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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

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Title: Shanxi Yuncheng 25MW Biomass Power Plant Project
Document Version: 05
Completion Date: 19/10/2010

Version Number	Date	Description
01	15/11/2007	PDD submittered for GSP
02	31/07/2009	PDD revised according to DOE's comments based on the documents review and on-site interview.
03	23/12/09	The PDD is revised according to the approved consolidated baseline methodology ACM0006 "Consolidated methodology electricity generation from biomass residues", Version 09 EB48;
04	20/05/2010	The PDD is revised according to the comments for the incompleteness from EB
05	19/10/2010	The PDD is revised according to the comments for the incompleteness from EB

A.2. Description of the project activity:

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Shanxi Yuncheng 25MW Biomass Power Plant Project (hereinafter referred to the proposed project) is located on Dongfeng Village, An'yu Town, Jiang County, Yuncheng City, Shanxi Province of P.R. China. The project entity is Shanxi Jianghe Chemical Silicon Co. Ltd.

The proposed project involves installation of two 75 t/h medium temperature and medium pressure fluidized bed boilers (TG-75/3.82) and one set of 25MW power generation unit. The project will consume 141,120 tonnes corn stalks with 10.38% water content collected from local area within 50km for incineration every year to generate electricity which will be connected to North China Power Grid (NCPG). The annual power generated by the project is 137,500 MWh and the annual on-grid electricity provided from the project is 121,000 MWh.

The electricity generated by the project should have been supplied by the NCPG prior to the start of the project activity implementation. The biomass residues used by the project should be dumped or left to decay under aerobic conditions in an uncontrolled manner without utilizing them for energy purposes, which are all the same as the baseline scenario.

When the proposed project is put into operation, it will help reduce GHG emissions from the predominant coal-fired power generation of NCPG. Moreover, the proposed project will use straws for energy purpose, which will reduce CH_4 emissions because the biomass is dumped or left to decay in an uncontrolled manner in the absence of the proposed project. The annual emission reduction is approximately 129,038 tCO_2e.

Furthermore, specific sustainable benefits of the proposed project are described as follows:

- By using straw as fuels for power generation, large amount of coal will be saved and straws will be utilized in high efficiency, which will assist China in accelerating the commercialization of grid-connected renewable energy technologies and stimulating the energy markets;
- The project will mitigate the air pollution and ameliorate the living environment of local people;
- The project will improve the development of local economy, facilitate the local relevant industry and attract more investment;
- The project will create more employment opportunities, after operation, the project can provide 90 permanent jobs according to the feasibility study.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
People's Republic of China (Host)	Shanxi Jianghe Chemical Silicon Co., Ltd	No
Spain	FC2E Gestión S.L.(FC2E)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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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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Shanxi Province

A.4.1.3. City/Town/Community etc:

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Yuncheng City/Jiang County/ An'yu Town/ Dongfeng Village

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 is located in Shanxi Jianghe Chemical Silicon Co., Ltd, Dongfeng Village, An'yu Town, Jiang County, Yuncheng City, Shanxi Province of P.R. China. The project site is 15 km northeast from Jiang County. The geographical position of the powerhouse is East longitude of 110°24′17″ and North latitude of 35°20′50″ . This area has a convenient transportation, Tongpu railway is 15km away from the project site, the road between Yicheng County and Jiang County 5 km away and the Datong-Yuncheng road is 15km from the project site.

The following figure shows the location of the proposed project:

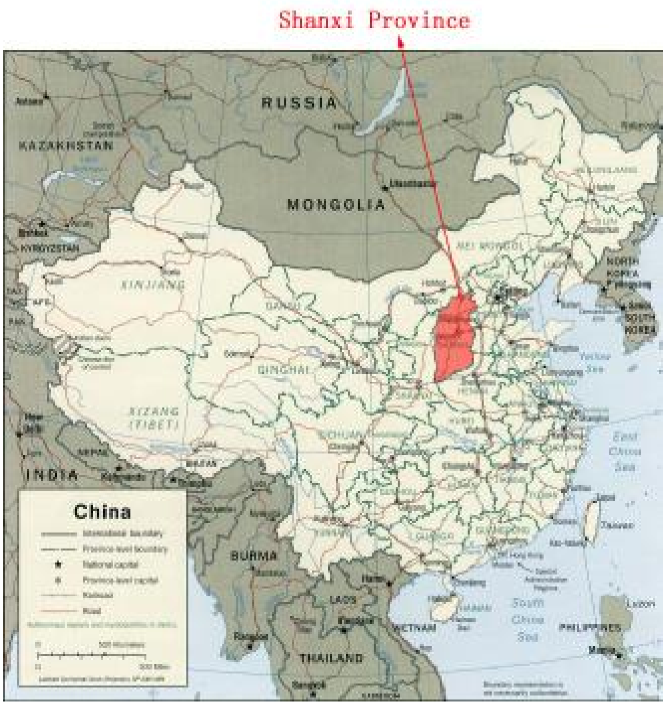

Figure A-1. Location of Shanxi Province in China

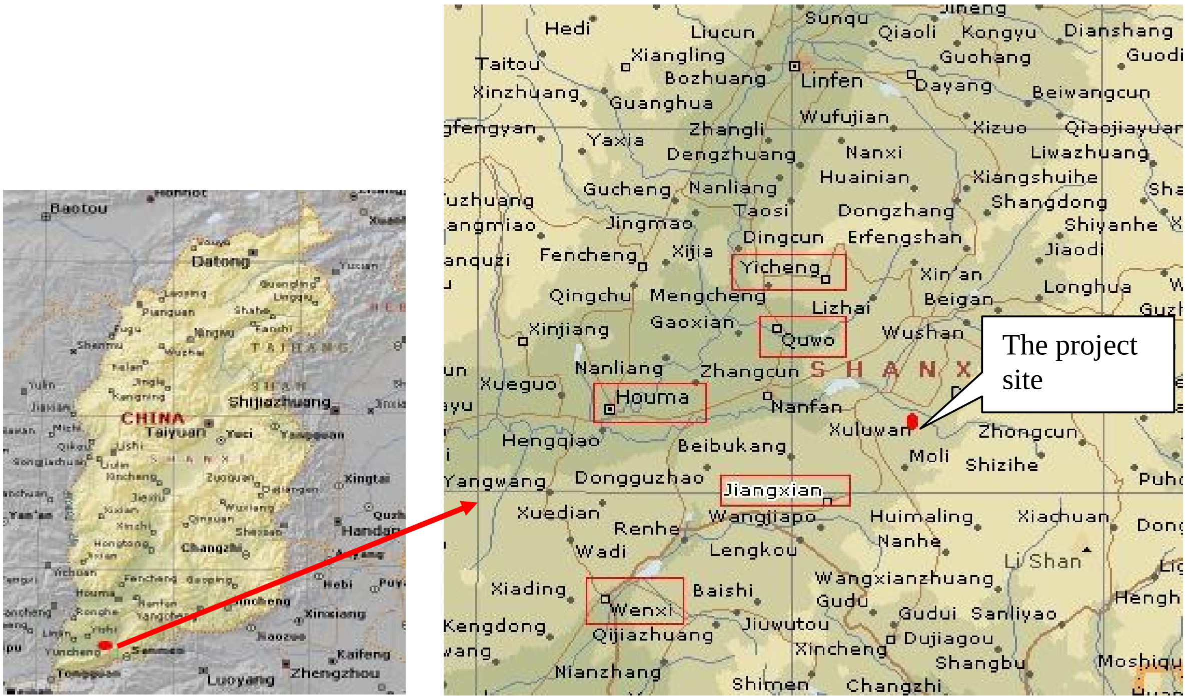

Figure A-2. Location of Project site in Shanxi Province

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

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Sectoral Scope 1: Energy Industries /Renewable Energy

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

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The scenario existing prior to the start of the implementation of the project activity (the same as baseline scenario):

The electricity generated by the project should have been supplied by the North China Power Grid prior to the start of the project activity implementation, which is the same as the baseline scenario. The North China Power Grid is dominated by fossil fuel fired plants, whose main emission is CO_2.

The biomass residues used by the project should be dumped or left to decay under mainly aerobic condition in an uncontrolled manner without utilizing it for energy purposes, prior to the start of the project activity implementation, which is the same as the baseline scenario. The main emissions of biomass residues are CH_4.

After the project is implemented, the project will consume 141,120[1] tonnes corn stalks with 10.38% water content[2] collected from local area within 50km around the power plant. The Project will build about 30 stalk collection substations to collect the straws from the local farmers around the substations. The straws will be bundled regularly used packing machines and transported to the stalk storeroom at the

[1] Feasibility Study Report of Shanxi Jianghe Chemical Silicon Co. Ltd. Biomass Generation Project, Shandong Engineering Consulting Institute, Feb.,2007

[2] Analysis Report for Coal and Coke written by China National Centre for Quality Supervision and Test of Coal.

project site.

After careful calculation and comparison, the proposed project plans to install two 75 t/h medium-temperature and medium-pressure circulating fluidized bed boilers and one set of 25MW power generation unit. The annual electricity generated by the biomass power plant is the product of rated power of steam generator and operational hours. The rated power of generator of the project is 25MW, and the operational hours are 5500 hours. Hence, the annual electricity generated by the project is 137,500 MWh. The electricity consumption rate of the project is 12%, therefore the annual on-grid electricity provided from the project is 121,000 MWh. Then, the electricity generated by the proposed project except for the electricity consumed by the project will be transmitted to the Shanxi power grid substation to connect the NCPG.

There will be a central controlling room for the boiler and steam turbines, and the controlling model is DCS (Distributed Control System). The controlling equipment is made in China and is of high quality. Circulating water and natural ventilation cooling systems will be adopted. The central system machine will control the dry ash and dregs, and the dregs will then be carried away by a separate machine.

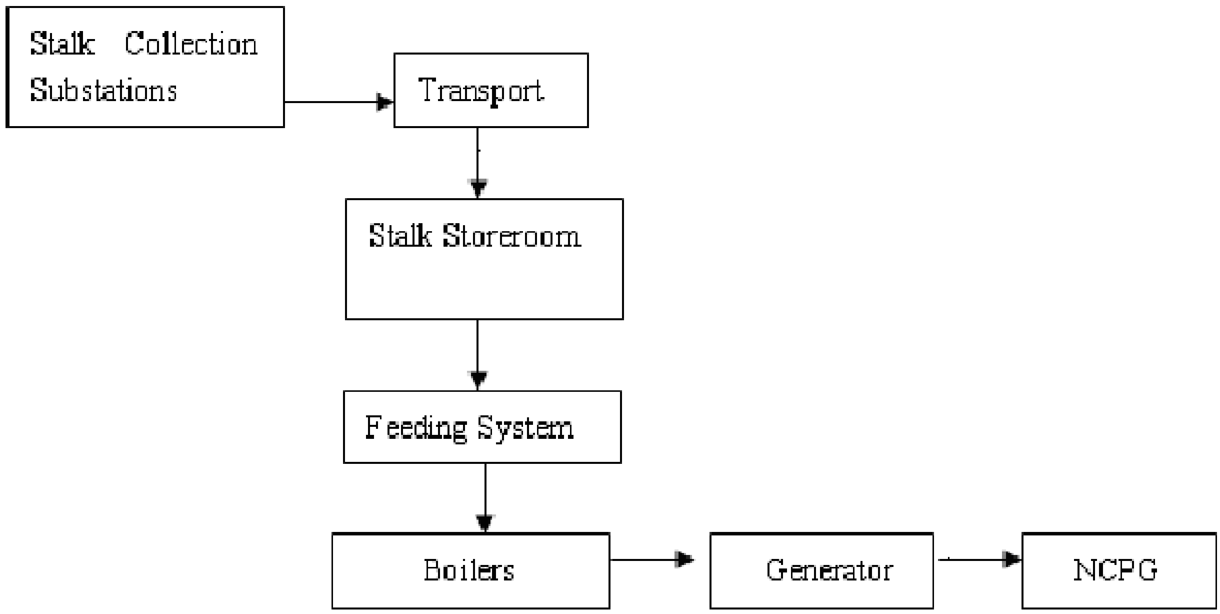

Figure A.3 The technical flow chart of the proposed project

Table A-1. Key technical specifications of the boilers

Parameters Name	Unit	Value	Manufacturer
Model	/	TG-75/3.82	
Boiler Rated Evaporating Capacity	t/h	75	Taiyuan Boiler Group Co., Ltd.
Rated Steam Pressure	MPa	3.82	
Rated Steam Temperature	ºC	450	

Boiler Efficiency	%	91	
Longevity	year	30	
Quantity	/	2	

Table A-2. Key technical specifications of steam turbines

Parameters Name	Unit	Value	Manufacturer
Model	/	N25-3.43-4	Qingdao Jieneng Steam Turbine Group Co., Ltd
Rated Capacity	MW	25	
Rated Feed-in Stream Pressure	MPa	3.43	
Rated Feed-in Stream Temperature	ºC	435	
Rated Feed-in Stream Capacity	t/h	125	
Rated Rotating Speed	r/min	3000	
Longevity	year	20	
Quantity	/	1	

Table A-3. Key technical specifications of generators

Parameters Name	Unit	Value	Manufacturer
Model	/	QF-25-2	Shandong Jinan Power Plant
Rated Capacity	MW	25	
Rated Rotation Speed	r/min	3000	
Line Voltage	kv	6.3	
Power Factor	%	80	
Longevity	year	20	
Quantity	/	1	

All of the equipment adopted by the proposed project is produced domestically. No technology transferred from aboard will be involved.

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

The renewable crediting period is chosen by the Project. The emission reductions generated by the Project over the first seven-year crediting period (15/12/2010 -14/12/2017) is presented in Table A-4. The total emission reductions are estimated to be 903,266 tCO_2e over the first 7-year crediting period.

