011

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.9104 (tco_2e/MWh

Step 3: Calculation of BM of the Grid

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}, \quad (6)$$

Where: CAP_{Total} is the total of new capacity additions, and $CAP_{Thermal}$ is the new capacity addition of thermal power.

Table A12. Installed Capacity of North China Power Grid 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 Power	MW	1055.9	5	783.8	787.3	567.9	50.8	3250.7
Nuclear Power	MW	0	0	0	0	0	0	0
Wind Power and Others	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

Source: China Power Yearbook 2005

Table A13. Installed Capacity of North China Power Grid in 2002

Installed Capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal Power	MW	3407.5	6245.5	16745.7	14327.8	9778.7	25102.4	75607.6
Hydro Power	MW	1038.5	5	775.9	795.3	592.1	50.8	3257.6
Nuclear Power	MW	0	0	0	0	0	0	0
Wind Power and Others	MW	0	0	13.5	0	76.6	0	90.1
Total	MW	4446	6250.5	17535.1	15123.1	10447.4	25153.1	78955.2

Source: China Power Yearbook 2003

Table A14. Installed Capacity of North China Power Grid in 2001

Installed Capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal Power	MW	3412.5	5632	16474.9	13415.8	8898.3	20957.7	68791.3
Hydro Power	MW	1058.1	5	742.6	795.9	566.2	56.2	3224
Nuclear Power	MW	0	0	0	0	0	0	0
Wind Power and Others	MW	0	0	9.9	0	46.7	0	56.6
Total		4470.6	5637	17227.4	14211.8	9511.2	21013.9	72071.9

Source: China Power Yearbook 2002

Table A15. Calculation of BM of North China Power Grid

	Installation in year 2001	Installation in year 2002	Installation in year 2004	New Additions from 2001 to 2004	Ratio in New Additions
	A	B	C	D=C-A	
Thermal Power（MW）	68791.3	75607.6	93594.9	24803.6	99.58%
Hydro Power（MW）	3224	3257.6	3250.7	26.7	0.10%
Nuclear Power（MW）	0	0	0	0	0.00%
Wind Power（MW）	56.6	90.1	137.7	81.1	0.32%
Total（MW）	**72071.9**	**78955.2**	**96983.2**	**24911.3**	**100.00%**
Percentage compared with installation of 2004	74.31%	81.41%	100%		

Build Margin Emission Factor of North China Power Grid : $EF_{BM,y}$=0.9104×99.58%=0.9066 tco_2e/MWh

Table A16. Baseline Emission Factor of North China Power Grid

	Parameter	Unit	Amount
A	Operating Margin Emission Factor	tco_2e/MWh	1.0797
B	Build Margin Emission Factor	tco_2e/MWh	0.9066
C	Combined Emission Factor (C=0.5*A+0.5*B)	tco_2e/MWh	**0.993**

Annex 4

MONITORING PLAN

1.Introduction of Monitoring Plan

This Monitoring plan will set out a number of monitoring tasks in order to ensure that all aspects of projected greenhouse gas (GHG) emission reductions for the proposed project are controlled and reported. This requires an on going monitoring of the project to ensure performance according to its design and that claimed Certified Emission Reductions (CERs) are actually achieved.

The monitoring plan of the proposed project is a guidance document that provides the set of procedures for preparing key project indicators, tracking and monitoring the impacts of the proposed project. The monitoring plan will be used throughout the defined crediting period for the project to determine and provide documentation of GHG emission impacts from the proposed project. This monitoring plan fulfils the requirement set out by the Kyoto Protocol that emission reductions projects under the CDM have real, measurable and long-term benefits and that the reductions in emissions are additional to any that would occur in the absence of the certified project activity.

The monitoring plan provides the requirements and instructions for:

- Establishing and maintaining the appropriate monitoring systems for electricity generated by the project;
- Quality control of the measurements;
- Procedures for the periodic calculation of GHG emission reductions;
- Assigning monitoring responsibilities to personnel;
- Data storage and filing system;
- Preparing for the requirements of an independent, third party auditor or verifier.

2.User of the Monitoring Plan & Procedure

The staffs of Guodian Wudi Bio Energy Co., Ltd at the biomass residues collection sites will record the data to be monitored concerning with information of biomass residues purchased from local area. The manager of the collection sites will be responsible for quality control and summary of this information. When the biomass is transported to the site of the power plant, the data of the biomass residues collection and transportation will be recorded by the staff of Guodian Wudi Bio Energy Co., Ltd. and stored in the power plant. The summary of biomass consumption by the power plant will be calculated by the CDM Project Manager of the proposed project monthly. Another data to be recorded is the fossil fuel consumption by the power plant and on-site electricity consumption. The related responsible operators will record this data, and the CDM manager will collect the data monthly.. Other related data need to be monitored are described in Section 5 below.

The CDM manager will in charge of the implementation of this Monitoring Plan and summarizing the results. The results will be checked by the General Manager of Guodian Wudi Bio Energy Co., Ltd. ensuring the quality and accuracy of the data monitored. The monthly summary will be reported to the headquarter of Guodian Technology & Environment Group Co., Ltd. in Beijing. The CDM Manager of the Guodian Technology & Environment Group Co., Ltd. will calculate the emission reductions of the proposed project and develop reports with the support from Easy Carbon Consultancy Co. Ltd.

3. Key definitions

The monitoring plan will use the following definitions of monitoring and verification.

Monitoring: the systematic surveillance of the project's performance by measuring and recording performance-related indicators relevant in the context of GHG emission reductions.
Verification: the periodic ex-post auditing of monitoring results, the assessment of achieved emission reductions and of the project's continued conformance with all relevant project criteria by a selected Designated Operational Entity (DOE).

