Project design document form for CDM project activities

(Version 05.0)

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Shandong Huimin Biomass Utilization Project
Version number of the PDD	03
Completion date of the PDD	11/09/2014
Project participant(s)	National Huimin Bio Energy Co., Ltd (the project owner) EDF Trading Limited
Host Party	P.R.China
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope 1: Energy Industries (Renewable sources) ACM0018 “Consolidated methodology for electricity generation from biomass residues in power-only plants” (Version 2.0.0)
Estimated amount of annual average GHG emission reductions	143,260 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Shandong Huimin Biomass Utilization Project (hereafter referred to as the Project) is located in Huimin County, Binzhou City, Shandong Province, P.R.China. The Project is invested, constructed and operated by National Huimin Bio Energy Co., Ltd. The project activity is to install one boiler with capacity of 130 t/h, and one steam turbine power generator with a capacity of 30 MW. Cotton straw, maize straw, and woods waste are used as fuel for power generation, and the annual biomass residues consumption is approximately 320,000 t. The gross quantity of electricity generation is 210,000 MWh per year, and the self-consumption rate is assumed to be 11.1%, therefore, the net power supply to grid is expected to be 186,690 MWh per year. The electricity supplied by the proposed project will be delivered to North China Power Grid (NCPG).

In the absence of the Project, the biomass residues used for the Project would be dumped or left to decay under mainly aerobic conditions, and the equivalent amount of power supplied by this Project would be provided by NCPG which the Project is connected to. This is the same with the baseline scenario of the Project.

The Project will achieve emission reductions via avoiding CO_2 emissions from the same amount of electricity generated by NCPG, which is mainly composed of traditional fossil fuel fired power plants. It is estimated that the project activity will generate emission reductions of about 143,260 tCO_2e per year.

The Project will not only supply renewable electricity to the grid, but also contribute to sustainable development of the local community, the host country and the world by means of:

- reducing greenhouse gas emissions compared to a business-as-usual scenario;
- helping to stimulate the growth of the biomass power industry in China;
- reducing the emission of other pollutants resulting from the power generation industry in China, compared to a business-as-usual scenario;
- providing local employment opportunities during the construction and operation period of the Project.

A.2. Location of project activity

A.2.1. Host Party

>>
People's Republic of China

A.2.2. Region/State/Province etc.

>>
Shandong Province

A.2.3. City/Town/Community etc.

>>
Binzhou City, Huimin County

A.2.4. Physical/Geographical location

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The Project is sited in Huimin County, Binzhou City, Shandong Province. The Project has geographical coordinates with east longitude of 117°34´30´´- 117°34´32´´ and north latitude of

37°22´44´´-37°22´47´´. Figure 1 shows the location of Shandong Province, Figure 2 shows the location of the Project.

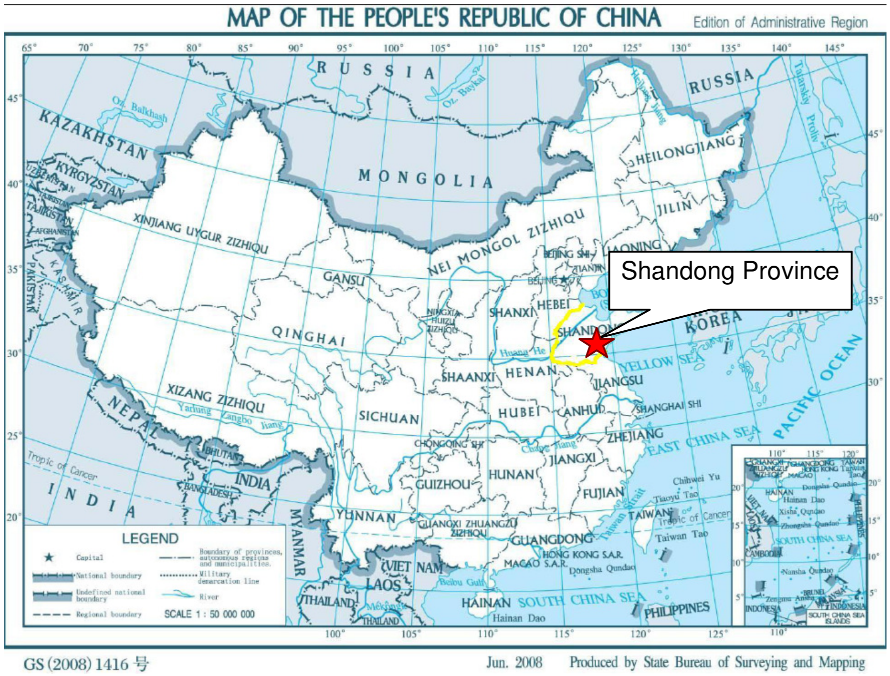

Figure 1 Location of Shandong Province

Figure 2 Location of the Project

A.3. Technologies and/or measures

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In the absence of the Project, the biomass residues used for the Project would be dumped or left to decay under mainly aerobic conditions, and the equivalent amount of power supplied by this Project would be provided by NCPG which the Project is connected to. This is the same with the baseline scenario of the Project.

The project activity is to install one boiler with a capacity of 130 t/h, and one steam turbine generator with a capacity of 30 MW. Biomass residues are used as fuel for boiler generating steam, and the steam drives turbine generator which create power. Figure 3 below shows the technical process of the project, and Table 1 below shows the key technical specifications of the main equipments. The operating hour of the Project is 7,000 hours, and the plant load factor is 0.799

which was determined by a third qualified institute and in compliance with *Guidelines for The Reporting and Validation of Plant Load Factors (Version 01)*, and the consumption of biomass residues is approximately 320,000 t/y (wet-basis). The gross quantity of electricity generation is 210,000 MWh per year, and the self-consumption rate is assumed to be 11.1%, therefore, the net power supply to grid is expected to be 186,690 MWh per year. The electricity supplied by the proposed project will be delivered to North China Power Grid (NCPG).

The transportation of biomass residues (from local farmers to the Project plant) will generate CO_2 emissions, and the normal operation of the Project plant will also consume diesel fuel for mechanical treatment and in-plant transportation that also brings CO_2 emissions.

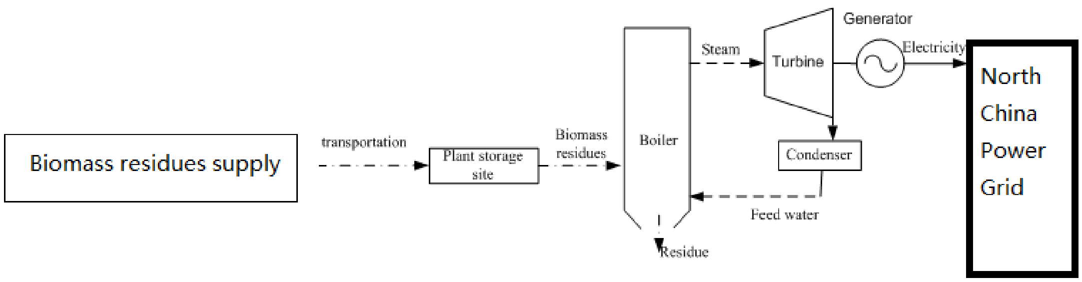

Figure 3 Technical process of the Project

Table 1 Key technical parameters of major equipments employed by the Project

Item	Quantity	Key technical specifications	Data Source
Boiler	1 set	Type: YG-130/9.2-T1 Capacity: 130t/h Life time: 20 years Manufacturer: Jinan Boiler Group Co., Ltd.	*Technical Specification Agreement*
Steam turbine	1 set	Type: N30-8.83 Capacity: 30MW Life time: 20 years Manufacturer: Qingdao Jieneng Stream Turbine Group Co., Ltd.	*Technical Specification Agreement*
Generator	1 set	Type: QF-30-2 Capacity: 30MW Life time: 20 years Manufacturer: Shandong Jinan Power Equipment Factory	*Technical Specification Agreement*

To monitor the baseline emissions and the project emissions of the proposed project, the following data will be monitored during the implementation of the proposed project.

The net electricity supplied by the proposed project to the grid will be monitored through one bidirectional electricity meter installed at the local substation.

The mass of freight, and transportation distance will be recorded. The transportation information of the biomass from local farmers to the plant will be monitored and documented. The quantity of the biomass will be measured by weight meters.

The biomass quantity and type will be monitored and recorded, and the moisture content will be monitored by moisture instrument for each batch of biomass of homogeneous quality. Measurements of net calorific value of biomass residues will be carried out at reputed laboratories and according to relevant international standards. And the biomass residues recourse will also be monitored annually.

The fossil fuel consumption consumed will be measured by weight meters and recorded in a log book by company staffs. The net calorific value of diesel ($NCV_{i,y}$) consumed and its emission factor will be obtained from the IPCC Guidelines, and any future revision of the IPCC Guidelines should be taken into account.

The Project employs domestically manufactured turbines and involves no technology transfer from abroad.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	National Huimin Bio Energy Co., Ltd (the project owner)	No
France	EDF Trading Limited	No

A.5. Public funding of project activity

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There is no public funding from Annex I Parties for this Project.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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The following approved baseline and monitoring methodology is applied to the Project:

The Approved Methodology:
ACM0018 "Consolidated methodology for electricity generation from biomass residues in power-only plants" (Version 2.0.0)

Tools:
"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02)
"Tool to calculate the emission factor for an electricity system" (Version 02.2.1)
" Project and leakage emissions from road transportation of freight" (Version 01.0.0)

For more information regarding these methodologies please refer to
http://cdm.unfccc.int/methodologies/index.html

B.2. Applicability of methodology and standardized baseline

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The Project is a greenfield built biomass residue power generation project and satisfies all applicable conditions of the methodology ACM0018 as analysed below.