Table A-4 The estimated amount of emission reductions over the first crediting period

Years	Annual estimation of emission reductions in tonnes of CO_2e
15/12/2010~14/12/2011	129,038
15/12/2011~14/12/2012	129,038
15/12/2012~14/12/2013	129,038
15/12/2013~14/12/2014	129,038
15/12/2014~14/12/2015	129,038

15/12/2015~14/12/2016	129,038
15/12/2016~14/12/2017	129,038
Total estimated reductions (tonnes of CO_2e)	903,266
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	129,038

A.4.5. Public funding of the project activity:

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There is no public funding from Annex I Parties for the project.

SECTION B. Application of a baseline and monitoring methodology:

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

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The baseline methodology applied to the proposed project activity includes:

The approved consolidated baseline methodology ACM0006 "Consolidated methodology electricity generation from biomass residues", Version 09;

The approved consolidated baseline methodology ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", Version 10;

"Tool to calculate the emission factor for an electricity system"Version 02；

"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02, EB41, 2008);

"Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01, EB39, 2008);

"Combined tool to identify the baseline scenario and demonstrate additionality", Version 02.2.

For more information on these methodologies, please refer to
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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This methodology is applicable to biomass residue fired electricity generation project activities,

including cogeneration plants.

The project activity may include the following activities or combinations of these activities:

- The installation of a new biomass residue fired power plant at a site where currently no power generation occurs (**greenfield power projects**); or
- The installation of a new biomass residue fired power plant, which replaces or is operated next to existing power plants fired with either fossil fuels or the same type of biomass residues as in the project plant (**power capacity expansion projects**); or
- The improvement of energy efficiency of an existing power plant (**energy efficiency improvement projects**), e.g. by retrofitting the existing plant or by installing a more efficient plant that replaces the existing plant; or
- The replacement of fossil fuels by biomass residues in an existing power plant (**fuel switch projects**).

The project activity involves the installation of a new 2×75t/h+25 MW biomass residue fired generation plant at the site where no power was generated prior to the implementation of the project activity. Therefore, the project activity is a Greenfield power project.

ACM0006 lists four conditions of applicability for applying the methodology to project activities. The conditions and how they are fully met by the Project are listed below.

- **No other biomass types than biomass residues, as defined above, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired).**
  Predominant fuels used by the proposed project are maize stalks. Only about 30 tons of diesels[3] will be used for boiler start-up. Therefore, the project fulfills this condition.

- **For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process; The implementation of the project shall not increase the biomass production in the facility.**
  The stalks used by the project are byproducts of agriculture crops, not from a production process. Additionally, according to the survey conducted by Special Investigation Team for Straw Resources, there is at least 571,430 tons surplus straw in 50km surrounding of the project[4]. The project requires about 141,120 tonnes straws. Therefore, the implementation of the project will not increase the biomass production in the area.

- **The biomass used by the project should not be stored for more than one year.**
  As per the stock rotation regulation of the warehouse at the project plant, the biomass fuels collected will be consumed on a first-come-first-used basis[5]. And a regular clearance of the warehouse will be made every three months. Thus, the biomass residues used in the project activity

3 Feasibility Study Report of Shanxi Jianghe Chemical Silicon Co. Ltd. Biomass Generation Project, Shandong Engineering Consulting Institute, Feb.,2007

4 Straw resources survey and evaluation report in Jiang County and its surrounding areas, Special Investigation Team for Straw Resources, Feb., 2007.

5 Feasibility Study Report of Shanxi Jianghe Chemical Silicon Co. Ltd. Biomass Generation Project, Shandong Engineering Consulting Institute, Feb.,2007

will not be stored for more than one year.

- **No significant energy quantities, except from transportation of the biomass, are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to combustion (e.g. etherification of waste oils) are not eligible under this methodology.**
  Except for transportation of the straws, the proposed project has no significant consumption of fossil fuels.

To sum up, the methodology ACM0006 is applicable for the proposed project activity.

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

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According to the Version 09 of the ACM0006, the project boundary encompasses the power plant at the project site, the means for transportation of biomass to the project plant, 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 Grid (including Beijing City, Tianjin City, Hebei Province, Shandong Province, Inner Mongolia Autonomous Region and Shanxi Province).

In this PDD, CH_4 emission will be included for both project and baseline emissions. According to ACM 0006, the GHGs included or excluded from the project boundary are listed as follows:

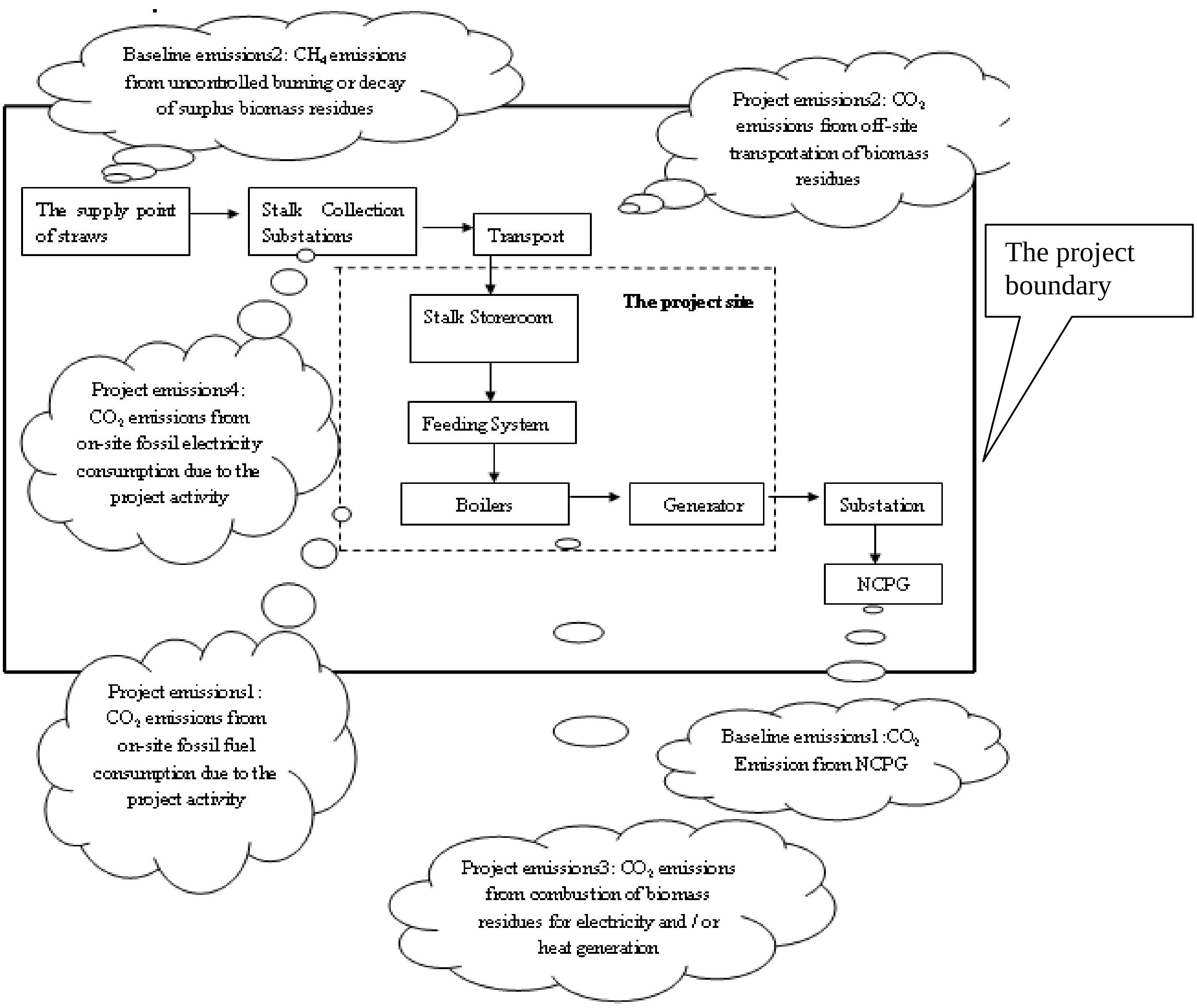

Figure B-1：**The Flow diagram of the project boundary**

Table B-1 GHGs included or excluded from the project boundary

	Source	Gas	Included ?	Justification / Explanation
Baseline	Electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Heat generation	CO_2	No	No heat generation in this project
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	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	Project participants may decide to include this emission source, where case B1 has been identified as the most likely baseline scenario.
		N_2O	No	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.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass residues	CO_2	Yes	An important emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Combustion of biomass residues for electricity and / or heat generation	CO_2	No	CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Yes	This emission source must be included because CH_4 emissions from uncontrolled burning or decay of biomass in the baseline scenario are included.
		N_2O	No	Excluded for simplification. This emission source is assumed to be small.
	Storage of biomass residues	CO_2	No	CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	Excluded for simplification. Since biomass is stored for not longer than one year, this emission source is assumed to be small.

		N_2O	No	Excluded for simplification. This emissions source is assumed to be very small.
	Waste water from the treatment of biomass residues	CO_2	No	No waste water is generated from the pre-treatment of biomass residues in the project activity.
		CH_4	No	No waste water is generated from the pre-treatment of biomass residues in the project activity.
		N_2O	No	No waste water is generated from the pre-treatment of biomass residues in the project activity.

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

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According to methodology ACM0006 (Version 09), the baseline scenario will be identified by using the latest version of "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 02.2)

Step 1. Identification of alternative scenarios

Sub-step 1a. Define alternative scenarios to the proposed CDM project activity

According to methodology ACM0006, realistic and credible alternatives should be separately determined regarding:

- How **power** would be generated in the absence of the CDM project activity;
- What would happen to the **biomass residues** in the absence of the project activity.
- How the **heat** would be generated in the absence of the project activity;

The proposed project is not a cogeneration project and then will not generate heat, so alternative of heat generation is not considered. Therefore, the reasonable and feasible baseline scenarios of the proposed project are identified below from the first two parts mentioned above.

1. Power generation

In order to determine the most plausible baseline scenario for power generation, detailed analysis is summarized in Table B-2:

Table B-2 Identifying the most plausible baseline scenario for power generation

Series	Alternative	Included?	Justification/Explanation
P1	The proposed project activity not undertaken as a CDM project activity	Yes	It seems to be a plausible alternative without considering the investment barriers.

P2	The continuation of power generation in an existing biomass residue fired power plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the project activity	No	As there is no existing biomass power generation plant[6], this alternative is not applicable
P3	The generation of power in an existing captive power plant, using only fossil fuels	No	As there is no existing captive power generation plant, this alternative is not applicable
P4	The generation of power in existing and/or new grid-connected power plants	Yes	Purchase electricity from North China Power Grid is in compliance with all applicable legal and regulatory requirements in China and faced with no economical barriers. Hence, the Alternative P4 is a credible and realistic alternative.
P5	The installation of a new biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case	No	Biomass residue fired grid-connected technology is under initial development and application stage[7], therefore, it is not common practice in China. Hence, the alternative P5 isn't the credible and realistic baseline scenario.
P6	The installation of a new biomass residue fired power plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity. Therefore, the power output is the same as in the project case	No	Compared to the proposed project, Alternative P6 is financial unattractive. Therefore, Alternative P6 can't be considered as a feasible alternative.
P7	The retrofitting of an existing biomass residue fired power, fired with the same type and with the same annual amount of biomass residues	No	As there is no existing biomass power generation plant, this alternative is not applicable;

[6] Letter of supplying statistic required by the biomass power plant of Shanxi Jianghe Chemical Silicon Co. Ltd. Shanxi Development and Reform Commission,[2008]54

7 http://www.chinapower.com.cn/article/1123/art1123981.asp

	as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case		
P8	The retrofitting of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity	No	As there is no existing biomass power generation plant, this alternative is not applicable;
P9	The installation of a new fossil fuel fired captive power plant at the project site	Yes	It is a plausible baseline scenario
P10	The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity;	No	The project is just a power plant, whose service differs greatly from cogeneration project. Furthermore, it's forbidden to be cofired with normal fossil fuel in new biomass power plants according to the Notice on further strengthen the management on the environment impact assessment of biomass power project which is issued by National Environment Committee on September 4, 2008 [8] Therefore, alternative P10 is excluded.
P11	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.	No	There is no existing fossil fuel fired cogeneration plants cofired with biomass residues at the project site, so P11 is excluded.

2. Unused biomass

In order to determine the most plausible baseline scenario for unused biomass, detailed analysis is summarized in Table B-3:

[8] Notice on further strengthen the management on the environment impact assessment of biomass power project Huafa [2008] 82 http://www.zhb.gov.cn/info/bgw/bwj/200809/t20080908_128308.htm

Table B-3 Identifying the most plausible baseline scenario for unused biomass

Series	Alternative	Included?	Justification/Explanation
B1	The biomass residues are dumped or left to decay under mainly aerobic conditions.	Yes	According to Straw resources survey and evaluation report in Jiang County and its surrounding areas, a certain amount of the surplus biomass residues would be dumped or left to decay under mainly aerobic conditions in the absence of the proposed project. Therefore, alternative B1 is a realistic baseline alternative for unused biomass.
B2	The biomass residues are dumped or left to decay under clearly anaerobic conditions.	No	There is no deep landfill with more than 5 meters around the site of the project, hence, the unused biomass residues are impossible dumped or left to decay under clearly anaerobic conditions. Therefore, B2 is excluded.
B3	The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.	Yes	This is the common practice in local area, thus it is the applicable alternative
B4	The biomass residues are used for heat and/or electricity generation at the project site	No	There is no heat and/or electricity generation plant using biomass residues at the project site. Therefore, B4 is excluded.
B5	The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants	No	There is no generation or cogeneration plant using biomass residues at the project site[9], therefore, B5 is excluded.
B6	The biomass residues are used for heat generation in other existing or new boilers at other sites	No	There is no existing or new biomass heat generation plant using biomass resides as fuel at other sites due to the transportation cost. Therefore, B6 is excluded.
B7	The biomass residues are used for other energy purposes, such as the generation of biofuels	No	There are no other energy generation plants that need utilize surplus biomass residues consumed by the proposed project. Therefore, B7 is excluded.
B8	The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry)	No	There are no companies using biomass for non-energy purposes at the project site such as fertilizer or as feedstock in processes. So alternative B8 is excluded.