4. Calibration of Meters & Metering

4.1 Electricity output meter
An agreement should be signed between the project owner and the Grid that defines the metering arrangements and the required quality control procedures to ensure accuracy. The metering equipment will be properly calibrated and checked annually for accuracy. The project owner will prepare backup procedures to deal with any errors occurred to the meters. In case of any errors happens, the grid-connected electricity generated by the proposed project shall be determined by the project owner and the Grid jointly according to the error handling procedures.

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

4.2 Electricity input meter
Following the same process as listed in 4.1.

4.3 Biomass residues consumption
The project owner will conduct an energy balance analysis to verify the amounts of biomass residues collected at the collection sites, purchased at biomass procurement department of the power plant and combusted by the boilers. If significant difference among the three sources identified, the project developer will conduct further check the original records to find out reasons and correct. If the significant difference can't be resolved, the most conservative value of biomass utilized by the proposed project will be applied as monitoring results.
5. Monitoring

5.1 Electricity Generated
Grid-connected electricity generated by the proposed project will be monitored through metering equipment at the substation (interconnection facility connecting the facility to the Grid). The data can also be monitored and recorded at the on-site control center using a computer system. The meter reading will be readily accessible for DOE. Calibration tests records will be maintained for verification.

5.2 Availability of Biomass Residues
The project developer will provide evidence to DOE concerning with the availability of Biomass residues resource in the nearby counties. This will be obtained from official information yearly. If it is not available, the data will be calculated or estimated based on a survey conducted by project developer yearly.

5.3 Biomass Residues Consumption of the Power Plant
The quality and type of biomass residues burned by the power plant will be monitored during the operation of the power plant, including all the necessary parameters of the biomass residues to be monitored according to Section B.7 of this PDD. All relevant records will be maintained for verification.

5.4 Fossil Fuel Consumption by the boiler

Fossil Fuel Consumption by the boiler during the operation will be recorded and monitored during the operation period of the proposed project. All relevant records will be maintained for verification.

5.5 Transportation of Biomass residues

The project developer of the proposed project will structure a recording and monitoring system within the biomass residues supply and management system covering all the biomass collection sites established by the proposed project. The quantity and type of biomass, transportation vehicle and transportation distance to the collection sites will be recorded by company staffs at the sites. The receipts and records regarding with biomass purchase by the proposed project will be documented and summarized for verification. The transportation of the biomass from the collection sites to the power plant will be monitored and documented by the project developer to determine the fossil fuel consumption by the biomass transportation activity. The transportation records will be documented and maintained for verification.

5.6Electricity purchased from the grid

When the generator stops working due to maintenance or other purpose, the proposed project needs a certain amount of electricity from grid. This amount will be metered, and the record be kept for examination. The meter reading will be readily accessible for DOE. Calibration tests records will be maintained for verification.

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5.7 Leakage

Within the boundary of the project, the consumption amount of biomass and the usable amount of the rest biomass will be monitored to assure the leaking effect generated from the project. This is accessible through official approach. For example, the agricultural statistic agency and the investigation agency at the county level providing the biomass to the project. If the data is unavailable, the project developer will do the research with the assistance of the government. If any leakage happens during the crediting period , the project owner will collect the parameter responsible for the leakage in the PDD under the assistance of governmental agencies.

6. Quality Assurance and Quality Control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity. This is an on-going process that will be ensured through the CDM in terms of the need for verification of the emissions on an annual basis according to this PDD and the CDM manual.

7. Data Management System

This provides information on record keeping of the data collected during monitoring. Record keeping is the most important exercise in relation to the monitoring process. Without accurate and efficient record keeping, project emission reductions cannot be verified. Below follows an outline of how project related records would be managed.

Overall responsibility for monitoring of GHG emissions reduction will rest with the CDM responsible person of the proposed project. The CDM manual sets out the procedures for tracking information from the primary source to the end-data calculations in paper document format. It is the responsibility of the proposed project owner to provide additional necessary data and information for validation and verification requirements of respective DOE. Physical documentation such as paper-based maps, diagrams and environmental assessment will be collated in a central place, together with this monitoring plan. All paper-based information will be stored by the project owner and kept at least one copy.

8. Verification and Monitoring Results

The verification of the monitoring results of the project is a mandatory process required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported and projected in the PDD. It is expected that the verification will be done annually.

The responsibilities for verification of the project are as follows:

- Sign a verification service agreement with specific DOE and agree to a time framework set by the EB for carrying out verification activities while taking into account the buyer's schedule. The proposed project owner will make the arrangements for the verification and will prepare for the audit and verification process to the best of its abilities.
- The proposed project owner will facilitate the verification through providing the DOE with all required necessary information, before, during and, in the event of queries, after the verification.
- The project owner will fully cooperate with the DOE and instruct its staff and management to be available for interviews and respond honestly to all questions from the DOE.
- DOE must be an Accredited Entity with a proven track record in environmental auditing and verification, experience with CDM projects and work in developing countries. The DOE should be accredited by the CDM Executive Board.
- If the proposed project owner deems that requirements of DOE go beyond the scope of verification, they should contact the CDM consultant to determine whether the requirements of DOE are reasonable. If considered unreasonable, a rejection letter in a written format should be provided to the DOE with justifiable reasons. If the project owner and the DOE cannot reach an agreement, the matter will be submitted to EB or UNFCCC for arbitration.

The project owner should designate CDM responsible person for the overall responsibility for the monitoring and verification process and act as the focal point for DOE.