Applicable conditions of the methodology ACM0018	The Project
(1) No other biomass types than biomass residues, as defined in the methodology, are used in the project plant;	The Project will only use biomass residues which are cotton straw, maize straw, woods waste (from forestry residues), and all the biomass residues are collected and provided by the local farmers.
(2) Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired shall not exceed 80% of the total fuel fired on an energy basis;	The Project will not co-fire fossil fuels.
(3) For the 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, longs, etc.) or in other substantial changes (e.g. product change) in this process;	Cotton straw and maize straw are by-product of agriculture, and woods waste is from forestry residues. Thus the project activity will use the by-product and residues from agriculture and forestry other than from production processes.
(4) The biomass residues used by the project facility should not be stored for more than one year;	The storage capacity of this project is approximately 60,000 tones of biomass residues, which can only serve about two months biomass residues consumption. Therefore, the biomass residues used by the project facility will not be stored for more than one year.
(5) Projects that chemically process the biomass residues prior to combustion (e.g. by means of esterification, fermentation and gasification) are not eligible under this methodology. The biomass residues can however be processed physically such as by means of drying, pelletization, shredding and briquetting;	Only simple physically processing are used upon the biomass residues, such as drying and shredding.

(6) No power and heat plant operates at the project site during the crediting period;	There's no power and heat plant operated at the project site before, and there will be no such power and heat plant operating during the crediting period.
(7) If any heat is generated for purposes other than power generation (e.g. heat which is produced in boilers or extracted from the header to feed thermal loads in the process) during the crediting period or was generated prior to the implementation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the following conditions should apply: (a) The implementation of the project activity does not influence directly or indirectly the operation of the heat generation equipment, i.e. the heat generation equipment would operate in the same manner in the absence of the project activity; (b) The heat generation equipment does not influence directly or indirectly the operation of the project plant (e.g. no fuels are diverted from the heat generation equipment to the project plant); and (c) The amount of fuel used in the heat generation equipment can be monitored and clearly differentiated from any fuel used in the project activity.	There was no heat generated by on site or off-site heat generation equipment connected to the project and used for purposes other than power generation. Also, there will not have heat generated during the crediting period and used for purpose other than power generation.
(8) In the case of fuel switch project activities, the use of biomass residues or the increase in the use of biomass residues as compared to the baseline scenario is technically not possible at the project site without a capital investment in : (a) The retrofit or replacement of existing heat generators/boilers; or (b) The installation of new heat generators/boilers; or (c) A new dedicated biomass residues supply chain established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that would otherwise not be used for energy purposes); (d) Equipment for preparation and feeing of biomass residues	The project is not a fuel switch project activity.

According to ACM0018, the methodology is only applicable if the most plausible baseline scenario, as identified per the "Procedure for the selection of the baseline scenario and demonstration of additionality".

Section hereunder, is:

- For power generation: Scenarios P2 to P7, or a combination of any of those scenarios;
- For biomass use: Scenarios B1 to B8, or a combination of any of those scenarios. For scenarios B5 to B8, leakage emissions should be accounted for as per the procedures of the methodology.

As analyzed in section B.4, P5 & B1 is indentified as the most plausible baseline scenario to the proposed project. Therefore, ACM0018 is applicable to the proposed project.

B.3. Project boundary

The Project is a greenfield biomass residue generation plant, and the PP will not claim the CH_4 emissions from the burnt or decay of biomass residues in baseline scenario. According to ACM0018, the spatial extent of the project boundary encompasses:

- The project activity, power-only plant.
- All power plants physically connected to the NCPG.
- The site where the biomass residues would have been left for decay or dumped.
- The trucks which transport biomass residues to the project site.

Overview of the emission sources included in or excluded from the project boundary is provided in Table 2.

Table 2 Overview of the emission sources included in or excluded from the project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Electricity generation	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Since B1 is identified as the most likely baseline scenario, the Project participants decide to exclude this emission source.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project scenario	On-site fossil fuel consumption	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Off-site transportation and processing of biomass residues	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Combustion of biomass residues for electricity	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	This emission source is excluded due to the CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario is excluded.
		N_2O	Excluded	Excluded for simplification.
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Waste water from the treatment of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	There is no waste water treated under anaerobic condition.
		N_2O	Excluded	Excluded for simplification.

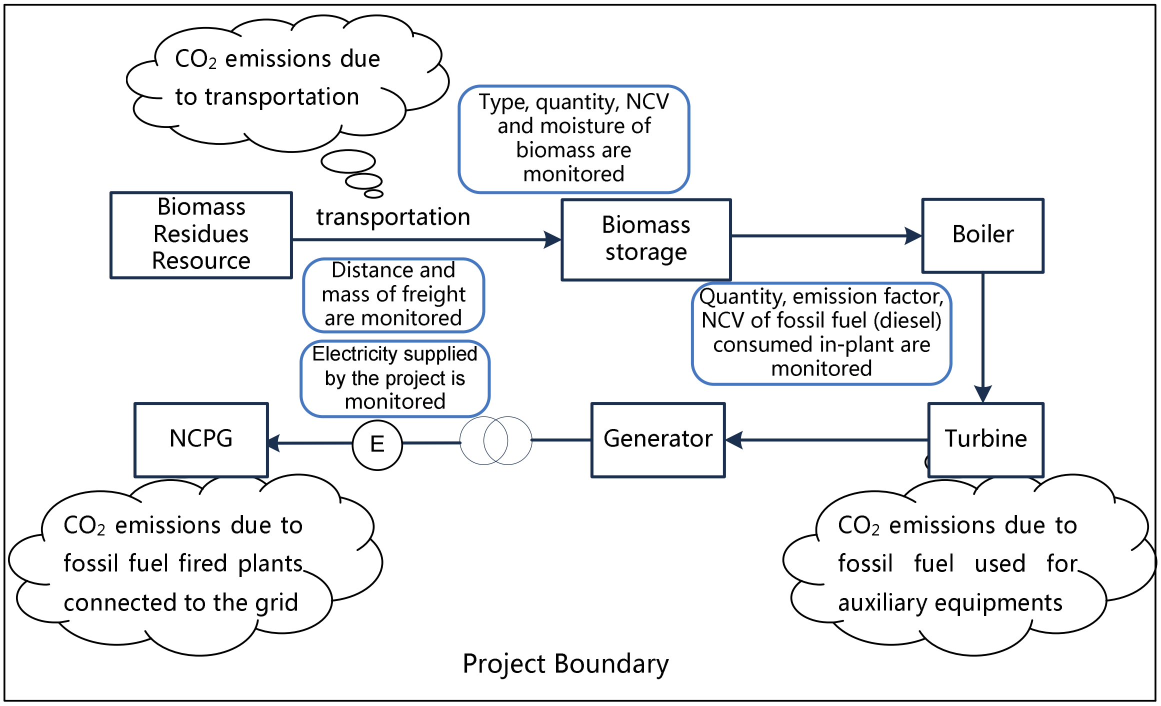

Figure 4 Flow diagram of the project boundary

B.4. Establishment and description of baseline scenario

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The procedures in the approved baseline methodology ACM0018 were used to identify the baseline scenario, and the additionality was demonstrated simultaneously.

STEP 1 Identification of alternative scenarios

This step serves to identify all alternative scenarios to the proposed CDM project activity(s) that can be the baseline scenario through the following sub-steps:

Step 1a Define alternative scenarios to the proposed CDM project activity

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.

1The possible alternative scenarios of the Project were as below as per the methodology ACM0018:

P1: The proposed project activity not undertaken as a CDM project activity;
P2: If applicable, the continuation of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The existing power-only plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the project activity;
P3: If applicable, the continuation of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The existing power-only plants would operate with different conditions from those observed in the most recent three years prior to the project activity;
P4: If applicable, the retrofitting of existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The retrofitting may or may not include a change in fuel mix;

P5: The generation of power in the grid;
P6: The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using the same amount or less biomass residues than under scenario P1;
P7: The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using more biomass residues than under scenario P1.

As the project activity is the establishment of a greenfield power plant and supplies electricity only to the grid, then the alternatives considered for power generation should include only the scenarios P1 and P5, which is in compliance with ACM0018 version 02.0.0.

2 Define alternative scenarios for biomass residues utilization
According to ACM0018, the analysis of which biomass residues categories are used in the project activity should be taken, which has been shown in Table 3 below. The quantity of biomass residues in Table is obtained from *FSR*.

Table 3 Categories of biomass residue

No.	Biomass residue type	Biomass residues source	Biomass residues fate in the absence of the project activity	Biomass residues use in project scenario	Biomass residues quantity (10^4tonnes on wet basis)
1	Cotton straw	Offsite from local farmer	Dumped (B1)	Electricity generation on-site (biomass-only boiler)	3.3
2	Maize straw	Offsite from local farmer	Dumped (B1)	Electricity generation on-site (biomass-only boiler)	1.6
3	Woods Waste	Offsite from local farmer	Dumped (B1)	Electricity generation on-site (biomass-only boiler)	27.1

The realistic and credible alternatives are listed and discussed in Table 4 below.

Table 4 Identifying the most plausible alternative scenarios for use of biomass residue

Series	Alternative	Feasible?	Justification/Explanation
B1	The biomass residues are dumped or left to decay mainly under aerobic conditions.	Yes	This alternative is the common practice treatment of biomass residue in the absence of the Project at present.
B2	The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to landfills which are deeper than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields;	No	There is no infrastructure for biomass residue collecting and landfill treatment on-site or nearby the project site. B2 is unrealistic and excluded.
B3	The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.	Yes	This is an alternative for further consideration.
B4	The biomass residues are used for electricity generation in power-only plant configuration at the project site in new and/or existing power plants;	Yes	The proposed project activity not undertaken as a CDM project activity.