[9] Straw resources survey and evaluation report in Jiang County and its surrounding areas, Special Investigation Team for Straw Resources, Feb., 2007.

Outcome of Step 1a: The plausible alternative scenarios to the project activity is shown in tableB-4

Table B-4. Combination of baseline scenarios for the Shanxi Biomass Project

Scenario	**Project type**	**Baseline scenario**		
		Power generation	Heat generation	Use of biomass
2	Power Greenfield projects	P1,P4 or P9	None	B1 or B3

Sub-step 1b. Consistency with mandatory applicable laws and regulations

1. Power generation

As for P1, related policies and regulations have been issued to promote to utilize biomass, such as *The People's Republic of China Renewable Energy Law*[10], and currently there are no related regulations that compel to use biomass. Therefore, Alternative P1 is a realistic and credible choice.

As for P4, "Purchase electricity from North China Power Grid" is in compliance with all applicable legal and regulatory requirements in China. Hence, the Alternative P4 is a credible and realistic alternative.

According to Chinese laws and regulations, construction of coal-fired power plants of less than 135MW are prohibited in the areas which can be covered by large grids such as provincial grids[11], and the fossil fuel power units with installed capacity less than 100MW are strictly regulated for installation [12].

Therefore, Alternative P9 is not a realistic and credible choice.

2. Unused biomass

Biomass has been dumped or left to decay or burned in an uncontrolled manner are ubiquitous both in China and near the project site. However, in order to protect the environment and save resources, burning straw is prohibited by the Ministry of Environment Protection of the P.R.C in 2008[13]. Therefore, B3 is not a common scenario.

Outcome of Step 1b: The alternative scenarios P1, P4 and B1 are in compliance with all mandatory applicable laws and regulations; therefore they go into the next step. The proposed project activity not undertaken as a CDM project activity (P1) is not the only alternative among them.

10 The People's Republic of China Renewable Energy Law, Decree No. 33 http://www.gov.cn/ziliao/flfg/2005-06/21/content_8275.htm

11 Notice on Strictly Prohibiting the Installation of Coal-fired Generator with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No.[2002]6.

12 Interim Rules on Small scale fired Generator Construction and Management (Aug, 1997)

13 http://www.mep.gov.cn/info/bgw/bwj/200805/t20080504_122059.htm

Step 2. Barrier analysis

From the remaining alternative scenarios, the baseline and the additionality of the project activity will be determined, as per the combined baseline-additionality tool, using financial analysis. However, it is worth highlighting that the project does face the following barriers:

Sub-step 2a. Identify barriers that would prevent the implementation of alternative scenarios:

Investment barriers

Firstly, the biomass power plant is a green field project activity and its initial investment is higher than the normal coal-fired power generation project. In addition, power generated from biomass is a new technology in China and the equipment performance is unstable, which bring operational risks. Banks are reluctant to provide loans for such project activity. Finally, the capital market in China is not fully developed, so the financing channels are too limited[14]. Therefore, the access to financing is a key barrier in the construction of biomass power plants in China.

Technological barriers

Since the technology of biomass power generation in China has not been fully industrilzed, skilled and/or trained staffs able to operate and maintain the facility are scarce, and there are no education/training institutions in China providing such training activities[15].

The project owner has no experience in the operation and maintenance of biomass fired plant. This adds uncertainty to the operating results of of the project activity. The CDM revenue can help the project owner to overcome these investment and technological barriers.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers:

As indicated, the purpose of the barrier analysis above reported was not to eliminate the remaining alternatives, P1, P4 and B1, which will be analysized under step 3, but to highlight the difficulties that the development of biomass projects currently faces in China.

Step 3. 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 additional funding that may be derived from the CDM project activities. The investment analysis was conducted in the following steps:

Sub-step 3a. 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 from

[14] http://www.sdpc.gov.cn/zjgx/t20071123_174054.htm

[15] http://www.sdpc.gov.cn/zjgx/t20071123_174054.htm

electricity output, the simple cost analysis method is not appropriate. The investment comparative analysis method is only applicable to a case where the alternative baseline scenario is similar to the proposed project, 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 the benchmark analysis method based on the consideration that benchmark IRR and total investment IRR of the power sector are both available.

Sub-step 3b. Apply benchmark analysis (Option III)

According to the "Economical Assessment and Parameters for Construction Project, 3rd edition", a project will be economically or financially attractive when the IRR is better than the sectoral benchmark IRR. From the "Economical Assessment and Parameters for Construction Project, 3rd edition", the sectoral benchmark IRR on total investment for power industry in China is set at 8%.

Sub-step 3c. Calculation and comparison of financial indicators

(1) Basic parameters for calculation of financial indicators

The basic parameters for calculation of the financial indicators in the Feasibility Study Report of the proposal project are listed below. The Shanxi Development and Reform Commission have approved the Feasibility Study Report. The main financial indicator is shown in table B-5:

Table B-5. The financial indicators for Yuncheng Biomass Project

Indicator	Unit	Value	Data Source
Biomass price	Yuan RMB/t	190	FSR
Installed capacity	MW	25	FSR
Gross Annual Electricity Generated	GWh/a	137.5	FSR
Electricity Consumption Rate for power generation	%	12	FSR
Operational hours	Hours per annum	5500	FSR
Annual power generation	GWh/a	121	FSR
Tariff for power (including VAT)	RMB/Kwh	0.524	FSR
Operational lifetime	Year	20	FSR
Static total investment	Ten thousand RMB	26,952	FSR
Annual Operation and maintenance cost	Ten thousand RMB	3,338	FSR

Including:			FSR
Straw cost	Ten thousand RMB	2,681	FSR
Water Cost	Ten thousand RMB	26	
Wage and Welfare	Ten thousand RMB	185	FSR
Cost for repairs, maintenance and materials	Ten thousand RMB	404	FSR
Other Expenses	Ten thousand RMB	41.25	FSR
Depreciation period	Year	15	FSR
Rate of scrap value	%	5	FSR
Recovery of residue values of the fixed assets	Ten thousand RMB	1347.60	FSR
Income tax rate	%	33	FSR
Value added tax	%	17	FSR
City maintenance & construction tax rate	%	5	FSR
Education addition tax rate	%	3	FSR
Crediting Period	Year	7×3=21 (renewable)	Term Sheet
Expected CERs price	€/ t CO_2e	8	Term Sheet

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

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

Table B-6 shows the project IRR of the proposed project with and without the sales of CERs. Without the sales of CERs the project IRR is 4.13%, which is lower than the financial benchmark. Thus the proposed project is not considered to be financially attractive.

Table B-6 Project IRR of the proposed project

	Project IRR
Without CERs	4.13%
With CERs	9.30%

However, taking into account the CDM revenues, the project IRR is 9.30%, which is higher than the financial benchmark. Therefore the CDM revenues enable the project to overcome the investment barrier and demonstrate the additionality of the proposed project.

Sub-step 3d. Sensitivity analysis (only applicable to option II and III)

The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For the proposed project, three parameters were selected as sensitive factors to check out the financial attractiveness:

1) Static Total Investment
2) Annual O&M cost
3) Tariff For Power
4) Annual Electricity Output

The results of sensitive analysis are shown in Table B-7, Table B-8 Table B-9 Table B-10 and Figure B-2 below.

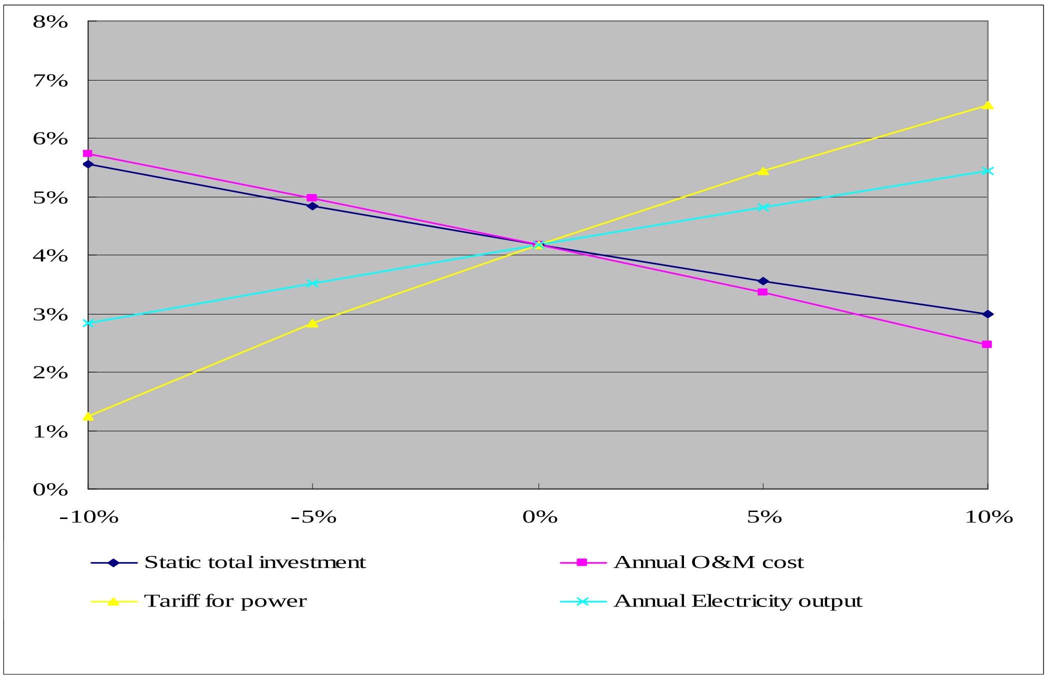

Figure B-2. IRR of Total Investment Sensitivity to Different Financial Parameters (Without CER revenue)

Table B-7 The impact of static total investment on project IRR

Variation Range	-28,4%	-10%	-5%	0%	5%	10%
Static total investment	8%	5.35%	4.73%	4.13%	3.58%	3.07%

Table B-8 The impact of Annual O&M cost on project IRR

	-28,4%	-10%	-5%	0%	5%	10%
Annual O&M cost	8%	5. 64%	4.91%	4.13%	3.33%	2.46%

Table B-9 The impact of Tariff for power on project IRR

Variation Range	-10%	-5%	0%	5%	10%	17,7%
Tariff for power	1.25%	2.82%	4.13%	5.36%	6.46%	8%

Table B-10 The impact of Annual Electricity output on project IRR

Variation Range	-10%	-5%	0%	5%	10%	17,7%
Annual Electricity output	1.27%	2.83%	4.13%	5.35%	6.44%	8%

As shown in Figure B-2, the IRR of total investment fluctuates differently when the above four indictors vary from -10% to 10%. However, without the revenue from CDM, IRR of the proposed project activity is much lower than the benchmark 8%.

Based on the above analysis, the tariff for power is the most significant factor of the total investment of the project. The project IRR reaches 8% benchmark if the electricity price is 17,7% higher than the expected tariff for the proposed project. According to the Clause 7 of the *Tentative Management Measures for Price and Sharing of Expenses for Electricity Generation from Renewable Energy* (Document No. NDRC Energy [2006] [16]), "the feed-in-tariff of biomass power generation project is decided by the government. Price administration agency of the State Council will stipulate region-specific benchmark tariff, and tariff standards will be composed of the benchmark tariff for the desulphurized coal-fired generator of various provinces (autonomous regions, municipalities directly under the Central Government) in 2005 plus a subsidy to the tariff. The standard subsidy to the tariff of biomass projects is 0.25 RMB/kWh. Beginning from the date when the power generation project is put into operation, the subsidy will be continued for 15 years, and after that it will be cancelled." According to the Notice on the tariff in North China Power Grid Fagaijiage 2006 No.1228, the benchmark tariff for the desulphurized coal-fired generator units in Shanxi Provice is 0.25936 RMB. Since the standard subsidy is 0.25 RMB/kWh, the tariff for the proposed project should be fixed at 0.50936RMB for 15 years. In the FSR, the tariff for the proposed project is calculated at 0.524RMB/kWh which is higher than the 0.50936RMB/kwh that the project activity will finally receive. Therefore, the tariff of 0.524RMB for the proposed project is conservative, and the IRR will not exceed 8%.

The second most sensitive parameter in the sensitivity analysis is the annual operating costs. When it decreases by 28,4%, the IRR will reach the benchmark IRR. This scenario is unlikely to happen - considering that the price of biomass residues is increasing steadily. As shown in the IRR analysis, the costs of biomass fuel accounts for about 80% of the total annual operating costs and the price of straw used in the PDD is 190 yuan / ton. However, as per the latest investigation report on the local biomass

[16] http://www.china.com.cn/chinese/2006/Feb/1118762.htm

resource, the biomass price is 300 RMB / ton[17] and the biomass price is still showing a further tendency to increase. Therefore, it is impossible for annual operating costs to decrease to such an extent.

The third most sensitive parameter in the sensitivity analysis is the static total investment. If the static total investment would decrease to an amount of 28.4%, the IRR will reach the benchmark of 8%. To install 1 kw biomass energy under current conditions is only feasible for 10,000 yuan/kw. [18] It is therefore not visible that the 6523 yuan/kw cost relation of the project can negative affect the sensitivity.

The last sensitive parameter is annual electricity output. Only under the assumption that the operational hours reach a value of 7881 hours, the IRR will exceed 8%. This is an unrealistic assumption for domestic biomass-fired power units. Therefore, the IRR will not exceed 8%.

The proposed project faces a financial barrier. When the expected price of CER is 8€/tCO_2e, the IRR of the project activity will be 9.30%, higher than the benchmark 8%, which demonstrates that the CDM alleviates the identified financial barrier of the project.

Outcome of Step 3: Based on the analysis above, the most economically attractive scenario of power generation is P4.

Therefore, from the above analysis, the most plausible baseline scenario is as follows.

Combination of baseline scenarios for the Shanxi Biomass Project

Scenario	**Project type**	**Baseline scenario**		
		Power generation	Heat generation	Use of biomass
2	Power Greenfield projects	P4	None	B1

Step 4: Common practice analysis

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

The project is the first biomass generation project in Shanxi province. Furthermore, there are only two other biomass power generation projects approved by the local government until end of 2008: Shanxi Yangqu 2×12MW Biomass Power Plant Project in Yangqu City[19] and Shanxi Fuhua 2×12MW Biomass Power Plant Project in Changzi City[20] .These two projects have the same power capacity and the same technology as the proposed project in Shanxi Province. Thus, these two projects are similar to the proposed project activity.

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

Shanxi Yangqu 2×12MW Biomass Power Plant Project and Shanxi Fuhua 2×12MW Biomass Power

[17] http://www.sdpc.gov.cn/zjgx/t20071123_174054.htm
[18] http://www.jsnj.gov.cn/njhlt/njhlt/200804/8406.shtml
[19] http://www.xnyfd.com/news_1.asp?ida=60&nid=1&WorksID=8889
[20] http://218.26.168.126:82/n16/n1398/n2108/n5731/n29907/6964987.html

Plant Project mentioned above face the same investment barrier, technology barriers as the proposed project, so they are applying for the CDM project. Therefore, the proposed project can not be demonstrated as common practice.

In conclusion, the proposed project meets the additionality criteria, and thus is additional.

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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As per "Combined tool to identify the baseline scenario and demonstrate additionality", Version 02.2, and the analysis in section B.4, the baseline scenario is identified, the additionality of the proposed project is demonstrated simultaneously.

The CDM development and application was confirmed and required by the Board of Directors of the project company on Apr. 18th, 2007. The consulting contract was signed between the project owner and the CDM Center of Excellence Ltd., Representative Office Beijing on May 11th, 2007, and the CDM application was started.

Data	key events
Feb., 2007	The Feasibility Study Report was completed.
Mar. 9th, 2007	Shanxi Development and Reform Committee replied the biomass power generation investment application of Shanxi Jianghe Chemical Silicon Co. Ltd.
Apr. 18th, 2007	Shanxi Jianghe Chemical Silicon Co. Ltd held a board meeting to discuss the CDM project.
Apr. 25th, 2007	The Shanxi Power Co., Ltd. approved the project connecting to the local power grid.
May. 11th, 2007	The development contract with the CDM advisor was signed
Aug. 7th, 2007	Approval of the EIA.
Sep. 28th, 2007	Approval of the FSR.
Nov. 6th, 2007	The term sheet was signed with FC2E.
Nov. 15th, 2007	The starting date of construct.
Dec. 17th, 2007	The ERPA was signed with FC2E.
Feb. 3rd, 2008	The project starts to be globally published in UNFCCC's websites.

Feb. 29th, 2008	The project was approved by Chinese DNA.
Apr. 17th, 2008	The project was validated on sited by DNV.
Aug. 8th, 2008	Signing date of the steam turbine purchase contract.
Sep. 6th, 2008	Signing date of the boiler purchase contract.
Sep. 23rd, 2008	Signing date of the generator purchase contract.
May. 4th, 2009	The project was approved to connect to the power grid by Shanxi Power Co., Ltd.
May. 11th, 2009	The project owner signed Power Purchase Agreement(PPA) with Yuncheng Power Supply Branch Company of Shanxi Power Co., Ltd.

All of the activities mentioned above happened long before the construction of the project started in Nov. 15th, 2007, which proves the serious consideration of CDM prior to the start of the project as well as the additionality of the project.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

According to the analysis in Section B.4, the baseline scenario applying to the proposed project is shown below:

Combination of baseline scenarios for the Shanxi Biomass Project

Scenario	Project type	Baseline scenario		
		Power generation	Heat generation	Use of biomass
2	Power Greenfield projects	P4	None	B1

Scenario 2 is applied to the proposed project. The calculation process and equation for the proposed project emissions, baseline emissions, leakage emissions and total emission reductions are presented below.

Project emissions

Project emissions include CO_2 emission from transportation of biomass to the project site and CO2 emissions from on-site consumption of fossil fuels due to the project activity and CH4 emissions from the combustion of biomass. GHG emissions from the project activity in year y are calculated on the following equation:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH_4} \cdot (PE_{Biomass,CH_4,y} + PE_{WW,CH4,y}) \quad (1)$$

Where:

PE_y are CO_2 emissions generated by the proposed project during the year y in tons of CO_2 equivalents,

PET_y are CO_2 emissions during the year y due to transportation of the biomass to the project plant in tons of CO_2 equivalents,

$PEFF_y$ are CO_2 emissions during the year y due to fossil fuels co-fired by the generation facility in tons of CO_2 equivalents,

$PE_{EC,y}$ are CO_2 emissions from on-site electricity consumption,

GWP_{CH_4} is the global warming potential for the methane valid for the relevant commitment period,

$PE_{Biomass,CH_4,y}$ are the CH4 emissions from the combustion of biomass during the year y (tCH_4/yr),

$PE_{WW,CH4,y}$ are emission from waste water generated from the treatment of biomass residues in year y (tCH_4/yr)

a). CO_2 emissions from combustion of fossil fuels for transportation of biomass to the project plant

The biomass used for the proposed project is not generated directly at the project site. Project participants shall determine CO_2 emissions resulting from transportation of the biomass to the project plant. The emission is calculated on the following equation:

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} * AVD_y * EF_{km,co2} \qquad (2)$$

PET_y are CO_2 missions due to the biomass transportation from the biomass supply site to the project site in the year y in tons of CO_2 equivalents,

AVD_y is the average return trip distance between the biomass fuel supply site and the site of the project plant in kilometers (km). All the straws supply sites are within 50 kilometers away around the site of the proposed project, therefore the conservative value of 100 is chosen to calculate.

EF_{km,CO_2} is the average CO_2 emission factor for the trucks measured in tCO_2/km. Since the truck applied in the proposed project has the truck load of 10 tons, the IPCC default of 0.001011 for the Heavy Duty Diesel Vehicle is applied.

$BF_{T,k,y}$ is the quantity of biomass type k that has been transported to the project site during the year y in a volume or mass unit. For the proposed project the annual consumption of the corn stalk is 126,472 tons of dry corn stalks

TL_y is the average truck load of the trucks used measured in tons or volume of biomass. For the proposed project the truck load will be 10 tons.

k is Types of biomass residues used in the project plant and that have been transported to the project plant in year *y*

b). CO_2 emissions from on-site consumption of fossil fuels

The biomass power plant may require using some diesel oil, e.g. for start-ups or during winter operation (when biomass humidity is too high). The GHG emissions from on-site consumption of fossil fuels will be calculated according to " Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"(Version 02) as follows:

This process also leads to GHG emissions, which is calculated on the following equation:

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y} \quad (3)$$

$PE_{FC,j,y}$ are CO_2 emissions from combustion of respective fossil fuels in the biomass power plant during the year *y* in tons of CO_2 equivalents

$FC_{i,j,y}$ is the quantity of fossil fuel type *i* combusted in process j during the year(mass or volume unit /yr). Given the baseline scenario is scenario 2, and in accordance with ACM0006, project emissions will be determined for the following two combustion processes *j*:

- Fossil fuels combusted in the project plant during the year *y* ($FF_{project\ plant,i,y}$);
- Fossil fuels combusted at the project site for other purposes that are attributable to the project activity during year *y* ($FF_{project\ site,i,y}$).

$COEF_{i,y}$ is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2 / mass or volume unit of fossil fuel);

i the fuel types combusted in process j during the year y, which is diesel for this project.

Since the necessary data is not available for Option A to calculate $COEF_{i,y}$, Option B is implemented as follows:

$$COEF_{i,y} = NCV_{i,y} * EF_{CO2,i,y} \quad (4)$$

Where:

$NCV_{i,y}$ is the weighted average net calorie value of the fuel type *i* in year in y (GJ/mass or volume unit). The carbon fraction of the fuel can not provided and the fuel supplier can not provide the values in invoices, therefore, the national default values sourced from *China Energy Statistical Yearbook* is used in the project, which is 42.652 GJ/t for diesel[21].

$EF_{co2,i,y}$ is the weighted average CO_2 emission factors of fuel type *i* in year in y(tCO_2/GJ), which is 0.0748 tCO_2/GJ for diesel[22].

i the fuel types combusted in process j during the year y, which is diesel for this project.

c). CO_2 emissions from electricity consumption

It is estimated that the electricity consumption at each straw-collecting sub-station is 50 kWh per day. For approximately 30 sub-stations within the project boundary, the total electricity consumption is conservatively calculated as 548 MWh (assuming that each sub-station works 365 days per year). The total consumption of grid electricity by the project activity is conservatively estimated as 600 MWh/year.

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[21] China Energy Statistical Yearbook 2005

[22] Data source: Upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

According to the " Tool to calculate baseline, project and/or leakage emissions from electricity consumption"(version 01), the calculation are shown below:

$$EC_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}) \quad \textbf{(5)}$$

$EC_{EC,y}$ The project emission from electricity consumption by the project activity during the year y(tCO_2/yr)

$EC_{PJ,j,y}$ The quantity of electricity consumed by the project activity during the year(MWH). As described above this value is considered to be 600MWh/year, consumed in straw-collecting sub-station

$EF_{El,j,y}$ The emission factor for the grid in year(CO_2/ MWh). As calculated, this value is 1.0302 (tCO_{2e}/ MWh)

$TDL_{j,y}$ The average technical transmission and distribution losses in the grid in year y for the voltage level at which electricity is obtained from the grid at the project site. According to the tool, default value of 20% is implemented for the proposed project.

d). Methane emissions from combustion of biomass

Methane emissions from combustion of biomass are calculated as follows:

$$PE_{Biomass,CH4,y} = EF_{CH4,BF} \times \sum_{k} BF_{k,y} \times NCV_k \quad (6)$$

Where:

$PE_{Biomass,CH_4,y}$ are the methane emissions from the combustion of biomass during the year y in tons of CH_4 ,

$BF_{k,y}$ is the quantity of the biomass type i used as fuel in the project during the year y (t),

NCV_k is the net calorific value of the biomass type i (TJ/ton of dry matter). Based on the project feasibility study report, it is taken as 15.68 GJ/ton.

$EF_{CH4,BF}$ is the CH_4 emission factor for the combustion of biomass in the project plant (tCH_4/ GJ). According to the IPCC default value provided in table 4 of ACM0006, the CH_4 emission factor of combustion of biomass in agriculture is 0.03 tCH_4/TJ. Considering a conservativeness factor of 1.37, the CH4 emission factor in this PDD is taken as 0.0000411 tCH_4/GJ.

e). Methane emissions from waste water treatment ($PE_{WW,CH4,y}$)

Since the biomass residues used in this project needn't to be treated before burning in the boiler, thus there will be no methane emission from waste water treatment.

Emission Reductions due to displacement of electricity

$$ER_{electricity,y} = EG_y \times EF_{electricity,y}$$
$$= (EG_{togrid}, - EC_{fromgrid,y}) \times EF_{electricity,y}$$
$$= (EG_{output,y} - EG_{auxilary,y} - EG_{fromgrid,y}) \times EF_{electricity,y} \quad (7)$$

Where:

$ER_{electricity,y}$ are the emission reductions due to displacement of electricity during the year y in tons of CO_2

EG_y is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation)during the year y in MWh/year

$EF_{electricity,y}$ is the CO_2 emission factor for the electricity displaced due to the project activity during the year y in tons of CO_2/ MWh.

$EG_{togrid,y}$ the quantity of power electricity connected to the grid during the year y in MWh/year

$EG_{output,y}$ the gross quantity of power electricity generated by the project during the year y in MWh/year

$EG_{auxilary,y}$ the quantity of power electricity consumed by the project d during the year y in MWh/year

$EG_{fromgrid,y}$ the quantity of power electricity down from the grid

Determination of $EF_{electricity,y}$

Step 1. Identify the relevant electric power system

The electricity generated by the proposed project will be connected to North China Power Grid. According to the authority documents regarding grid boundaries provided by the Chinese *DNA*, NCPG consists of Beijing, Tianjin, Hebei, Shandong, Shanxi and Inner Mongolia power grids. NCPG will import power from North East Power Grid (NEPG), which consists of Jilin, Liaoning and Hielongjiang power grids.

Step 2. Select an operating margin (OM) method

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

1. Simple OM, or
2. Simple adjusted OM, or
3. Dispatch data analysis OM, or
4. Average OM.

The dispatch data analysis OM, method 3, is the best choice. But it requires the detailed operating and dispatch data of power plants within the grid, while the dispatch data for NCPG is not available in public. Therefore, this method is not applicable.

The method 2 needs the annual load duration curve of the NCPG. However, the data required by this method is not available in public. Therefore, this method is not applicable, either.

The method 4 can only be used when low-cost/must run resources account for more than 50% of total amount of grid power generation, while the method 1 is used when low-cost/must run resources account for less than 50% of total amount of grid power generation. From 2002 to 2005, the low-cost/must-run electricity generation in NCPG account for 0.89%, 0.86%, 0.76% and 0.75% respectively[23], which are far

[23] 《The State Electric Industry Yearbook 》from 2003 to 2006

less than 50% of the total amount of grid power generation. Therefore, method 1 simple OM is applicable to the project.

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

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

·Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or

·Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or

·Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (Option C).