B5	The biomass residues are used for power and/or heat generation in other existing or new power plants at other sites;	No	There is no power or heat generation project using biomass residues as fuel within 50 km of proposed project. Considering the cost of biomass collection, transportation and storage, theses surplus biomass residues will not be used in other existing or new grid-connected power plants. Therefore, B5 is excluded.
B6	The biomass residues are used for other energy purposes, such as the generation of bio-fuels;	No	There is no project that produces or uses biomass residues for other energy purposes at the project site, and furthermore the technologies of bio-fues or other energy purposes are not mature in China[1]. Therefore, B6 is excluded.
B7	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	Prior to the Project, most of biomass residues were dumped or left to decay, so the abandoned biomass residues utilized in the Project will not be used for non-energy purposes in the absence of this project. Therefore, B7 is excluded.
B8	The primary source of the biomass residues and/or their fate in the absence of the project activity cannot be clearly identified.	No	The source of the biomass residues and their fate in the absence of the project activity are clearly identified in Table 3 above. Therefore, B8 is excluded.

According the Methodology ACM0018, for biomass residues categories for which scenarios B1 or B3 is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario. Towards this end, for each biomass residues category, one of the following procedures should be applied:

(a) Demonstrate that there is an abundant surplus of the type of biomass residue in the region of the project activity which is not utilized. For this purpose, demonstrate that the quantity of that type of biomass residues available in the region in at least 25% larger than the quantity of biomass residues of that type which is utilized in the region;
(b) Demonstrate for the sites from where biomass residues are sourced that the biomass residues have not been collected or utilized but dumped and left to decay, land-filled or burnt without energy generation prior to their use under the project activity this approach is only applicable to biomass residues categories for which project participants can clearly identify the site from where the biomass residues are sourced.

The Project takes procedure (a) to demonstrate. The utilizations of all the biomass residues in 50 km around the project site are given as show below[2].

Biomass residue type	Annual available amount (10^4 tones)	Other use, excluding the Project (10^4 tones)	The Project use (10^4 tones on wet basis)	Annual available amount/Total annual use
Cotton	46.7	16.6	3.3	234.67%

[1] http://wenku.baidu.com/view/e9dcd11dfc4ffe473368abbf.html

[2] The data is sourced from *FSR*.

straw				
Maize straw	90.1	36.6	1.6	235.86%
Woods Waste	106.3	20.3	27.1	224.26%

Therefore, the scenarios B1 and B3 are plausible baseline alternatives for biomass residues categories.

Outcome of Step 1a:
The reasonable and feasible alternative scenarios of the Project for power generation are:
P1: The proposed project activity not undertaken as a CDM project activity;
P5: The generation of power in the grid;

The reasonable and feasible alternative scenarios of the Project for use of biomass residues are:
B1: The biomass residues are dumped or left to decay under mainly aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.
B3: The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes;
B4: The biomass residues are used for electricity generation in power-only plant configuration at the project site in new power plants;

Sub-step 1b Consistency with mandatory applicable laws and regulations:
The objective of this step is to determine whether the alternatives listed in outcome of step 1a are in compliance with all mandatory applicable legal and regulatory requirements.

Alternatives			Whether plausible	Explanation
Power generation	P1	The proposed project activity not undertaken as a CDM project activity	Yes	In compliance with all Chinese mandatory applicable laws and regulations
	P5	The generation of power in the grid	Yes	In compliance with all Chinese mandatory applicable laws and regulations.
The use of biomass residues	B1	The biomass residues are dumped or left to decay mainly under aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields;	Yes	In compliance with all Chinese mandatory applicable laws and regulations.
	B3	The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes	No	This is not in compliance with Chinese Regulation, i.e. *Announcement to Publish Administrative Measures of Burning Prohibition and*

				Integrated Utilization of Straw (Code: HF [1999]No.98). The regulation requires biomass residues burning should be forbidden and should be strictly under control.
	B4	The biomass residues are used for electricity generation in power-only plant configuration at the project site in new and/or existing power plants;	Yes	In compliance with all Chinese mandatory applicable laws and regulations.

Outcome of sub-step 1b: based on the discussion above, it is identified that two plausible combined scenarios are left after Step1:

Combination	Power generation	Use of biomass residues
1	P1	B4
2	P5	B1

Step 2 Barrier analysis
There are no barriers identified that would prevent the implementation of either of the alternative scenarios above.

Outcome of Step 2
All remaining alternatives, combined scenarios "P1 & B4" and "P5 & B1" go through this step.

Step 3 Investment analysis
The objective of Step 3 is to compare the economic or financial attractiveness of the alternative scenarios remaining after Step 2 by conducting an investment analysis. The analysis includes all alternative scenarios remaining after Step 2, including scenarios where the project participants do not undertake an investment (i.e. a combination of B1 and P5). The remaining scenarios are scenario 1 (P1 & B4) and scenario 2 (P5 & B1).

For scenario 1 (P1 & B4), basic parameters for project IRR (post tax) calculation are summarized in Table 5 below.

Table 5 Basic parameters for IRR Calculation sourced from FSR

Installed Capacity	30	MW
Electricity Generation	210,000	MWh/year
Consumption Rate	11.1	%
Net Electricity Supplied	186,960	MWh/year
Construction Period	1	Year
Operation Period	20	Year
Total Project Cost	29,144.62	10000RMB
Deductible Input VAT	1,859.55	10000RMB
Tariff (including VAT)	0.75	RMB/kWh
Interest During Construction	688.39	10000RMB
Debt Ratio of Long-term Loan	80	%
Interest of Long-term Loan	5.94	%
Interest of Working Capital Loan	5.31	%
Biomass Residue Consumption	320,000	t/year
Biomass Residue Price (excluding	285	RMB/t

VAT)		
VAT	17	%
income tax	25	%
urban maintenance and construction tax	7	%
surtax for education	4	%
Depreciation Period	15	year
Residual Value Rate	5	%
Maintenance Rate	2.5	%
VAT for Biomass	13	%
VAT for Water	6	%
Annual O & M Cost	10,870.89	10000RMB

The result of the financial indicator (project IRR post tax) is 1.64%.

For scenario 2 (P5 & B1), since it does not involve any investment by the project participants, the financial benchmark (in the case of IRR) is derived from a government/officially approved financial benchmark in China[3], which is 8%.

The comparison of financial attractiveness is shown in Table 6 below.

Table 6 Comparison of Financial Attractiveness

Alternative Scenario	Financial Indicator (IRR)
Scenario 1 (P1 & B4)	1.64%
Scenario 2 (P5 & B1)	8%

For scenario 1 (P1 & B4), the following financial parameters were taken as uncertain factors for sensitive analysis of financial attractiveness:

- Total Project Cost
- O&M
- Electricity Supply
- Tariff
- Price of Biomass Residues
- Biomass Residues Consumption

The results of sensitive analysis of six indicators of the Project are shown in Table 7 and Figure 5.

Table 7 Sensitivity analysis of the Project

Range / Parameter	-10%	-5%	0%	5%	10%
Total Project Cost	3.09%	2.34%	1.64%	1.00%	0.41%
O&M	6.98%	4.51%	1.64%	-1.54%	-5.67%
Electricity Supply	-7.23%	-2.03%	1.64%	4.88%	7.67%
Tariff	-7.23%	-2.03%	1.64%	4.88%	7.67%
Price of Biomass Residues	6.24%	4.10%	1.64%	-1.03%	-4.20%
Biomass Residues Consumption	6.24%	4.10%	1.64%	-1.03%	-4.20%

[3] *Interim Rules on Econoic Assessment of Electric Power Engineering Retrofit Project* issued by State Power Corporation of China in 2002

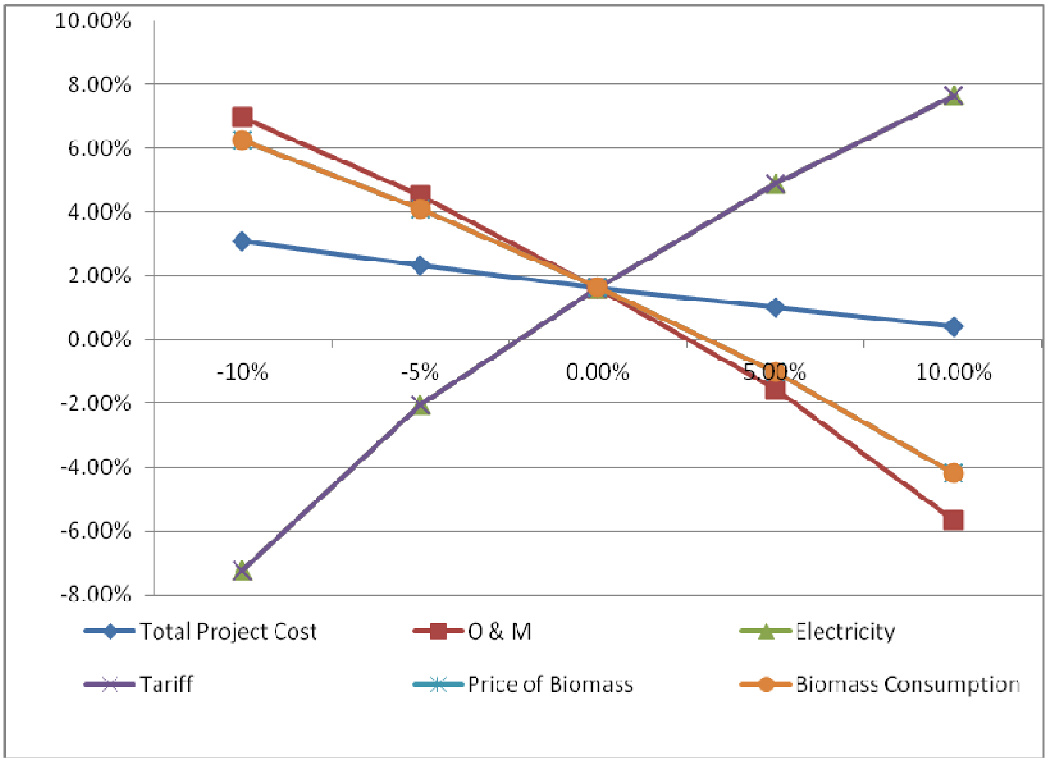

Figure 5 Sensitivity analysis of the Project (without CERs revenues)

It can be seen that even the variation range of the uncertain factors reaches 10%, the project IRR (after tax) does not reach 8% (Financial Indicator of P5 & B1).