Option A should be preferred and must be used if fuel consumption data is available for each power plant / unit. But at present in China, the data of fuel consumption and net electricity generation of each power plant / unit is not available in public. Therefore, Option A is not applicable.

Option B needs the data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, but at present in China, the data is not available in public. Therefore, Option B is not applicable.

In China electricity power industry, nuclear and renewable power generation are considered as low-cost / must-run power sources, and the quantity of electricity supplied to the grid by these sources is available. So, Option C is applicable to the project.

The simple OM emission factor is calculated as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,y}}{\sum_{m} EG_{m,y}} \quad (8)$$

Where:

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

$FC_{i,m,y}$ Amount of fossil fuel type *i* consumed by power plant / unit *m* in year *y* (mass or volume unit)

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

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

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

m All power plants / units serving the grid in year *y* except low-cost / must-run power plants / units

i All fossil fuel types combusted in power plant / unit *m* in year *y*

y The three most recent years for which data is available (ex anteoption).

With reference to the *Notification on Determining Baseline Emission Factor of China's Grid* (publised on Aug. 9th, 2007)[24], the simple OM emission factor for NCPG is 1.1208 tCO_2e/MWh (refer Annex 3 for details).

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

The sample group of power units m used to calculate the build margin consists of either:
(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprises the larger annual generation.

For the project activity, method (b) will be used. "Tool to calculate the emission factor for an electricity system" allows project participants to choose between two given options for calculating the build margin for the project, one is ex-ante calculation, and the other is annual ex-post updating in the first crediting period. For the project, ex-ante calculation is chosen. The build margin emission factor ($EF_{grid,BM,y}$) for the project is therefore based on the most recent information available at the time of PDD submission.

Step 5. Calculate the build margin emission factor

The build margin emissions factor ($EF_{grid,BM,y}$) is the generation-weighted average emission factor (tCO_2e/MWh) of all power plants *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (9)$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year *y* (tCO_2e/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit *m* in year *y* (tCO_2e/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

With reference to the *Notification on Determining Baseline Emission Factor of China's Grid*, the build margin emission factor ($EF_{BM,y}$) of NCPG is 0.9397 tCO_2e/MWh (refer Annex 3 for details).

Step 6. Calculate the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \qquad (10)$$

Where:

$EF_{grid,CM,y}$	Combined margin CO_2 emission factor in year *y* (tCO_2e/MWh)

[24] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2193

$EF_{grid,OM,y}$ Operating margin CO_2 emission factor in year *y* (tCO_2e/MWh)
$EF_{grid,BM,y}$ Build margin CO_2 emission factor in year *y* (tCO_2e/MWh)
W_{OM} Weighting of operating margin emissions factor (%)
W_{BM} Weighting of build margin emissions factor (%)

The following default values should be used for W_{OM} and W_{BM} :
$W_{OM} = W_{BM} = 0.5$

Hence, $EF_{grid,CM,y} = EF_{grid,OM,y} \times 0.5 + EF_{grid,BM,y} \times 0.5$
$= 1.1208 \times 0.5 + 0.9397 \times 0.5$
$= 1.0302 (tCO_2e/MWh)$

$EF_{Elec,gr,j,y} = EF_{grid,CM,y} = 1.0302 (tCO_2e/MWh)$

Emission Reductions due to displacement heat

As there is no heat generation is involved in the project activity, this amount is zero.

Baseline emissions due to uncontrolled burning of anthropogenic sources of biomass

Step 1 Determination of the quantity of biomass residues used as a result of the project activity.

Since the baseline scenario has been identified as scenario 2, the total quantity of biomass resi dues used in the project plant is attributable to project activity and hence $BF_{PJ,k,y} = BF_{k,y}$ = 126,472 tons of dry corn stalks (The annual 141, 120 tons of straws are consumed with the moisture content of 10.38%).

Step 2. Estimation of methane emissions, consistent with the baseline scenario for the use of biomass residues (B1 or B3)

As the baseline scenario for biomass residue use has been identified as B1, then the methane emissions can be calculated by multiplying the quantity of biomass that would not be use in the absence of the project activity with the net calorific value and an appropriate emission factor:

$$BE_{Biomass,y} = GWP_{CH4} * \sum_k BF_{PJ,k,y} * NCV_k * EF_{burning,CH4,k,y} \quad (11)$$

Where:

$BE_{Biomass,y}$ is emissions from the unused biomass during the year y in tons of CO2

GWP_{CH_4} is the Global Warning Potential for methane valid for the relevant commitment period ($21tCO_2/tCH_4$),

NCV_k is the net calorific value of the biomass type I (TJ/ton of dry matter or TJ/liter), for the proposed project, the value of 0.01568 TJ/ton is applied.

$BF_{PJ,k,y}$ is the incremental quantity of biomass residue type i used as a result of the project activity in the project plant during the year y (tons of dry matter or liter). Based on the

project feasibility study report, the annual used corn stalk will be 126,472 tons of dry straws.

$EF_{burning,CH_4,i}$ is CH_4 emission factor for uncontrolled burning of the corn stalks in tCH_4/TJ. As there is no accurate information about the CH_4 emission factor, the default value of 0.0027 tCH_4/tons is adopted in the PDD according to ACM0006. Considering the uncertainty is greater than 100%, therefore a conservativeness factor of 0.73 is used in this PDD, thus the CH4 emission factor of 0.001971 tCH_4/TJ biomass residues should be used.

Leakage Emissions

The proposed project will collect the corn stalks within 50km as the supplier for the project. As stated in the baseline and monitoring methodology of the proposed project activity, leakage emissions will be calculated due to insufficient biomass supply. If the biomass supply is insufficient, biomass transportation from other consumers to the project site will cause additional fossil fuel consumption around the project site. The biomass in surplus will be monitored and recorded annually. On the condition that biomass supply proves sufficient, the emission leakage is zero. There are three options in the baseline methodology to demonstrate that the biomass used in the project power plant will not increase the fossil fuel consumption elsewhere. Among them, option 2 is "Demonstrate that there is an abundant surplus of the biomass in the region of the project activity which is not utilized". For this purpose, the project owner has 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. According to the proposed project feasibility study, the biomass (straw) to be used in the proposed project amounts to 141,120 tons. The surplus of corn stalks in Jiang County and nearby areas within 50km is 571,430 tons annually according to a conservatively calculation in the feasibility study, which is about three times of the quantity of biomass utilized (141,120 tons). Hence, the leakage emission is zero.

Emission Reductions

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y \quad (12)$$

Where:

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

$ER_{electricity,y}$ = Emission reductions due to displacement of electricity during the year *y* (tCO_2/yr)

$ER_{heat,y}$ = Emission reductions due to displacement of heat during the year *y* (tCO_2/yr)

$BE_{biomass,y}$ = Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y* (tCO_2e/yr)

PE_y = Project emissions during the year *y* (tCO_2/yr)

L_y = Leakage emissions during the year *y* (tCO_2/yr)

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

Data / Parameter:	GWP_{CH4}
Data unit:	Dimensionless
Description:	Global warming potential for methane
Source of data used:	IPCC 2006 Revised Guidelines
Value applied:	21 for First Commitment Period, Shall be updated according to any future COP/MOP decisions.

Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC 2006 default value
Any comment:	-

Data / Parameter:	EF_{CH_4}
Data unit:	kg CH4 / TJ
Description:	Methane emission from biomass combustion under control
Source of data used:	IPCC Guidelines 2006
Value applied:	30
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$EF_{burning,CH_4}$
Data unit:	kg CH_4 / TJ
Description:	Methane emission from biomass combustion
Source of data used:	IPCC Guidelines 2006
Value applied:	270
Justification of the choice of data or description of measurement methods and procedures actually applied :	The methane emission factor is 270Kg CH4/ TJ with uncontrolled combustion according to IPCC Guidelines 2006.
Any comment:	-

Data / Parameter:	$EF_{km,CO2}$
Data unit:	tCO_2/km
Description:	Average CO_2 emission factor for transportation of biomass with trucks
Source of data used:	IPCC 2006 default value from the Moderate Control index for the US heavy Duty Diesel Vehicle
Value applied:	0.001011
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	IPCC value from the latest version published will be utilized

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/t
Description:	Net Caloric Value(NCV) of the diesel
Source of data used:	*China Energy Statistical Yearbook 2006*
Value applied:	42.652
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$EF_{co2,i,y}$
Data unit:	tCO_2/GJ
Description:	weighted average CO_2 emission factor for the diesel(tCO_2/GJ)
Source of data used:	IPCC default value at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories, which is a conservative estimate.
Value applied:	$EF_{CO2,\ diesel}$ = 0.0748 tCO_2/GJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$TDL_{i,y}$
Data unit:	%
Description:	average technical transmission and distribution losses in the grid in year y
Source of data used:	Tool to calculate baseline, project and/or leakage emissions from electricity consumption
Value applied:	20%
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$EF_{CH4,BF}$
Data unit:	tCH_4/GJ
Description:	CH_4 emission factor for the combustion of biomass in the project plant

Source of data used:	According to the IPCC default value provided in table 4 of ACM0006, the CH_4 emission factor of combustion of biomass in agriculture is 0.03 tCH_4/TJ. Considering a conservativeness factor of 1.37, the CH4 emission factor in this PDD is taken as 0.0000411 tCH_4/GJ.
Value applied:	0.0000411 tCO_2/GJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$EF_{burning,CH4,i}$
Data unit:	tCH_4/TJ
Description:	CH_4 emission factor for the combustion of biomass in the project plant
Source of data used:	As there is no accurate information about the CH_4 emission factor, the default value of 0.0027 tCH_4/tons is adopted in the PDD according to ACM0006. Considering the uncertainty is greater than 100%, therefore a conservativeness factor of 0.73 is used in this PDD, thus the CH4 emission factor of 0.001971 tCH_4/TJ biomass residues should be used.
Value applied:	0.00197
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	MJ/t, m^3
Description:	Net calorific value of fossil fuel type *i* in year *y* consumed in NCPG
Source of data used:	China Energy Statistics Yearbook 2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistic data used for calculating emission coefficient of carbon
Any comment:	Uncertainty level of the data is low

Data / Parameter:	EF_{CO2}
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	The IPCC 2006 default value

Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The default value of IPCC is used as country-specific data which could not be revealed for public use
Any comment:	Uncertainty level of the data is low

Data / Parameter:	$CAP_{m,y,j}$
Data unit:	*MW*
Description:	The installed capacity of power source *j* of province *m* in years *y*.
Source of data used:	The China Energy Statistical Yearbook（2004~2006）
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistic data used for calculating *OM* emission factor
Any comment:	Uncertainty level of the data is low

Data / Parameter:	$OXID_i$
Data unit:	%(Percentage)
Description:	The oxidation factor of coal
Source of data used:	The IPCC 2006 default value
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data of IPCC in 2006 used for calculating emission coefficient of carbon
Any comment:	Uncertainty level of the data is low

Data / Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	Fire power generation of the grid within the project boundary
Source of data used:	The State Electric Industry Yearbook (2004~2006)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistic data used for calculating *OM* emission factor
Any comment:	Uncertainty level of the data is low

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume unit(10^4t or 10^8m^3)
Description:	Amount of fossil fuel type i consumed in the project electricity system (NCPG) in year y
Source of data used:	The China Energy Statistical Yearbook (2004~2006)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistic data used for calculating *OM* emission factor
Any comment:	Uncertainty level of the data is low

Data / Parameter:	h_i
Data unit:	%
Description:	The portion of electricity used in NCPG.
Source of data used:	China Electricity Yearbook
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is obtained from the China Electricity Yearbook and is reliable.
Any comment:	Uncertainty level of the data is low

Data / Parameter:	h_b
Data unit:	%
Description:	The efficiency of best technology in NCPG.
Source of data used:	China Electricity Yearbook
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is obtained from the China Electricity Yearbook and is reliable.
Any comment:	Uncertainty level of the data is low

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid (NCPG) by power unit in year y
Source of data used:	The China Energy Statistical Yearbook (2004~2006)

Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	-

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

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The emission reductions of the proposed project is the difference between the emission reductions through substitution of electricity generation with fossil fuels, project emissions, emission due to leakage and the baseline emissions due to burning of anthropogenic sources of biomass.

The project emission reductions are equal to 3,828 t and the calculation process is presented below.

1) According to the above formula (2) CO_2 emissions from combustion of fossil fuels for transportation of biomass to the project plant is 1,279 tCO_2 e/year.

The data for calculation and source of the data is listed below

	A	B	C	D	E
Data	Biomass demand (t/year)	Average load per trip（t）	Average distance from storage site to the power plant (km)	Emission Factor of the truck transportation (tCO_2/km)	GHG emission from the biomass transportation（tCO_2e/ year） E=A/B*C*D/1000
Amount	126,472	10	100	0.001011*	1,279

*data source: IPCC default value from the Moderate Control index for the US Heavy Duty Diesel Vehicle.

2) According to the above formula (3) CO_2 emissions from on-site consumption of fossil fuels are equal to 96tCO_2 e/year.

The data for calculation and source of the data is listed below

	A	B	C	D
Data	Diesel consumed（t/year）	Diesel CO_2 emission factor（tCO_2 /GJ）	Net calorie Value (GJ/t)	GHG emissions from fossil fuel combustion（tCO_2e/year） C=A*B*C
Amount	30	0.0748	42.652	96

3) **CO_2 emissions from electricity consumption**

The data for calculation and source of the data is listed below

	A	B	C	D

Data	Annual Electricity consumption (MWh)	Emission Factor (tCO_2/MWh)	TDL_y	GHG **emissions from electricity consumption** (tCO_2e/year) D=A*B*(1+C)
Amount	600	1.0302	20%	741

4) According to the above formula (5) the methane emissions from combustion of biomass are equal to 1,712 tCO_2e/year.

The data for calculation and source of the data is listed below

	A	B	C	D	E	F
Data	Biomass burnt (t/year)	Biomass Net Calorific Value （TJ/t）	Methane Emission Factor (controlled burning) （$KgCH_4$/TJ）	Conservativeness value	Global Warming Potential of CH_4	GHG emissions from biomass combustion (tCO_2e/year)
Amount	126,472	0.01568	30	1.37	21	1,712

Therefore, $PE_y = PET_y + PEFF_y + PE_{Biomass,CH_4,y}$ = 1,279+96+1,712+741=3,828(t)

Emission Reductions due to displacement of electricity are 124,654t CO_2e/year
According to the above formula, the emission reductions are calculated and the calculation process and source of data are described as follows:

	A	B	C
Data	Annual Power Generation (MWh)	Emission Factor (tCO_2/MWh)	Emission Reduction (tCO_2e/year) C=A*B
Amount	121,000	1.0302	124,654

Emission Reduction due to displacement of heat is zero.

Baseline emissions due to areobic decay of the biomass residues are 8,208tCO_2/year.

According to the above formula, the baseline emissions are calculated and the calculation process and source of data are described as follows:

	A	B	C	D	E	F
Data	Biomass Burned (t/year)	Biomass Net calorific Value （TJ/t）	Methane Emission Factor in agriculture （$KgCH_4$/TJ）	Conservat-iveness Factor	Global Warming potential of CH_4	GHG emissions from biomass combustion （tCO2/year）
Data source	Feasibility study	Feasibility study	IPCC default value	Baseline Methodology	IPCC default value	F=A*B*C*D*E/1000

Amount	126,472	0.01568	270	0.73	21	8,208

Leakage emissions are equal to zero.

All in all, the emission reductions of the proposed project are 0+124,654+8,208-3,827-0= **129,038 tCO_2,** based on the above formula. $ER_y = ER_{heat} + ER_{electricity} + BE_{biomass,y} - PE_y - L_y$.

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

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Year	Estimation of project activity emissions (tones of CO_2e)	Estimation of baseline emissions (tones of CO_2e)	Estimation of leakage (tones of CO_2e)	Estimation of overall emission reductions (tones of CO_2e)
15/12/2010~14/12/2011	3,828	132,866	0	129,038
15/12/2011~14/12/2012	3,828	132,866	0	129,038
15/12/2012~14/12/2013	3,828	132,866	0	129,038
15/12/2013~14/12/2014	3,828	132,866	0	129,038
15/12/2014~14/12/2015	3,828	132,866	0	129,038
15/12/2015~14/12/2016	3,828	132,866	0	129,038
15/12/2016~14/12/2017	3,828	132,866	0	129,038
Total (tonnes of CO_2e)	26,796	930,062	0	903,266

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

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B.7.1. Data and parameters monitored:

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Data / Parameter:	$BF_{k,y}$
Data unit:	tons of dry matter
Description:	Quantity of biomass residue type *k* combusted in the project plant during the year *y*
Source of data to be used:	Continuous on-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	With the moisture content of approximately 10.38%, 141,120×(1-10.38%) = 126,472
Description of measurement methods and procedures to be	The straws are to be weighted by weighting system. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be crosschecked with the quantity of electricity generated and fuel

applied:	purchase receipts every month.
QA/QC procedures to be applied:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes in the project site.
Any comment:	-

Data / Parameter:	$BF_{T,k,y}$
Data unit:	tons of dry matter or liter
Description:	Quantity of biomass residue type k that has been transported to the project site during the year y where k are the types of biomass residues used in the project plant in year y
Source of data to be used:	Continuous on-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	With the moisture content of approximately 10.38%, 141,120×(1-10.38%) = 126,472
Description of measurement methods and procedures to be applied:	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass transported to the project plant. The quantity shall be crosschecked with the quantity of electricity generated and fuel purchase receipts
QA/QC procedures to be applied:	The direct measurement on the mass or volume will be cross-checked according to the energy balance, which is based on the purchased quantity and storage changes in collection substations.
Any comment:	-

Data / Parameter:	Moisture content of the biomass residues
Data unit:	%
Description:	Moisture content of each biomass residue type *k*
Source of data to be used:	Continuous on-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	10.38
Description of measurement methods and procedures to be applied:	Continuously monitored by moisture analyzer. Moisture content of the biomass residues will be both measured in collection point and in power plant.
QA/QC procedures to be applied:	The instrument will be regularly calibrated as per related technical standard.
Any comment:	-

Data / Parameter:	NCV_k
Data unit:	TJ/t
Description:	Net Calorific Value of biomass utilized in power plant

Source of data used:	China National Center for Quality Supervision and Test of Coal
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.01568[25]
Description of measurement methods and procedures to be applied:	Measurements shall be carried out at reputed laboratories and updated at least once per half year according to relevant international standards.
QA/QC procedures to be applied:	Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass.
Any comment:	-

Data / Parameter:	AVD_y
Data unit:	km
Description:	Average round trip distance between biomass fuel supply sites and the project site
Source of data to be used:	Continuous on-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	50*2=100
Description of measurement methods and procedures to be applied:	Distance traveled will be continuously recorded during the reception of the biomass trucks. The collection point from where the individual trucks are coming will be noted. The average round trip distance will be calculated every month.
QA/QC procedures to be applied:	Check consistency of distance records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps).
Any comment:	-

Data / Parameter:	TL_y
Data unit:	-
Description:	the average truck load of the trucks used measured in tons or volume of biomass
Source of data to be	On-site measurement and recording

[25] Analysisi Report for Coal Ash, China National Center for Quality Supervision and Test of Coal, 2007

used:	
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:	All the weights of each truck carrying biomass to the project plant will be recorded at least 2 years flowing the end of the crediting period.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$FF_{projectplant,i,y}$
Data unit:	t
Description:	the quantity of diesel oil to be used setups of the project
Source of data to be used:	Dispatch centre of the project plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	30
Description of measurement methods and procedures to be applied:	The quantity of the diesel oil to be combusted in the proposed project will be monitored and recorded continually. The buyer will double-check these data.
QA/QC procedures to be applied:	The data measured by the meter will be double-checked according to the invoice
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EG_{togrid,y}$
Data unit:	MWh/year
Description:	the quantity of power electricity connected to the grid
Source of data to be used:	Record of electric meter on site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	121,000
Description of measurement methods and procedures to be applied:	The quantity of electricity to the power grid will be measured by the two-way electricity meter E1 installed at the 357 switchpoint of Anyu 110KV Substation by the grid company. The data will be collected every month.
QA/QC procedures to	Electricity meters should meet DL/T448-2000 or other relevant national

be applied:	standards at the time of installation. During the operational time, electricity meters will be annually calibrated according to JJG 596-1999 or other relevant national standard. The accuracy of the electricity meters should comply with the acceptable range as outlined in the relevant national standard.Additionally, these data will be cross-checked according to invoice provided by the grid company.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EG_{fromgrid,y}$
Data unit:	MWh/year
Description:	the quantity of power electricity down from the grid
Source of data to be used:	Record of electric meter on site
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:	The quantity of the electricity from the power grid on site will be measured by the two-way electricity meter E1 installed in be installed in the 110KV An'yu Substation by the grid company. The data will be collected every month.
QA/QC procedures to be applied:	Electricity meters should meet DL/T448-2000 or other relevant national standards at the time of installation. During the operational time, electricity meters will be annually calibrated according to JJG 596-1999 or other relevant national standard. The accuracy of the electricity meters should comply with the acceptable range as outlined in the relevant national standard. Additionally, these data will be cross-checked according to invoice provided by the grid company.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EG_{output,y}$
Data unit:	MWh/year
Description:	the gross quantity of power electricity generated by the project
Source of data to be used:	Record of electric meter on site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	137,500
Description of measurement methods and procedures to be applied:	The quantity of the electricity will be measured by the electricity meter E2 installed the exit of generator in the project site by the project developer. The data will be collected every hour and aggregated.
QA/QC procedures to be applied:	Electricity meters should meet DL/T448-2000 or other relevant national standards at the time of installation. During the operational time, electricity

	meters will be annually calibrated according to JJG 596-1999 or other relevant national standard. The accuracy of the electricity meters should comply with the acceptable range as outlined in the relevant national standard. Additionally, these data will be cross-checked according to the data of E1.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EG_{auxilary,y}$
Data unit:	MWh/year
Description:	the quantity of power electricity consumed by the project
Source of data to be used:	Record of electricity meter on site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	16,500
Description of measurement methods and procedures to be applied:	The quantity of the electricity consumed by the project from the project will be measured by the electricity meter E3 installed in the project site by the project developer.
QA/QC procedures to be applied:	Electricity meters should meet DL/T448-2000 or other relevant national standards at the time of installation. During the operational time, electricity meters will be annually calibrated according to JJG 596-1999 or other relevant national standard. The accuracy of the electricity meters should comply with the acceptable range as outlined in the relevant national standard. Additionally, these data will be cross-checked according to the data of E1 and E2. The data will be collected every hour and aggregated.
Any comment:	Uncertainty level of data is low.

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	600
Description of measurement methods and procedures to be applied:	Use electricity meters. The electricity consumed at 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:	The quantity shall be cross-checked with electricity purchase receipts.
Any comment:	-

Data / Parameter:	$B_{available,y}$
Data unit:	tonne
Description:	Amount of biomass fired in all grid-connected power plants in Jiang County and nearby counties within 50km
Source of data to be used:	official statistics
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:	This will be obtained from official data. If it is not available, the data will be calculated or estimated based on available official information every year.
QA/QC procedures to be applied:	This data can be calculated in accordance with the planting area and output of the straw.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	B_g
Data unit:	tonne
Description:	The quantity of biomass that is available in surplus in Jiang County and nearby counties within 50km
Source of data to be used:	feasibility study
Value of data applied for the purpose of calculating expected emission reductions in section B.5	571,430
Description of measurement methods and procedures to be applied:	The data come from official information. If the data is not available, the calculation and evaluation can be based on official information every year. The quantity of surplus supply is the difference between available biomass and biomass used for other purposes than grid connected electricity generation.
QA/QC procedures to be applied:	Uncertainty level of data is low, which can be calculated in accordance with the planting area and output of the corn.
Any comment:	Uncertainty level of data is low.

B.7.2. Description of the monitoring plan:

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The approved baseline methodology applied in the proposed project activity is ACM0006 (Version 09)- “consolidated baseline methodology for grid-connected electricity generation from biomass residues”.

Therefore, the monitoring methodology applied for this project activity corresponds to the approved baseline methodology ACM0006.

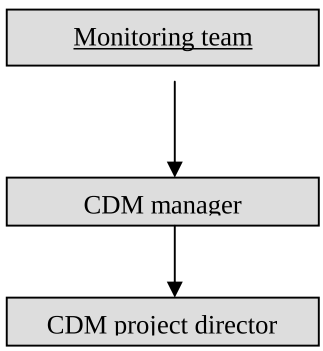
1. The requirement of monitoring

The proposed project owner must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected DOE to verify project performance as part of the verification and certification process. This process also reinforces that CO_2 reductions are real and credible to the buyers of the Certified Emission Reductions (CERs).

Emission reduction will be achieved through avoiding power generation from fossil fuels. Therefore, the grid-connected power generation and the baseline emission factor are the most important data that need to be monitored.

2. Monitoring structure

There will be a CDM department in charge of the whole monitoring process. The department will be led by a CDM project director, and will also include a CDM manager and a monitoring team. The management structure of the CDM department is as follows:



The operational staffs will undertake the monitoring tasks including hourly watching metering equipments, collecting electricity data and completing records, checking and analyzing the data, archiving relevant records, reporting to CDM manager. Monitoring staffs will receive training on how to read the electricity meter on time and record the data correctly and on how to treat emergent situation before the project is implemented. In the following years within the crediting period, relevant training will also be carried out based on real situation.

The project owner will appoint a CDM manager who will be responsible for verification of the measurement and the calculation of the emissions reductions. The CDM manager will take the responsibility of the monitoring plan implementation and prepare the monitoring reports.

The General Manager will be the CDM project director and hold the overall responsibility for the monitoring process. The CDM project director will review the monitoring reports.

3. Monitoring

3.1 Electricity generated and consumed by the project

Two-way electricity meter need to be installed to monitor the net power generation of the proposed project. The net power generation is the difference of the quantity of power electricity connected to the grid($EG_{togrid,y}$) and the quantity of electricity down from the grid ($EC_{fromgrid,y}$). When the project is under the period of examination and repairmen, the project had to consume the electricity from the grid.

Electricity meters E1 will be installed the 357 switchpoint of Anyu 110KV Substation in Yuncheng as the main meter system.

$EG_y = EG_{togrid}, - EC_{fromgrid,y}$

Electricity meter E2 and E3 will respectively monitoring the electricity generated by the project and consumed by the project.

$EG_{togrid,y} = EG_{output,y} - EG_{auxilary,y}$

E1 can be read remotely and also record the accumulative generation by Yuncheng Power Supply Branch Company of Shanxi Power Co., Ltd. The Yuncheng Power Supply Branch Company should provide the data from the main meter system to Shanxi Jianghe Chemical Silicon Co., Ltd every month to check the quantity of electricity connected to the grid. All of data will be recorded by the project owner for verification for at least for two years. The data of E1 can be crossed-checked by the difference of E2 and E3 every month. If the readings of E1 exceed the accuracy, the difference of E2 and E3 will be applied.

3.2 Biomass residue consumption at the project plant ($BF_{k,y}$)

The quantity of biomass residues consumed at the project plant will be measured by the automatic weighing system every day and aggregated annually. The net calorific value of biomass residue type k utilized in the project will be tested by the updated reputed laboratories once per half year. This measurement could be cross-checked against the biomass residues purchased and transported every month. In addition, an energy balance analysis compared with the electricity generated by the project every month will be conducted to verify the credibility of the monitoring result. All relevant records will be maintained for verification.