For further consideration, the IRR of the Project could reach 8% (Financial Indicator of P5 & B1) if one of the following conditions is achieved:

- The Total Project Cost decreases by at least 36.50%;
- The Annual O&M Cost decreases by at least 12.23%;
- The Feed-in electricity increases by at least 10.67%;
- The Bus-bar tariff increases by at least 10.67%;
- The Biomass residue price decreases by at least 14.45%.
- The Biomass residues consumption decreased by at least 14.45%.

However, none of these conditions can be achieved due to the following reasons:

·**Regarding the Total Project Cost**
By collecting some of the investment contracts signed, even if not all the investment contracts are included, it still can be counted that the actual investment has reached 272.3391 million RMB that accounts for 93.44% of the total project cost (291.4462 million RMB) estimated in the FSR, therefore it is impossible to decrease the total project cost by 36.50%.

·**Regarding O&M Cost**
The O&M Cost consists of biomass residue cost, salary and welfare of employees, material cost, water cost, maintenance cost, and miscellaneous cost. As per *China Statistical Yearbook 2011*, the trends of *Purchasing Price Index for Raw Material, Fuel and Power* and *Average Annual Salary and Welfare* keep increasing in recent years. Therefore, it is impossible to decrease the O&M cost of the Project by 12.23%.

·**Regarding Feed-in electricity**
The project IRR could reach 8% when the operating hours would increase by at least 10.67%. The operation hour of this project is 7,000 hr which is the highest among biomass power-only projects in Shandong province. The current configuration of the main equipments and the fuel (biomass

residues) are the best match for this Project, and it was designed by a qualified third institute, so it is impossible to increase the feed-in electricity by 10.67%.

·**Regarding the Tariff**
National Development and Reform Commission issued the *Notice on the Perfection of the Biomass Residues Power Generation Tariff Policy (Document No. FGJG [2010] No.1579)*, regulating that the on-grid tariff of generation from agroforestry biomass residues is fixed as 0.75 RMB/kWh (including VAT)[4]. Thus, there's no chance for the tariff to be increased by 10.67%.

·**Regarding Biomass Price and Consumption**
When the biomass residues price is decreased by 14.45%, the IRR will exceed 8%. The actual purchase price for this project varies from 305 RMB/t to 362 RMB/t that exceeds the value (285 RMB/t) estimated in FSR. Therefore, the situation of biomass residues price decreasing by 14.45% is unlikely to happen. For the biomass quantity, considering the performance of the main equipments and local biomass resource, the types, moisture, NCV, and quantities of biomass residues estimated in the FSR are the most optimized result for the project. To maintain the same power generation (with PLF of 0.799), the actual consumption of biomass residues has little room decline further. Therefore, the biomass purchase cost will be impossible to decrease by 14.45%.

Outcome of Step 3:
Based on the analysis above, alternative scenario 2 (P5 & B1) is the most financially attractive, therefore, according to the methodology ACM0018 (version 02.0.0), the baseline scenario is scenario (P5 & B1), which are the power is provided by the grid, and the biomass residues are dumped or left to decay under mainly aerobic conditions.

STEP 4 Common practice analysis

As per ACM0018 (version 2.0.0), similar activities to the proposed CDM project activity is identified below, and a compare of proposed project activity to other similar activities is conducted if there's any similar project identified.

The *Guidelines on Common Practice* (version 02.0) is also followed as below.

Sub-step 4-1: Calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

The total installation capacity of the Project is 30MW. Range of +/- 50% of the capacity is from 15MW to 45MW.

Sub-step 4-2: Identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:
(a) The projects are located in the applicable geographical area. Since biomass projects located in the same province/region have similar grid structure, geological and transportation conditions and economic development, thus, only the projects located in Shandong Province, P.R.China are chosen.
(b) The projects apply the same measure as the proposed project activity. Thus, only the projects provided power generation to grid based on renewable energy are chosen.
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity. Thus, only the projects use biomass energy are chosen.
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant. Thus, only projects provide power to the grid are chosen.
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step sub-step 4-1. Thus, only projects have a capacity of 15 MW – 45 MW are

[4] http://www.sdpc.gov.cn/xwfb/t20100723_362409.htm

chosen.

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity. Thus, only the projects started commercial operation before 18/03/2011[5] are chosen.

Searching from public & available sources, Local DRC website, NDRC website, China's DNA website and UNFCCC website, based on the conditions above there are 5 projects identified as below:

(1) Shandong Shanxian 1*25 MW Biomass Power Plant Project (ref. 1032);
(2) Shandong Wudi Biomass Generation Project (ref. 1263);
(3) Shandong Gaotang 30 MW Biomass Power Generation Project (ref. 1375);
(4) Shandong Kenli Biomass Generation Project (ref. 2526);
(5) Guodian Liaocheng Biomass Power Project (ref. 2963).

Sub-step 4-3: Within the projects identified in Sub-step 4-2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

The projects identified in Sub-step 4-2 are all CDM registered projects. Thus, N_{all}=0.

Sub-step 4-4: Within similar projects identified in Sub-step 4-3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

Since N_{all}=0, thus N_{diff}=0.

Sub-step 4-5: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

Since $N_{all} = N_{diff}$, ,therefore, $N_{all} - N_{diff}$ =0, which is less than 3.

The Project activity is not a "common practice".

Outcome of Step 4:
Based on the analysis above, the project is additional.

The baseline scenario is:
Combination of P5 and B1: The generation of power in the grid, and the biomass residues are dumped or left to decay mainly under aerobic conditions.

B.5. Demonstration of additionality

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As per ACM0018, the additionality of the proposed project is demonstrated simultaneously during the identification of the baseline scenario in section B.4.

The starting date of the project activity is before the date of validation. Table 9 demonstrates that the incentive from the CDM was seriously considered in the decision to proceed with the project activity.

Table 9 Timeline of the Project

[5] The starting date of the proposed project is 18/03/2011 which is earlier than the GSC date.

Date	Milestone
Sept. 2010	*FSR* was finalized.
16/09/2010	*FSR Approval* was issued by local DRC.
15/02/2011	Board meeting for CDM apply
18/03/2011	*Civil Engineering and Construction Contract* was signed as the earliest evidence of project start.
20/03/2011	Construction starting date.
23/03/2011	*Turbine Purchase Contract* was signed.
25/03/2011	*Boiler Purchase Contract* was signed.
26/03/2011	*Generator Purchase Contract* was signed.
01/07/2011	DNA of China was informed of the intention to implement CDM development of the Project.
06/07/2011	UNFCCC secretariat was informed of the intention to implement CDM development of the Project.
09/11/2011	*ERPA* was signed.
09/03/2012	GSC PDD was published on the UNFCCC.
28/07/2012	Commissioning

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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Emission Reductions

Emission Reductions are calculated as follows:

$ER_y = BE_y – PE_y – LE_y$

Where:

ER_y =Emissions reductions during year y (tCO_2e)

BE_y =Baseline emissions during year y (tCO_2e)

PE_y =Project emissions during year y (tCO_2e)

LE_y =Leakage emissions during year y (tCO_2e)

Baseline Emissions

According to the ACM0018 (version 02.0.0), Baseline emissions are calculated as follows:

$BE_y = BE_{EL,y} + BE_{BR,y}$

Where:

BE_y = Baseline emissions in year y (tCO_2e)

$BE_{EL,y}$ = Baseline emissions due to generation of electricity in year *y* (tCO_2e)

$BE_{BR,y}$ = Baseline emissions due to uncontrolled burning or decay of biomass residues in year *y* (tCO_2e)

As per the ACM0018 version 02.0.0, the calculation of baseline emissions due to uncontrolled burning or decay of biomass residues is optional. The project participants do not include these emissions sources in baseline calculation. Thus,

$BE_y = BE_{EL,y}$

Where:

BE_y =Baseline emissions in year y (tCO_2 e)

$BE_{EL,y}$ =Baseline emissions due to generation of electricity in year y (tCO_2 e)

Baseline emissions are determined through the following steps:

Step 1: Determination of $BE_{EL,y}$

Baseline emissions from electricity generation are calculated based on the net quantity of electricity generated at the project site under the project scenario ($EG_{PJ,y}$) and a baseline emission factor ($EF_{BL,EL,y}$) which expresses the weighted average CO_2 intensity of electricity generation in

the baseline, as follows:
$BE_{EL,y} = EG_{PJ,y} \cdot EF_{BL,EL,y}$

Where:
$BE_{EL,y}$ = Baseline emissions due to generation of electricity in year y (tCO_2)
$EG_{PJ,y}$ = Net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year y (MWh)
$EF_{BL,EL,y}$ = Emission factor for electricity generation in the baseline in year y (tCO_2/MWh)

Step: 1.1 Determination of $EG_{PJ,y}$
The net quantity of electricity generated in supplied by all power plants which are located at the project site and included in the project boundary ($EG_{PJ,y}$) is determined as the difference between the gross electricity generation at the project site ($EG_{PJ,gross,y}$) and the total auxiliary electricity consumption ($EG_{PJ,aux,y}$), as follows:
$EG_{PJ,y} = EG_{PJ,gross,y} - EG_{PJ,aux,y}$
Where:
$EG_{PJ,y}$ = Net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year y (MWh)
$EG_{PJ,gross,y}$ =Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year y (MWh)
$EG_{PJ,aux,y}$ = Total auxiliary electricity consumption required for the operated of the power plants the project site (MWh)

Step: 1.2 Determination of $EF_{BL,EL,y}$
The electricity generated under the project activity could be generated in the baseline in three different ways, depending on the baseline scenario and the particular situation of the project activity:

- **Use of biomass residues at the project site**. Electricity could be generated with biomass residues in power plants at the project site.
- **Use of fossil fuels at the project site.** Electricity could be generated with fossil fuels in power plants at the project site.
- **Power generation in the electricity grid.** Electricity could be generated by power plants in the electricity grid.

For some project types, electricity would be generated in the baseline by a combination of these three ways. Therefore, $EF_{BL,EL,y}$ is a weighted average baseline emission factor: it is determined based on each of the three ways electricity could be generated (grid, biomass residues, fossil fuels), multiplied with its respective emission factor over the total amount of electricity produced in the baseline.

For this project activity, the implementation of the project will increase the quantity of electricity produced by power plants included in the project boundary and this added electricity is exported to the
grid or would in the baseline be purchased from the grid.

ACM0018 gives an approach to calculate $EF_{BL,EL,y}$ as follows:

$$EF_{BL,EL,y} = \frac{EG_{BL,FF,y} \cdot EF_{BL,FF,y} + EG_{BL,grid,y} \cdot EF_{grid,CM,y} + EG_{BL,FF/grid,y} \cdot MIN(EF_{BL,FF,y}; EF_{grid,CM,y})}{EG_{BL,BR,y} + EG_{BL,FF,y} + EG_{BL,grid,y} + EG_{BL,FF/grid,y}}$$

Where:
$EF_{BL,EL,y}$ = Emission factor for electricity generation in the baseline in year y (tCO_2/MWh)
$EG_{BL,BR,y}$ = Amount of electricity that would be generated with biomass residues in power-only Plants operated at the project site in the baseline in year y (MWh)
$EG_{BL,FF,y}$ = Minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year y (MWh)
$EG_{BL,grid,y}$ = Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year y (MWh)

$EG_{BL,FF/grid,y}$ = Amount of electricity that would be generated in the baseline either by power plants in the electricity grid or by power plants at the project site using fossil fuels in year y(MWh)
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid-connected electricity generation in year y (tCO_2/MWh)
$EF_{BL,FF,y}$ = CO_2 emission factor for electricity generation with fossil fuels in power plant(s) at the project site in the baseline in year y(tCO_2/MWh)

In the following, first amounts of electricity generated from the various sources in the baseline ($EG_{BL,BR,y}$,$EG_{BL,grid,y}$, $EG_{BL,FF,y}$ and $EG_{BL,FF/grid,y}$) are determined ,taking into account the project configuration the baseline scenario. Therefore, different cases have to be considered. Then the emission factors ($EF_{grid,CM,y}$ and $EF_{BL,FF,y}$) are determined.

Step 1.3: Determination of $EG_{BL,BR,y}$

In the baseline scenario for the project activity, there is no electricity that would be generated with biomass residues in power-only plants operated at the project site. Therefore, as per ACM0018, $EG_{BL,BRy}$ = 0.

Step 1.4: Determination of $EG_{BL,FF,y}$

In the baseline scenario for the project activity, there is no electricity that would be generated with fossil fuels at the project site. Therefore, as per ACM0018, $EG_{BL,FF,y}$ = 0.

Step 1.5: Determination of $EG_{BL,grid,y}$

In the baseline scenario for the project activity, the electricity supplied by the project will replace equivalent amount of electricity in the power grid. Therefore, as per ACM0018, $EG_{BL,grid,y} = EG_{PJ,y}$.

Step 1.6 : Determination of $EG_{BL,FF/grid,y}$

$EG_{BL,FF,grid,y}$ represents the amount of electricity that could be generated in the baseline in the gird or at the project site using fossil fuels. $EG_{BL,FF/grid,y}$ corresponds to the remainder of electricity generation, i.e. the amount that exceeds the minimum electricity that would be generated by power plants in electricity grid($EG_{BL,grid,y}$), the minimum amount of electricity that could be generated with fossil fuels at the project site ($EG_{BL,FF,y}$), and the amount of electricity that would be generated with biomass residues at the project site ($EG_{BL,BR,y}$). Accordingly, $EG_{BL,FF/grid,y}$ is calculated as follows:

$$EG_{BL,\ FF/\ grid\ y} = EG_{PJ,\ y} - EG_{BL,\ BR\ y} - EG_{BL,\ FF\ y} - EG_{BL\ grid\ y}$$

Where:

$EG_{BL,FF/grid,y}$ = Amount of electricity that could be generated in the baseline either by power plants in the electricity grid or by power plants at the project site using fossil fuels in year y (MWh)
$EG_{PJ,y}$ = Electricity generated in power plants included in the project boundary in year y (MWh)
$EG_{BL,BR,y}$ = Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in baseline in year y (MWh)
$EG_{BL,FF,y}$ = Minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year y(MWh)
$EG_{BL,grid,y}$ = Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year y (MWh)

According to *Step 1.3*, *Step 1.4*, and *Step 1.5* above, EGBL,FF,grid,y is calculated as follows:

$$EG_{BL,\ FF/\ grid\ y} = EG_{PJ,\ y} - EG_{BL,\ BR\ y} - EG_{BL,\ FF\ y} - EG_{BL\ grid\ y} = EG_{PJ,\ y} - 0 - 0 - EG_{PJ,\ y} = 0$$

Step 1.7: Determination of $EF_{BL,FF,y}$

Methodology ACM0018 (Version 02.0.0) provides two options for determination of $EF_{BL,FF,y}$. If fossil fuel power plants were operated at the project site prior to the implementation of the project activity, either Option A or Option B can be used to determine $EF_{BL,FF,y}$. For new power plants that would be constructed at the project site in the baseline scenario, Option B should be used.

According to the analysis of baseline scenario in section B.4, the project is a newly built power-only

project and no power plants were or would be operated at the project site prior to the implementation of the project in the baseline scenario, then it is not applicable.

Step 1.8: Determination of $EF_{grid,CM,y}$

$EF_{grid,CM,y}$ should be determined as the combined margin CO_2 emission factor for grid connected power generation in year *y*, calculated using the latest approved version of the "Tool to calculate the emission factor for an electricity system". The Tool was applied in the following steps:

Step 1: Identify the relevant electricity systems

As per the documents published by NDRC[6], the relevant electric system of this project is the NCPG.

There are electricity transfers from connected electricity systems to the project electricity system (electricity imports). The connected electricity systems are Central China Power Grid (CCPG) and Northeast China Power Grid (NEPG). Besides CCPG and NEPG, there's no electricity import from other country or electricity system. These electricity imports are all calculated, and the details are listed in Annex 3 of this PDD.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system, except where recent or likely future additions to transmission capacity enable significant increases in imported electricity. In such cases, the transmission capacity may be considered a build margin source. For the project, the spatial extent is limited to the project electricity system, the NCPG.

For the purpose of determining the operating margin emission factor, use one of the following options to
determine the CO2 emission factor(s) for net electricity imports from a connected electricity system:

(a) 0 tCO2/MWh; or
(b) The weighted average operating margin (OM) emission rate of the exporting grid; or
(c) The simple operating margin emission rate of the exporting grid; or
(d) The simple adjusted operating margin emission rate of the exporting grid.

This PDD selects Option (c), the simple operating margin emission rate of the exporting grid.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

The emission factor tool (Version 02.2.1) suggests two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

The option *I* have been chosen for the calculation.

Step 3: Select an operating margin (OM) method

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

(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or

[6] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

(d) Average OM

The simple OM method (option a) can only be used if low cost/must run resources[7] constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Considering the low cost/must run resources only constitute 0.7% , 0.8%, 0.9%, 1.3% and 2.0%[8] of total generation of NCPG from the year 2005 to 2009 respectively. Therefore, the simple OM method (option a) is chosen to calculate OM emission factor for the Project.

The emission factor tool (Version 02.2.1) also suggests two data vintages options for the simple OM emission factor calculation. This PDD selects the "Ex ante option" because the required data is available. The selected option is:

> *Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.*

Thus, the data vintage chosen is from 2007 to 2009, and not be changed during the crediting periods.

Power plants registered as CDM project activities should be included in the sample group that is used to calculate the operating margin if the criteria for including the power source in the sample group apply.

Step 4: Calculate the operating margin emission factor according to the selected method
The simple OM emission factor is calculated as the generation-weighted average CO2 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. The simple OM may be calculated by one of the following two options:
Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based 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.

Due to the following three reasons, this project uses Option B to calculate operation margin.
(1) The necessary data for Option A is not available; and
(2) Only 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 source is known; and
(3) Off-grid power plants are not included in the calculation (i.e. if Option I has been chosen in Step 2).

The Operation B is the calculation based on total fuel consumption and electricity generation of the system.

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y}$$

Where:

$EF_{grid,OMsimple,y}$ Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
$FC_{i,y}$ Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit);
$NCV_{i,y}$ Net calorific value (energy content) of fossil fuel type i in year y

[7] They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

[8] China Electric Power Yearbook 2006-2010

(GJ mass or volume unit);

$EF_{CO2,i,y}$ CO2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);

EG_y Quantity of net electricity generation delivered to the grid by all power sources serving the system, not including low cost/must run power plants/units, in year *y* (MWh).

Step 5: Calculate the build margin (BM) emission factor

The tool suggests two options of data vintage to calculate BM. This project chooses option 1, which is:

> *For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.*

The sample group of power unit *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the

annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units *m* used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$).

However, it is very difficult to obtain the data of the five power plants built most recently, because these data are considered as confidential information by the company itself and the grid in China. Therefore, Option (a) is not applicable and a deviation[9] of option (b) that approved by the EB is applied here. That is, the capacity addition from one year to another is used as basis for determining the build margin, whichever results in a capacity addition that is closest to 20% of total installed capacity.