3.3 Fossil fuel consumption($FF_{projectplant,i,y}$)

Fossil fuel consumption by the boiler during operation will be recorded and monitored during the operational period of the proposed project. The diesel for boiler start-ups will be stored in barrels. And its consumption will be metered through the flow meter. All relevant records will be maintained for verification. The diesel consumed by the forklifts at the straw-collecting stations will be determined by the quantity of diesel purchased and remained, and it should be cross-checked by diesel purchase invoice.

3.4 Transportation of biomass residues ($BF_{T,k,y}$)

The project owner will structure a recording and monitoring system within the biomass residues supply and management system covering all the straw-collecting stations and sub-stations. The quantity of biomass residues, type and load of truck, transportation distance to the collecting stations will be recorded by company staff at the sites every day. The receipts and records regarding biomass residues

purchases by the proposed project will be documented and summarized for verification.

The quantity of biomass residues transported will be measured by weighbridges. The moisture content of the biomass residues will be measured. The transportation of biomass residues from the collecting stations and sub-stations to the project plant will be monitored and documented by the project owner to determine the amount of fossil fuel consumed by biomass residues transportation. The transportation records will be documented and maintained for verification.

3.5 Biomass residues' availability (B_g and $B_{available,y}$)

Both the utilized and the available quantity of the biomass residue fired at the project plant in the defined geographical region will be monitored every year to check the leakage effect. This will be obtained from official information such as the statistics from local agricultural bureau of relevant counties on a yearly basis. If it is not available, the data will be calculated or estimated annually based on a survey conducted by a qualified third-party, e.g., a consulting agency.

4. Installation and calibration of Meters

The electricity generated by the project will be connected to the power grid through Anyu sub-station increasing the voltage to 110 kV. The main electricity meter (E1) will be installed at the Anyu sub-station to monitor the net electricity supplied to the grid. The electricity meter E2 will installed in the outlet of generator. The metering equipments E1 will reach 0.2 S in accuracy degree.

Electricity meters should meet DL/T448-2000 or other relevant national standards at the time of installation. During the operational time, electricity meters will be annually calibrated according to JJG 596-1999 or other relevant national standard.

The automatic weighting system used at the project plant could be installed at the inlet of power plant and the outlet of biomass substation. All weighting system should be calibrated by the manufacturer once time every year as per request by the project owner.

The maintenance of monitoring equipment and installation:

1) If monitoring equipment is broken, relevant staffs should repair it as soon as possible according to the specification.;
2) If the equipment can not be repaired, replacement should be carried out immediately.

The missing data during repair and replacement will be identified in conservative manner which results min emission reductions.

5. QA/QC

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, which will be ensured through the CDM mechanism in terms of the need for verification of the emission on an annual basis according to this PDD and the CDM manual. This process is open to comments from the DOE.

The financial department should keep all relevant invoices, such as power sales and purchase receipts, fuel purchase receipts, biomass purchase receipts and other relative data. These invoices will used to double-check the monitoring data. All receipts of every month will be collected to compute the total amount.

6. Data Management System

Record keeping is the most important part in relation to the monitoring process. Without accurate and efficient data, the emission reduction from the proposed project cannot be verified.

Overall responsibility for monitoring of GHG emission reduction will rest with the CDM person responsible for 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. If the data and information are from the Internet, the website must be provided. Moreover, the credibility and reliability of the data and information must be confirmed by the CDM developer or other qualified entities. It is the responsibility of the proposed project owner to provide additional necessary data and information for validation and verification requirement of the DOE.

Physical documentation such as paper-based maps, diagrams and environment assessment report will be collated in a central place with the monitoring plan. In order to facilitate auditor's reference, monitoring results will be indexed. All paper-based information will be stored by the technical department of company, and at least one copy will be kept.

All the records and documents will be archived through the full crediting years and two years after. The monitored data will be synchronously delivered to DOE, who is entrusted as the monitoring plan consultant by the project owner. The DOE could provide monitoring services to the project owner, and provide the data to other project participants such as CER purchaser for utilization.

7. Monitoring report

The CDM manager is responsible for writing the monitoring report. The report should include the electricity supplied to the power grid every month and the CER calculation result every month, which will be submitted to general manager to check and will be the important material for verification of DOE. All the relevant data records will be kept by the Project owner during the crediting period.

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

>>

The completion of the baseline methodology is 01/08/2007.
The technicians determining the baseline methodology include:

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All the above mentioned persons and company are not project participants.

SECTION C. Duration of the project activity / Crediting period

C.1 . Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

15/11/ 2007(The starting date of construction)[26]

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

>>

20years

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:

>>

The crediting period will start on 15/12/2010, or on the date of registration of the CDM project activity, whichever is later.

C.2.1.2. Length of the first crediting period:

>>

7years

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

[26] The date of Nov. 15th, 2007 was chosen as the starting date of the project since it was the date of construct start date, which is an earlier date than the date signing the key equipment purchase contract (Aug. 8th, 2008).

SECTION D. Environmental impacts

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

>>

An Environmental Impact Assessment (EIA) for the project was completed on July 2007 by the project entity and subsequently approved by the Shanxi Environmental Protection Agency in Aug. 7th, 2007. A summary of the impacts is presented below.

<u>The analysis of the environmental impacts during the construction period:</u>

Air pollution

The main air pollution sources during the construction period are dust from excavation, concrete mixing and construction materials transportation. Some measures will be taken to reduce the impact of dust, such as watering, covering and so on. The foundation excavation and pipe network construction will try to avoid in the windiness season.

Noise

Noise during the construction period is mainly caused by mechanical equipments operation such as excavator, bulldozer, and blender etc. While this impact is local and is in short term. It will disappear as the end of construction. In addition, some measures will be taken to reduce environmental impacts of noise to the fullest extent.

Solid waste

Solid wastes during construction period are mainly construction materials and some domestic waste. The excavated soil will be backfilled as much as possible. The wastes must be piled up in designed residues site. The domestic waste produced by the workers will be sent to solid waste treatment plant.

Waste water

The waste water during the construction period is mainly from construction and the workers' living waste water. As for waste water from construction, it will use deposition pool to dispose. The water disposed will be reused to water the machine. Living waste water dealt with by anaerobic lagoon will be used for watering.

<u>Analysis of environmental impacts after put into production:</u>

Impact on the air

During the operation period, the main pollution to the air is flue gas from the boiler and dust during straws transportation. The flue gas will be treated by the bag house dust collector and wet method-based flue gas cleaner and then release to the air through 60m high chimney. After the collection, transferring, transportation, the dust attached to straws is limited and can be neglected.

Waste water

The waste water during operation period is mainly from living waste water, industrial cooling water and boiler-washing water. Living waste water produced by 90 workers will amount to 8.64 m^3/d and it will be used for plant greening in summer and irrigation in winter after treated. Waste water from boiler and

circulation system will be treated in recovery pond for repeat utilization.

Noise

Noise in operation period is mainly from running equipments. Although the power plant is 553m away form the nearest village, some measurements will be taken to minimize the noise impact. The equipments used will be selected as low noise equipments; some shock absorbing measurements will be adopted in installation; trees will be planted by the road and surround the power plant to obstruct and absorb the noise.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

The proposed project has already received approval from Shanxi Environmental Protection Agency according to the Environmental Assessment Law. There is no significant negative impact on the environment.

SECTION E. Stakeholders' comments

>>

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

>>

The project developer collected comments from local stakeholders through questionnaires sent to the local population on 08/06/2007. There were 60 persons interviewed at random. The government department and experts agree that the proposed project will reduce energy consumption, abate pollution and increase the income for farmers by using local renewable energy resources. The main content of the questionnaire is summarized bellow, which has been provided to the DOE for validation.

Table E-1. Questionnaire to stakeholders

Num.	Question	Answer (mark"√"within ( ))		
1	Know the project info or not	Know ( )	A little ( )	Don't know ( )
2	The effect of the project to local economic development	Improve ( )	Delay ( )	No effect ( )
3	Impact of the project to the life of local citizens	Favourable ( )	Disadvantageous ( )	No impact ( )
4	Is it reasonable of choosing the project site	Reasonable ( )	Unreasonable ( )	No idea ( )
5	Impact to the environment of the projec in your opinion	Big ( )	Small ( )	No idea ( )
6	Do you support the construction of the proposed project	Yes ( )	No ( )	No idea ( )
Suggestions and requests to the project：				
Information of respondents： Gender：Male ( ) ；Female ( ) Age： Younger than 25 ( ) ；25-45 ( ) ；Older than 45 ( ) Occupation：Official ( ) ；Teacher ( ) ；Worker ( ) ；Farmer ( ) ；Others ( ) Education：Primary school ( ) ；Junior high school ( ) ；Senior high school ( ) ； College and above ( ) Signature Phone Date				

The sum-up of the questionnaires will be shown in E.2.

E.2. Summary of the comments received:

>>
Sixty questionnaires were delivered and all of them were collected, which show a quite positive attitude to the proposed project. Of the interviewees, officers occupy 43%, workers occupy 13%, teachers occupy 1%, farmers occupy 17%, others occupy 17%; fellows aged under 25 occupy 6%, 25~45 occupy 47%, 46 above occupy 47%; education degree with junior high school is 34%, senior high school persons occupy 38%, college degree and above occupy 28%.

According to the investigation analysis, people that know about the project are 87% of the total, people that think the project will promote the economic development are 100%, believing that the project will have a positive impact are 75%, 90% of the respondents consider the project site location is appropriate, 91.7% all of the interviewees believe the project has little influence or no influence on the environment and 100% of the people support the construction of the project, no adverse opinion.

Some of the stakeholders worried that the proposed project would pollute the air. However, as shown from the survey, most of the comments from the local population support the project construction, in that the proposed project will improve the local economy without obvious negative impact on the livelihood. In addition, the public has put forward some reasonable suggestions, such as the treatment for the noise and dust, comprehensive utilization of the dust and so on. Therefore, the project developer gives great importance to the management on the dust.

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

>>
As for the air pollution, it will not occur since the project owner will take measures, such as a dust catcher, to prevent it. Both the local resident and government gave strong support to the construction of the proposed project. According to comments from the stakeholders, it is not necessary to adjust the design, construction or operation of the proposed project.

As for the reasonable suggestions proposed by the public, such as how to prevent the noise and dust pollution, the construction company has adopted correspondent measurement to cut down the pollutions. Low noise equipment has been used; construction materials will be transported closed; frequent watering in the project site will lower the dust. All these measurements will help to cut down the noise and dust pollution.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project Entity：

Organization:	Shanxi Jianghe Chemical Silicon Co., Ltd
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URL:	
Represented by:	Mr. Laiyun YANG
Title:	General Manager
Salutation:	
Last Name:	Laiyun
Middle Name:	
First Name:	Yang
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

The Buyer：

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

>>

There is no public funding related to Annex I parties in the proposed project activity.

Annex 3

BASELINE INFORMATION

>>

1. Calculation of Operating Margin (*OM*) Emission Factor

According to the authority documents regarding grid boundaries provided by the Chinese *DNA*, NCPG consists of Tianjin, Beijing, Hebei, Shandong, Shanxi and Inner Mongolia power grids. Baseline information is with reference to the *Notification on Determining Baseline Emission Factor of China's Grid* (publised on 9 Aug., 2007)[27].

[27] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2193

Table A1 . Total Emissions of the North China Power Grid in 2003

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	Emission Factor	Oxidate Rate	Low Caloric Value (MJ/t,m^3,tce)	CO_2 Emission (tCO_2e)
									(tc/TJ)	(%)	(MJ/t,km^3)	K=G*H*I*J*44 /12/10000 (m)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44 /12/1000 (m)
Raw Coal	10^4t	714.73	1,052.74	5,482.64	4,528.5	3,949.32	6,808	22,535.94	25.8	100	20,908	445,737,636.11
Cleaned Coal	10^4t						9.41	9.41	25.8	100	26,344	234,510.60
Other Washed Coal	10^4t	6.31		67.28	208.21		450.9	732.7	25.8	100	8,363	5,796,681.31
Coke	10^4t					2.8		2.8	25.8	100	28,435	75,318.63
Coke Oveb Gas	10^8m^3	0.24	1.71		0.9	0.21	0.02	3.08	12.1	100	16,726	228,559.67
Other Gas	10^8m^3	16.92		10.63		10.32	1.56	39.43	12.1	100	5,227	914,399.71
Crude Oil	10^4t						29.68	29.68	20	100	41,816	910,139.18
Gasoline	10^4t						0.01	0.01	18.9	100	43,070	298.48
Diesel	10^4t	0.29	1.35	4		2.91	5.4	13.95	20.2	100	42,652	440,693.26
Fuel Oil	10^4t	13.95	0.02	1.11		0.65	10.07	25.8	21.1	100	41,816	834,672.45
PLG	10^4t							0	17.2	100	50,179	0
Refinery Gas	10^4t			0.27			0.83	1.1	18.2	100	46,055	33,807.44
Natural Gas	10^8m^3		0.5				1.08	1.58	15.3	100	38,931	345,076.60
Other petroleum Products	10^4t							0	20	100	38,369	0
Other Coking Products	10^4t							0	25.8	100	28,435	0
Other Energy	10^4tce	9.83					39.21	49.04	0	100	0	0
											Total	455,551,793

Data sources: China Energy Statistical Yearbook 2004

Table A2．Thermal Power Generation of the North China Power Grid in 2003

	Electricity Generation (MWh)	Used by the Power Plant (%)	Electricity supplied to the Grid (MWh)
Beijing	18,608,000	7.52	17,208,678
Tianjin	32,191,000	6.79	30,005,231
Hebei	108,261,000	6.5	101,224,035
Shanxi	93,962,000	7.69	86,736,322
Inner Mongolia	65,106,000	7.66	60,118,880
Shandong	139,547,000	6.79	130,071,759
Total			**425,364,906**

Data sources: The State Electric Industry Yearbook 2004

The North China Power Grid imported 4,244,380MWh electricity from the North East Power Grid in 2003, and the emission factor of the North East Power Grid in 2003 is 1.136435 tCO_2e/MWh.