First, use the available data in *China Energy Statistical Yearbook* of the most recent year to calculate the proportions of the CO_2 emission from solid, liquid and gaseous fuels in the total CO_2 emissions related to power generation. Second, calculate the thermal emission factor of NCPG based on the emission factor corresponding to the most advanced commercial generation technologies and the proportions above as the weights. Finally, the BM emission factor is the product of this emission factor of fossil fuel-fired power generation and the proportion of fossil fuel-fired power plants in the newly installed 20% capacity. The detailed steps and the related formulas are as follows:

Sub-step 1. Calculating the share of CO_2 emissions of different fuel-fired power plants in the total CO2 emissions

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}$$

Where:

$F_{i,j,y}$ = Amount of fossil fuel type *i* consumed in year y in province *j* (mass or volume unit)

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

$EF_{CO2,i,j,,y}$ = Emission factor of fossil fuel type *i* in year y in province *j* (tCO_2/GJ).

COAL, OIL and GAS refer to the subscript of the emission factors representing best technologies commercially available for coal, oil and gas fired power plants, respectively.

Sub-step 2: Calculate the thermal emission factor

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

[9] DNV 07/10/2005, *Request for guidance: Application of AM0005 and AMS-I.D in China*, http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM

Where:
$EF_{coal,y}$, $EF_{oil,y}$ and $EF_{gas,y}$ represent the emission factor of coal-fired, oil-fired and gas-fired power plant refer to advanced commercial technology.

Sub-step 3: Calculate the build margin (BM) emission factor

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

Where:

$CAP_{Total,y}$ = the addition capacity exceed 20% of the present installed capacity.
$CAP_{Thermal,y}$ = the thermal power plant capacity in the addition capacity.

Step 6: Calculate the combined margin (CM) emission factors

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

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option a) should be used as the preferred option.

The simplified CM method (option b) can only be used if:
- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

Therefore, the weighted average CM method (option a) was selected to calculate the combined margin emission factor.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y}$$

Where:
ω_{OM} Weighting of operating margin emissions factor (%);
ω_{BM} Weighting of build margin emissions factor (%);

According to the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1), for wind power generation project activities, the w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period and for subsequent crediting periods.
$EF_{grid,CM,y}$ = 0.5 × 0.9803 + 0. 5 × 0.6426 = 0.81145 (tCO_2e/MWh).

Project Emissions

According to the ACM0018 (version 02.0.0), the project emissions are calculated as follows:
$PE_y = PE_{FF,y} + PE_{EL,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y}$

Where:
PE_y = Project emissions during year y (tCO_2e)
$PE_{FF,y}$ = Emissions during the year y due to fossil fuel consumption (tCO_2)
$PE_{EL,y}$ = Emissions during the year y due to electricity use off-site for the processing of biomass residues (tCO_2)
$PE_{TR,y}$ = Emissions during the year y due to transport of the biomass residues to the project plant

(tCO_2)
$PE_{BR,y}$ = Emissions from the combustion of biomass residues during the year y (tCO_2e)
$PE_{WW,y}$ = Emissions from waste water generated from the treatment of biomass residues in year y (tCO_2e)

Determination of PE_{FFy}

The following emission sources will be included in determining $PE_{FF,y}$:

- Emissions from on-site fossil fuel consumption of auxiliary equipment and systems related to the generation of electric power.
- Fossil fuels required for the operation of equipment related to the on-site or off-site preparation, storage, processing and transportation of fuels and biomass residues (e.g. for mechanical treatment of the biomass, conveyor belts, driers, pelletization, shredding, briquetting processes, etc.).

The latest approved version of the Option B of *Tool to calculate project or leakage CO2 emissions from fossil fuel combustion* are used to calculate $PE_{FF,y}$.

$$PE_{FF,y} = PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

Where:
$PE_{FC,j,y}$ = Are the CO_2 emissions from fossil fuel combustion in process *j* during the year y (tCO_2/yr);
$FC_{i,j,y}$ = Is the quantity of the fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr);
$COEF_{i,y}$ = Is the CO_2 emission coefficient of the fuel type *i* in year *y* (tCO_2/mass or volume unit)
i = Are the fuel types combusted in process *j* during the year *y*

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two Options, depending on the availability of data on the fossil fuel type i, as follows:
Option A: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type i;
Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO2 emission factor of the fuel type i

Since the data used in Option A is not available, Option B is chosen. The CO_2 emission coefficient $COEF_{i,y}$ will be calculated based on the net calorific value and CO_2 emission factor of the fuel type i, as follows:
$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$
Where:
$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
i = Are the fuel types combusted in process *j* during the year *y*

Determination of $PE_{EL,y}$

For this project, there's no off-site collection station. The biomass residues are directly transported from the local farmers to the plant, and the processing upon biomass residues is conducted in-plant, so there's no off-site electricity consumption at all. Therefore, $PE_{EL,y}$ =0.

Determination of $PE_{TR,y}$

"*Project and leakage emissions from road transportation of freight*" gives two options for $PE_{TR,y}$ calculation: monitoring fuel consumption (Option A) or using conservative default values (Option B).

In this PDD, project participants choose Option B for $PE_{TR,y}$ calculation, therefore, $PE_{TR,y}$ are determined as follows:

$PE_{TR,y} = PE_{TR,m} = \sum D_{f,m} \times FR_{f,m} \times EF_{CO2,f} \times 10^{-6}$

Where:

$PE_{TR,m}$ = Project emission from road transportation of freight monitoring period m (t CO_2)

$D_{f,m}$ = Return trip road distance between the origin and destination of freight transportation activity *f* in monitoring period m (km)

$FR_{f,m}$ = Total mass of freight transported in freight transportation activity *f* in monitoring period m (t)

$EF_{CO2,f}$ = Default CO_2 emission factor for freight transportation activity *f* (g CO_2/t km)

f = Freight transportation activities conducted in the project activity in monitoring period m

Determination of $PE_{BR,y}$

According to the ACM0018 (version 02.0.0), if the $BE_{BR,y}$ is not included in calculation of baseline emissions, then the emissions from the combustion of biomass residues need not be included. Therefore, $PE_{BR,y}$ is excluded. Thus, $PE_{BR,y}$ = 0.

Determination of $PE_{WW,y}$

According to ACM0018 (version 02.0.0), this emission source should be estimated in cases where waste water originating from the treatment of the biomass is (partly) treated under anaerobic conditions and where methane from the waste water is not captured and flared or combusted. For this project, the waste water originating from the treatment of biomass is not treated under anaerobic conditions in the proposed project, thus, $PE_{ww,y}$ = 0.

Leakage

The main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion or other sources due to diversion of biomass residues from other uses to the project plant as a result of the project activity. Changes in carbon stocks in the LULUCF sector are expected to be insignificant since this methodology is limited to biomass residues, as defined in the applicability conditions above. The baseline scenarios for biomass residues for which this potential leakage is relevant are B5, B6, B7 and B8. According to the analysis of baseline scenario in section B.4, the baseline for use of biomass residues is B1, which is the biomass residues are dumped or left to decay under mainly aerobic conditions. Therefore leakage effects do not need to be addressed according to consolidated methodology ACM0018, i.e. LE_y=0 tCO_2e.

B.6.2. Data and parameters fixed ex ante

With consideration of the fact of the Project, data and parameters that are available at validation are summarized in below tables. To make the PDD clear for understanding, parameters provided in the methodology ACM0018 but not used for the Project are not listed.

Data / Parameter	$GEN_{j,y}$
Unit	MWh
Description	Total power generation of province j of North China Power Grid, Central China Power Grid, and Northeast Power China Grid in year y
Source of data	*China Electric Power Yearbook* 2006~2010 edition
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	The data obtained from the *China Electric Power Yearbook* issued by authorized entity in China are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$r_{j,y}$
Unit	%
Description	Auxiliary electricity consumption rate of province j of North China Power Grid in year y

Source of data	*China Electric Power Yearbook* 2008~2010 edition
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	The data obtained from the *China Electric Power Yearbook* issued by authorized entity in China are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{CO2,i,y}$
Unit	tC/TJ
Description	CO_2 emission factor per unit of energy of the fuel i
Source of data	*2006 IPCC Guideline for National Greenhouse Gas Inventories*
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	The data obtained from *2006 IPCC Guideline for National Greenhouse Gas Inventories* are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$CAP_{j,y}$
Unit	MW
Description	Total installed capacity of province j of North China Power Grid in year y
Source of data	*China Electric Power Yearbook* 2008~2010 edition
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	The data obtained from the *China Electric Power Yearbook* issued by authorized entity in China are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$NCV_{i,y}$
Unit	TJ per mass or volume unit of fuel i
Description	Net caloric value of fuel i
Source of data	P287 of *China Energy Statistical Yearbook* 2010 edition
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	The data obtained from the *China Energy Statistical Yearbook* issued by authorized entity in China are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$FC_{i,j,y}$
Unit	t or m^3
Description	Consumption of fuel type i of province j of North China Power Grid, Central China Power Grid, and Northeast Power China Grid in year y