Table A3．*OM* Emission Factor of the North China Power Grid in 2003

Electricity supplied to the Grid (MWh)	Total emission (tCO_2e)	OM (tCO_2e/MWh)
429,609,286	460,380,537	1.071626

Table A4. Total Emissions of the North China Power Grid in 2004

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	Emission Factor	Oxidate Rate	Low Caloric Value (MJ/t,m^3,tce)	CO_2 Emission (tCO_2e)
									(tc/TJ)	(%)	(MJ/t,km^3)	K=G*H*I*J*44 /12/10000 (m)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J	K=G*H*I*J*44 /12/1000 (m)
Raw Coal	10^4t	823.09	1,410	6,299.8	5,213.2	4,932.2	8,550	27,228.29	25.8	100	20,908	538,547,476.60
Cleaned Coal	10^4t						40	40	25.8	100	26,344	996,856.96
Other Washed Coal	10^4t	6.48		101.04	354.17		284.22	745.91	25.8	100	8,363	5,901,190.88
Coke	10^4t					0.22		0.22	25.8	100	28,435	5,917.89
Coke Oveb Gas	10^8m^3	0.55		0.54	5.32	0.4	8.73	15.54	12.1	100	16,726	1,153,187.45
Other Gas	10^8m^3	17.74		24.25	8.2	16.47	1.41	68.07	12.1	100	5,227	1,687,509.064
Crude Oil	10^4t							0	20	100	41,816	0
Gasoline	10^4t								18.9	100	43,070	0
Diesel	10^4t	0.39	0.84	4.66				5.89	20.2	100	42,652	186,070.49
Fuel Oil	10^4t	14.66		0.16				14.82	21.1	100	41,816	479,451.38
PLG	10^4t							0	17.2	100	50,179	0
Refinery Gas	10^4t		0.55	1.42				1.97	18.2	100	46,055	60,546.05
Natural Gas	10^8m^3		0.37		0.19			0.56	15.3	100	38,931	122,305.63
Other Petroleum Products	10^4t							0	20	100	38,369	0
Other Coking Products	10^4t							0	25.8	100	28,435	0
Other Energy	10^4tce	9.41		34.64	109.73	4.48		158.26	0	100	0	0
											Total	549,031,577.73

Data sources: China Energy Statistical Yearbook 2005

Table A5 . Thermal Power Generation of the North China Power Grid in 2004

	Electricity Generation (MWh)	Used by the Power Plant (%)	Electricity supplied to the Grid (MWh)
Beijing	18,579,000	7.94	17,103,828
Tianjin	33,952,000	6.35	31,796,048
Hebei	124,970,000	6.5	116,846,950
Shanxi	104,926,000	7.7	96,846,698
Inner Mongolia	80,427,000	7.17	74,660,384
Shandong	163,918,000	7.32	151,919,202
Total			**489,173,110**

Data sources: The State Electric Industry Yearbook 2005

The North China Power Grid imported 4,514,550MWh electricity from the North East Power Grid in 2004, and the emission factor of the North East Power Grid in 2004 is 1.17384 tCO_2e/MWh.

Table A6 . *OM* Emission Factor of the North China Power Grid in 2004

Electricity supplied to the Grid (MWh)	Total emission (tCO_2e)	OM(tCO_2e/MWh)
493,687,660	554,332,148	1.122840

Table A7 . Total Emissions of the North China Power Grid in 2005

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	Emission Factor	Oxidate	Low Caloric Value ($MJ/t,m^3$,tce)	CO_2 Emission (tCO_2e)
									(tc/TJ)	(%)	($MJ/t,km^3$)	K=G*H*I*J*44 /12/10000 (m)
		A	B	C	D	E	F	G=A+B+ C+D+E+ F	H	I	J	K=G*H*I*J*44 /12/1000 (m)
Raw Coal	10^4t	897.75	1,675.2	6,726.5	6,176.5	6,277.23	10,405.4	32,158.53	25.8	100	20,908	636,062,535.8
Cleaned Coal	10^4t						42.18	42.18	25.8	100	26,344	1,051,185.664
Other Washed Coal	10^4t	6.57		167.45	373.65		108.69	656.36	25.8	100	8,363	5,192,725.191
Coke	10^4t					0.21	0.11	0.32	25.8	100	28,435	8,607.84
Coke Oveb Gas	10^8m^3	0.64	0.75	0.62	21.08	0.39		23.48	12.1	100	16,726	1,742,396.483
Other Gas	10^8m^3	16.09	7.86	38.8.	9.88	18.37		91.03	12.1	100	5,227	2,111,027.27
Crude Oil	10^4t							0.73	20	100	41,816	22,385.49867
Gasoline	10^4t			0.01				0.01	18.9	100	43,070	298.4751
Diesel	10^4t	0.48		3.54		0.12		4.14	20.2	100	42,652	130,786.3867
Fuel Oil	10^4t	12.25		0.23		0.06		12.54	21.1	100	41,816	405,689.6325
PLG	10^4t							0	17.2	100	50,179	0
Refinery Gas	10^4t			9.02				9.02	18.2	100	46,055	277,221.01
Natural Gas	10^8m^3	0.28	0.08		2.76			3.12	15.3	100	38,931	681,417.0792
Other Petroleum Products	10^4t							0	20	100	38369	0
Other Coking Products	10^4t							0	25.8	100	28,435	0
Other Energy	10^4tce	8.58		32.35	69.31	7.27	118.9	236.41	0	100		0
											Total	647,686,276.33

Data sources: China Energy Statistical Yearbook 2006

Table A 8 . Thermal Power Generation of North China Power Grid in 2005

	Electricity Generation (MWh)	Used by the Power Plant (%)	Electricity supplied to the Grid (MWh)
Beijing	20,880,000	7.73	19,265,976
Tianjin	36,993,000	6.63	34,540,364
Hebei	134,348,000	6.57	125,521,336
Shanxi	128,785,000	7.42	119,229,153
Inner Mongolia	92,345,000	7.01	85,871,616
Shandong	189,880,000	7.14	176,322,568
Total			**560,751,013**

Data sources: The State Electric Industry Yearbook 2006

The North China Power Grid imported 23,423,000MWh electricity from the North East Power Grid in 2005, and the emission factor of the North East Power Grid in 2005 is 1.15764 tCO_2e/MWh.

Table A 9 . Emission Factor of North China Power Grid in 2005

Electricity supplied to the Grid (MWh)	Total emission (tCO_2e)	OM (tCO_2e/MWh)
584,174,013	674,805,425	1.155145

Hence, $EF_{OM,y}$ =1.12076 tCO_2e/MWh

2. Calculation of Build Margin (*BM*) Emission Factor

The calculation of the BM for the project makes use of aggregated data to identify the 20% most recent capacity addition (sample group). This is identified by direct comparison of the total installed capacity on NCPG in the most recent years for which data is available (As fer the project, the year 2005). BM is determined by selecting the year since which the new capacity additions are equal to or greater than 20%.

TableA10. Capacity additions of the North China Power Grid from 2003 to 2005

	Installed capacity in 2003	Installed capacity in 2004	Installed capacity in 2005	New added installed capacity 2003-2005	The fraction of newly added installed capacity
	A	B	C	D=C-A	
Thermal power（MW）	84006.6	93594.9	111068.7	27062.1	99.28%
Hydro power（MW）	3266.0	3250.7	3216.2	-49.8	-0.18%
Nuclear power（MW）	0	0	0	0	0.00%
Wind power（MW）	90.1	137.5	335.5	245.4	0.90%
Total（MW）	87362.7	96983.1	114620.4	27257.7	100.00%
The fraction of installed capacity compared with 2005	76.22%	84.61%	100%		

Data sources: The State Electric Industry Yearbook 2004-2006

As we could see from Table A 10, compared with the year 2005, the fraction of installed capacity of 2003 and 2004 are 76.22% and 84.61% respectively. So the year 2003 is selected since about 23.78% capacity has been added compared with 2005 (15.39% for 2004).

Of the added capacity since 2003, 99.28% is thermal capacity, i.e. NCPG is dominated by thermal power plants, while coal-fired power plants account for over 99% of thermal power plants (refer to Table A11). Therefore, the BM is calculated from the capacity of thermal power plant and the CO_2 emission factor of the best commercially available coal-fired thermal power plant in China.

Table A11. Calculating the proportion of solid fuel, liquid fuel and gas fuel in total thermal power emission

Fuel Type	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Total G=A+…+F	Caloric value kJ/kg H	Default carbon content I	Oxidation rate J	Emission K=G*H*I*J*44/12/100
Raw Coal	10^4t	897.75	1,675.2	6,726.5	6,176.45	10,405.4	6,277.23	32,158.53	20,908	25.8	1	636,062,536
Cleaned Coal	10^4t	0	0	0	0	42.18	0	42.18	26,344	25.8	1	1,051,186
Other Washed Coal	10^4t	6.57	0	167.45	373.65	108.69	0	656.36	8,363	25.8	1	5,192,725
Coke	10^4t	0	0	0	0	0.11	0.21	0.32	28,435	25.8	1	8,608
Total												**642,315,054**
Crude Oil	10^4t	0	0	0	0	0	0.73	0.73	41,816	20	1	22,385
Gasoline	10^4t	0	0	0.01	0	0	0	0.01	43,070	18.9	1	298
Kerosene	10^4t	0	0	0	0	0	0	0	43,070	19.6	1	0
Diesel	10^4t	0.48	0	3.54	0	0	0.12	4.14	42,652	20.2	1	130,786
Fuel Oil	10^4t	12.25	0	0.23	0	0	0.06	12.54	41,816	21.1	1	405,690
Other Petroleum Products.	10^4t	0	0	0	0	0	0	0	38,369	20	1	0
Total												**559,160**
Natural Gas	10^8m^3	2.8	0.8	0	27.6	0	0	31.2	38,931	15.3	1	681,417
Coke Oven Gas	10^8m^3	6.4	7.5	6.2	210.8	0	3.9	234.8	16,726	12.1	1	1,742,396

Other Gas	10^8m^3	160.9	78.6	388.3	98.8	0	183.7	910.3	5,227	12.1	1	2,111,027
LPG	10^4t	0	0	0	0	0	0	0	50,179	17.2	1	0
Refinery Gas	10^4t	0	0	9.02	0	0	0	9.02	46,055	18.2	1	277,221
Total												**4,812,062**
Total												**647,686,276**

Data sources: China Energy Statistical Yearbook 2006

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

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

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

where:

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

$COEF_{i,j}$ is the CO_2 emission coefficient of fuel *i* (tCO_2e/tCe), taking into account the carbon content of the fuels (coal, oil and gas) used by province *j* and the percent oxidation of the fuel in year(s) *y*;

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

According to the data and related calculation formula， l_{Coal} =99.177%， l_{Oil} =0.08%， l_{Gas} =0.74%.

It could be obviously concluded from the calculation results above that the amount of gas-fired and oil-fired power is very small in NCPG, in the project we could neglect the impacts of gas-fired and oil-fired power and it is conservative.

The best commercially available thermal power plant:

With reference to the *Notification on Determining Baseline Emission Factor of China's Grid*, the efficiency level of the best commercially available of thermal power is set as 600MW domestic subcritical generator sets. The weighted average value of coal consumption of power supply of 15 set of 600MW generator sets newly built in 2005 is taken as the estimation of the efficiency level of the best technology commercially available in the calculation result. The coal consumption of power supply of 600MW domestic subcritical power plant is estimated to be 343.33gce/kWh, which is equivalent to 35.82% of power supply efficiency.

Table A 11. Emission factor of the best power technology commercially available

	Variable	Efficiency of power supply	NCV (tc/TJ)	Oxidation factor	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-fired power plant	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-fired power plant	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

Hence, $EF_{Thermal,y} = l_{Coal,y} \times EF_{Coal,Adv,y} + l_{Oil,y} \times EF_{Oil,Adv,y} + l_{Gas,y} \times EF_{Gas,Adv,y}$ =0.9465(tCO_2/MWh)

So, $EF_{BM,y}$ =0.9465*99.28%=0.9397 tCO_2e/MWh

Table A 12. Installed capacity of the North China Power Grid in 2005

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Fire power	MW	3,833.5	6,149.9	22,333.2	22,246.8	19,173.3	37,332	111,068.7
Hydro power	MW	1,025	5	784.5	783	567.9	50.8	3,216.2
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	24	24	48	0	208.9	30.6	335.5
Total	MW	2,882.5	6,178.9	23,165.7	23,029.8	19,950.2	37,413.4	11,4620.5

Data sources: The State Electric Industry Yearbook 2006

Table A 13. Installed capacity of the North China Power Grid in 2004

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Fire power	MW	3,458.5	6,008.5	19,932.7	17,693.3	13,641.5	32,860.4	93,594.9
Hydro power	MW	1,055.9	5	783.8	787.3	567.9	50.8	3,250.7
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	0	0	13.5	0	111.8	12.3	137.5
Total	MW	4,514.4	6,013.5	20,730	18,480.6	14,321.2	32,923.5	96,983.2

Data sources: The State Electric Industry Yearbook 2005

Table A 14. Installed capacity of the North China Power Grid in 2003

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Fire power	MW	3,347.5	6,008.5	17,698.7	15,035.8	11,421.7	30,494.4	84,006.6
Hydro power	MW	1,058.1	5	764.3	795.7	592.1	50.8	3,266
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	0	0	13.5	0	76.6	0	90.1
Total	MW	4,405.6	6,013.5	18,476.5	15,831.5	12,090.4	30,545.2	87,362.7

Data sources: The State Electric Industry Yearbook 2004

Annex 4

MONITORING PLAN

There is no further information about monitoring.