Source of data	*China Energy Statistical Yearbook* 2008~2010 edition
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	The data obtained from the *China Energy Statistical Yearbook* issued by authorized entity in China are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$FC_{adv,coal}$
Unit	gCe/kWh
Description	weighted average fuel consumption for power generation of top 30 sets of 600 MW coal fired power generation units set up in 2009 (taken as efficiency level of the best technology commercially available in China)
Source of data	*2011 Baseline Emission Factors for Regional Power Grid in China*
Value(s) applied	311.5
Choice of data or Measurement methods and procedures	The data obtained from the *2011 Baseline Emission Factors for Regional Power Grid in China* made publicly available by China's DNA are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$FC_{adv,oil/ gas}$
Unit	gCe/kWh
Description	weighted average fuel consumption for power generation of 200 MW oil/gas fired combined cycle power generation units (taken as efficiency level of the best technology commercially available in China)
Source of data	*2011 Baseline Emission Factors for Regional Power Grid in China*
Value(s) applied	237.4
Choice of data or Measurement methods and procedures	The data obtained from *2011 Baseline Emission Factors for Regional Power Grid in China* are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	Biomass residues categories and quantities used for the selection of the baseline scenario selection and assessment of additionality
Unit	Type Source Fate in the absence of the project activity Use in the project scenario (scenarios P); Quantity (tonnes on dry-basis)
Description	Refer to Table 3 in section B.4
Source of data	*Feasibility Study Report*

Value(s) applied	No. / Biomass residue type / Biomass residues source / Biomass residues fate in the absence of the project activity / Biomass residues use in project scenario / Biomass residues quantity (10^4 tonnes on dry basis) 1 / Cotton straw / Offsite from local farmer / Dumped or left to decay mainly under aerobic conditions (B1) / Electricity generation on-site (biomass-only boiler) / 2.4 2 / Maize straw / Offsite from local farmer / Dumped or left to decay mainly under aerobic conditions (B1) / Electricity generation on-site (biomass-only boiler) / 1.0 3 / Wood residues / Offsite from local farmer / Dumped or left to decay mainly under aerobic conditions (B1) / Electricity generation on-site (biomass-only boiler) / 14.6
Choice of data or Measurement methods and procedures	Feasibility Study Report was finished by a qualified institute and approved by government. It is a reliable source.
Purpose of data	Calculation of project emissions
Additional comment	-

No.	Biomass residue type	Biomass residues source	Biomass residues fate in the absence of the project activity	Biomass residues use in project scenario	Biomass residues quantity (10^4 tonnes on dry basis)
1	Cotton straw	Offsite from local farmer	Dumped or left to decay mainly under aerobic conditions (B1)	Electricity generation on-site (biomass-only boiler)	2.4
2	Maize straw	Offsite from local farmer	Dumped or left to decay mainly under aerobic conditions (B1)	Electricity generation on-site (biomass-only boiler)	1.0
3	Wood residues	Offsite from local farmer	Dumped or left to decay mainly under aerobic conditions (B1)	Electricity generation on-site (biomass-only boiler)	14.6

Data / Parameter	$EF_{CO2,f}$
Unit	g CO_2 / t km
Description	Default CO_2 emission factor for freight transportation activity *f*
Source of data	*"Project and leakage emissions from road transportation of freight" (Version 01.0.0)*
Value(s) applied	245
Choice of data or Measurement methods and procedures	In *"Project and leakage emissions from road transportation of freight" (Version 01.0.0)*, the default value of emission factors for Light vehicles and Heavy vehicles are 245 (gCO_2 /t km) and 129 (gCO_2/t km), respectively. For conservativeness, the value of 245 (gCO_2/t km) will be adopted for $PE_{TR,m}$ calculations, no matter the freights are transported by Light vehicles or Heavy vehicles.
Purpose of data	Calculation of project emissions
Additional comment	As per the Tool of "*Project and leakage emissions from road transportation of freight*" (version 01.0.0), the $EF_{CO2,f}$ can be 245 g CO_2/t km for light vehicles and 129 g CO_2 /t km for Heavy vehicles. The project participants chose 245 g CO_2 /t km as a conservative value for project emissions calculation, even if the heavy vehicles are used for transportation.

B.6.3. Ex ante calculation of emission reductions

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I. Baseline emission

As the conclusion of section B.6.1 above, $BE_y = BE_{EL,y} = (EG_{PJ,gross,y} – EG_{PJ,aux,y}) \times EF_{grid,CM,y}$

According to the FSR of the Project, the electricity generation is estimated to be 210,000 MWh, and the auxiliary consumption is 23,310 MWh. According to the *2011 Baseline Emission Factors*

for Regional Power Grid in China, the baseline emission factor of the Project is 0.81145 tCO_2e/MWh.

The baseline emissions are calculated as follows:
$BE_y = BE_{EL,y} = (EG_{PJ,gross,y} – EG_{PJ,aux,y}) \times EF_{grid,CM,y}$ = (210,000-23,310) ×0.81145=151,489 tCO_2e.

II. Project emission

As the conclusion of section B.6.1 above, $PE_y = PE_{TR,y} + PE_{FF,y}$.

1. Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant ($PE_{TR,y}$)

For project emissions calculation in validation stage, $\sum FR_{f,m}$ is assumed as 32×10^4 tone. All the biomass residues are collected within 50 km away around the site of the Project, therefore the $D_{f,m}$ = 50 × 2= 100 km. As per *Project and leakage emissions from road transportation of freight (version 01.0.0)*, the value of $EF_{CO2,f}$ is 245 g CO_2 / t km.

Thus,
$PE_{TR,y} = PE_{TR,m} = \sum D_{f,m} \times FR_{f,m} \times EF_{CO2,f} \times 10^{-6} = 32\times10^4\times 100 \times 245 \times 10^{-6}$ = 7,840 t CO_2

2. Carbon dioxide emissions from on-site consumption of fossil fuels ($PE_{FF,y}$)
The Project is estimated to consume 120 t diesel (for mechanical treatment and in-plant transportation) a year. The $NCV_{diesel,y}$ is 43.3 GJ/t[10] (as per *2006 IPCC Guidelines on National GHG Inventories*), and $EF_{CO2,diesel,y}$ is 0.0748tCO_2e/GJ (as per *2006 IPCC Guidelines on National GHG Inventories*).

$PE_{FF,y} = FF_{project,i,y} \times NCV_{i,y} \times EF_{CO2e,i,y} = FF_{project,diesel,y} \times NCV_{diesel,y} \times EF_{CO2,diesel,y}$ =120×43.3×0.0748=389 tCO_2e.

Project emissions are calculated as follows:
$PE_y = PE_{TR,y} + PE_{FF,y}$ = 7,840+389 = 8,229 tCO2e

III. Estimated project leakage emissions:

As analysis of Section B6.1 above, there is no leakage caused by the project activity.

IV. Estimated emission reductions

$ER_y = BE_y – PE_y – LE_y$ =151,489 – 8,229– 0 =143,260 tCO2e/yr

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2013	8,229	151,489	0	143,260
2014	8,229	151,489	0	143,260
2015	8,229	151,489	0	143,260
2016	8,229	151,489	0	143,260
2017	8,229	151,489	0	143,260
2018	8,229	151,489	0	143,260

[10] Comparing with the local and nation data, the IPCC value (43.3 GJ/t) is more conservative.

2019	8,229	151,489	0	143,260
Total	57,561	1,060,423	0	1,002,820
Total number of crediting years	7			
Annual average over the crediting period	57,561	1,060,423	0	1,002,820

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

With consideration of the fact of the Project, data and parameters monitored are summarized in below tables. To make the PDD clear for understanding, parameters provided in the methodology ACM0018 but not used for the Project are not listed in below tables.

Data / Parameter	$EG_{PJ,\ y}$
Unit	MWh
Description	The net quantity of electricity supplied by all power plants which are located at the project site and included in the project boundary
Source of data	The data used in the PDD are obtained from the FSR of the Project. Actual data will be obtained through on-site measurement.
Value(s) applied	186,690
Measurement methods and procedures	$EG_{PJ,\ y}=EG_{PJ\ toGRID,y}- EG_{GRID\ toPJ,y}$ $EG_{PJ\ toGRID,y}$: Quantity of electricity supplied by the Project to the grid in year y $EG_{GRID\ toPJ,y}$: Quantity of electricity delivered to the Project from the grid in year y
Monitoring frequency	$EG_{PJ\ toGRID,y}$ and $EG_{GRID\ toPJ,y}$ are continuously measured and monthly recorded.
QA/QC procedures	Cross checked with receipts from electricity sales/quantity of fuels fired.
Purpose of data	Calculation of baseline emissions
Additional comment	According to the Power Purchase Agreement signed by the project owner and the grid company, one bidirectional electricity meter installed at the local substation is used for monitoring the quantity of electricity supplied to the grid by the Project ($EG_{PJ\ toGRID,y}$) and quantity of electricity delivered to the Project from the grid ($EG_{GRID\ toPJ,y}$). The power sales receipts are issued on the base of the monitoring results of the meter. The baseline emissions are calculated using the result of $EG_{PJ\ toGRID,y}$- $EG_{GRID\ toPJ,y}$, which is more conservative than using $EG_{PJ,gross,\ y}$ - $EG_{PJ,aux,y}$, since the monitoring point is at the grid side and power imported from the grid is deducted. The accuracy level of the meter will be at least 1.0, and the calibration of the meter will be conducted at least once a year.

Data / Parameter	$EG_{PJ,gross,y}$
Unit	MWh
Description	Gross quantity of electricity generated in power plant which are located at the project site and included in the project boundary in year *y*
Source of data	The data used in the PDD are obtained from the FSR of the Project. Actual data will be obtained through on-site measurement.
Value(s) applied	210,000
Measurement methods and procedures	-

Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	According to the Power Purchase Agreement signed by the project owner and the grid company, one bidirectional electricity meter installed at the local substation is used for monitoring the quantity of electricity supplied to the grid by the Project ($EG_{PJ\ toGRID,y}$) and quantity of electricity delivered to the Project from the grid ($EG_{GRID\ toPJ,y}$). The power sales receipts are issued on the base of the monitoring results of the meter. The baseline emissions are calculated using the result of $EG_{PJ\ toGRID,y}$-$EG_{GRID\ toPJ,y}$, which is more conservative than using $EG_{PJ,gross,\ y}$ - $EG_{PJ,aux,y}$, since the monitoring point is at the grid side and power imported from the grid is deducted.

Data / Parameter	$EG_{PJ,aux,y}$
Unit	MWh
Description	Total auxiliary electricity consumption required for the operation of the power plant at the project site
Source of data	The data used in the PDD are obtained from the FSR of the Project. Actual data will be obtained through on-site measurement.
Value(s) applied	23,310
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	According to the Power Purchase Agreement signed by the project owner and the grid company, one bidirectional electricity meter installed at the local substation is used for monitoring the quantity of electricity supplied to the grid by the Project ($EG_{PJ\ toGRID,y}$) and quantity of electricity delivered to the Project from the grid ($EG_{GRID\ toPJ,y}$). The power sales receipts are issued on the base of the monitoring results of the meter. The baseline emissions are calculated using the result of $EG_{PJ\ toGRID,y}$-$EG_{GRID\ toPJ,y}$, which is more conservative than using $EG_{PJ,gross,\ y}$ - $EG_{PJ,aux,y}$, since the monitoring point is at the grid side and power imported from the grid is deducted.

Data / Parameter	Biomass residues categories and quantities used in the project activity
Unit	Type Source Fate in the absence of the project activity (scenarios B); Use in the project scenario (scenarios P); Quantity (tonnes)

<table>
<tr><td>Description</td><td>Refer to Table 3 in section B4, the last column corresponds to the quantity of each category of biomass residues (tonnes). These quantities should be updated every year of the crediting period as part of the monitoring plan so as to reflect the actual use of biomass residues in the project scenario. These updated values should be used for emissions reductions calculations.

Along the crediting period, new categories of biomass residues (i.e. new types, new sources, with different fate) can be used in the project activity. In this case, a new line should be added to the table. If those new categories are of the type B1, B2, or B3, the baseline scenario for those types of biomass residues should be assessed using the procedures outlined in the guidance provided in the procedure for the selection of the baseline scenario and demonstration of additionality</td></tr>
<tr><td>Source of data</td><td>The data used in the PDD are obtained from the FSR. Actual data will be obtained through on-site measurement.</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><td>No.</td><td>Biomass residue type</td><td>Biomass residues source</td><td>Biomass residues fate in the absence of the project activity</td><td>Biomass residues use in project scenario</td><td>Biomass residues quantity (10^4 tones on dry basis)</td></tr>
<tr><td>1</td><td>Cotton straw</td><td>Offsite from local farmer</td><td>Dumped or left to decay mainly under aerobic conditions (B1)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>2.4</td></tr>
<tr><td>2</td><td>Maize straw</td><td>Offsite from local farmer</td><td>Dumped or left to decay mainly under aerobic conditions (B1)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>1.0</td></tr>
<tr><td>3</td><td>Woods waste</td><td>Offsite from local farmer</td><td>Dumped or left to decay mainly under aerobic conditions (B1)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>14.6</td></tr>
</table>
</td></tr>
<tr><td>Measurement methods and procedures</td><td>Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.</td></tr>
<tr><td>Monitoring frequency</td><td>Data monitored continuously and aggregated as appropriate</td></tr>
<tr><td>QA/QC procedures</td><td>Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes</td></tr>
<tr><td>Purpose of data</td><td>Calculation of project emissions</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

Data / Parameter	For biomass residues categories for which scenarios B1, B2, or B3 is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario
Unit	Tons

<table>
<tr><td>Description</td><td>- Quantity of available biomass residues of type n in the region
- Quantity of biomass residues of type n that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region
- Availability of a surplus of biomass residues type n (which can not be sold or utilized) at the ultimate supplier to the project and a representative sample of other suppliers in the defined geographical region.</td></tr>
<tr><td>Source of data</td><td>In validation period, the data used in the PDD are obtained from the FSR and Local Biomass Resource Report. In verification period, the data will be obtained from surveys or statistics</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><td>Biomass residue type</td><td>Annual available amount (10^4 tones)</td><td>Other use, excluding the Project(10^4 tones)</td><td>The Project use(10^4 tones)</td><td>Annual available amount/ Total annual use</td></tr>
<tr><td>Cotton straw</td><td>46.7</td><td>16.6</td><td>3.3</td><td>234.67%</td></tr>
<tr><td>Maize straw</td><td>90.1</td><td>36.6</td><td>1.6</td><td>235.86%</td></tr>
<tr><td>Woods Waste</td><td>106.3</td><td>20.3</td><td>27.1</td><td>224.26%</td></tr>
</table>
</td></tr>
<tr><td>Measurement methods and procedures</td><td>At the validation stage for biomass residues categories identified ex-ante, and always that new biomass residues categories are included during the crediting period.</td></tr>
<tr><td>Monitoring frequency</td><td>Survey/statistic conducted by local government annually</td></tr>
<tr><td>QA/QC procedures</td><td>-</td></tr>
<tr><td>Purpose of data</td><td>Calculation of leakage emissions</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

Data / Parameter	$D_{f,m}$
Unit	Kilometre
Description	Return trip road distance between the origin and destination of freight transportation activity *f* in monitoring period *m*
Source of data	Records of vehicle operator or records by project participants
Value(s) applied	100
Measurement methods and procedures	Determined once for each freight transportation activity f for a reference trip using the vehicle odometer or any other appropriate sources (e.g. on-line sources)
Monitoring frequency	To be updated whenever the road distance changes.
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$FF_{project, diesel,y}$
Unit	t
Description	Quantity of diesel combusted that are attributable to the project activity during the year *y*
Source of data	The data used in the PDD are obtained from the FSR of the Project. Actual data will be obtained through on-site measurement.
Value(s) applied	120
Measurement methods and procedures	Use weight meters.

Monitoring frequency	Measuring and recording for every refuelling process
QA/QC procedures	Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$NCV_{diesel,y}$
Unit	GJ/ton
Description	Net calorific value of diesel
Source of data	IPCC default values at the 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
Value(s) applied	43.3 (for diesel)
Measurement methods and procedures	Any update of IPCC Guidelines in future will be followed.
Monitoring frequency	Any update of IPCC Guidelines in future will be followed.
QA/QC procedures	–
Purpose of data	Calculation of project emissions
Additional comment	–

Data / Parameter	$EF_{CO2,diesel,y}$
Unit	tCO_2e/GJ
Description	CO_2 emission factor of diesel
Source of data	Data used in the PDD is obtained from *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.
Value(s) applied	0.0748 (for diesel)
Measurement methods and procedures	Any update of IPCC Guidelines in future will be followed.
Monitoring frequency	Any update of IPCC Guidelines in future will be followed.
QA/QC procedures	–
Purpose of data	Calculation of project emissions
Additional comment	–

Data / Parameter	$FR_{f,m}$
Unit	tonnes
Description	Total mass of freight transported in freight transportation activity *f* in monitoring period *m*
Source of data	Records by project participants or records by truck operators
Value(s) applied	320,000
Measurement methods and procedures	All the biomass transported to the plant will be measured by weight meters.
Monitoring frequency	Measuring and recording for each truck load. And each truck transported one type of the biomass residues per time.
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comment	–

Data / Parameter	$NCV_{n,y}$
Unit	GJ/tons on a dry-basis
Description	Net calorific value of biomass residue category *n* in year y
Source of data	On-site measurements
Value(s) applied	-
Measurement methods and procedures	Measurements shall be carried out at reputed laboratories and according to relevant international standards. Measure the NCV on dry-basis
Monitoring frequency	Monitoring at least once half a year
QA/QC procedures	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.
Purpose of data	Calculation of the quantity of fuels fired when crosscheck the power generation
Additional comment	-

Data / Parameter	Moisture content of the biomass residues
Unit	% Water content
Description	Moisture content of each biomass residues type *k*
Source of data	On-site measurements
Value(s) applied	Cotton straw: 27.3% Maize straw: 36.2% Woods Waste: 46.1%
Measurement methods and procedures	The moisture content will be monitored for each batch of biomass of homogeneous quality. The weighted average should be calculated for each monitoring period and used in the calculations.
Monitoring frequency	The moisture content is monitored for each batch of biomass of homogeneous quality.
QA/QC procedures	-
Purpose of data	Calculation of the quantity of fuels fired when crosscheck the power generation
Additional comment	In case of dry biomass, monitoring of this parameter is not necessary.

B.7.2. Sampling plan

>>
Not applicable

B.7.3. Other elements of monitoring plan

>>
The monitoring plan is made as below:

1. Monitoring structure

The monitoring structure is shown by Figure 6 and implemented by the project owner.

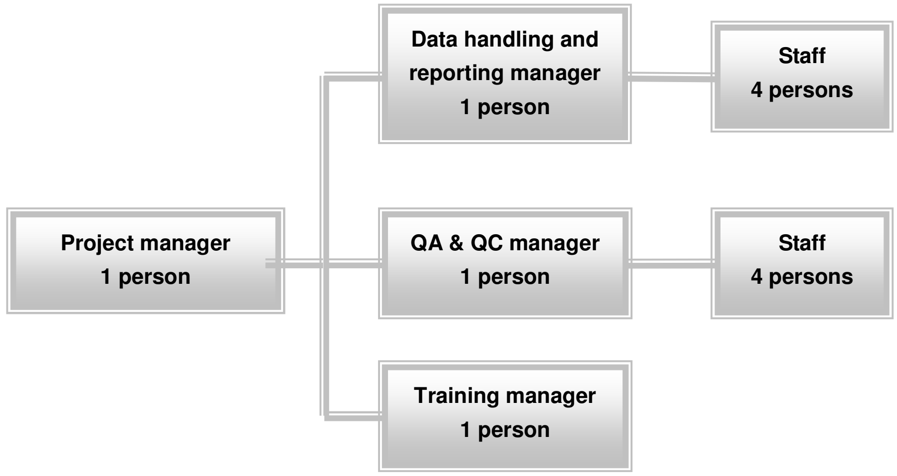
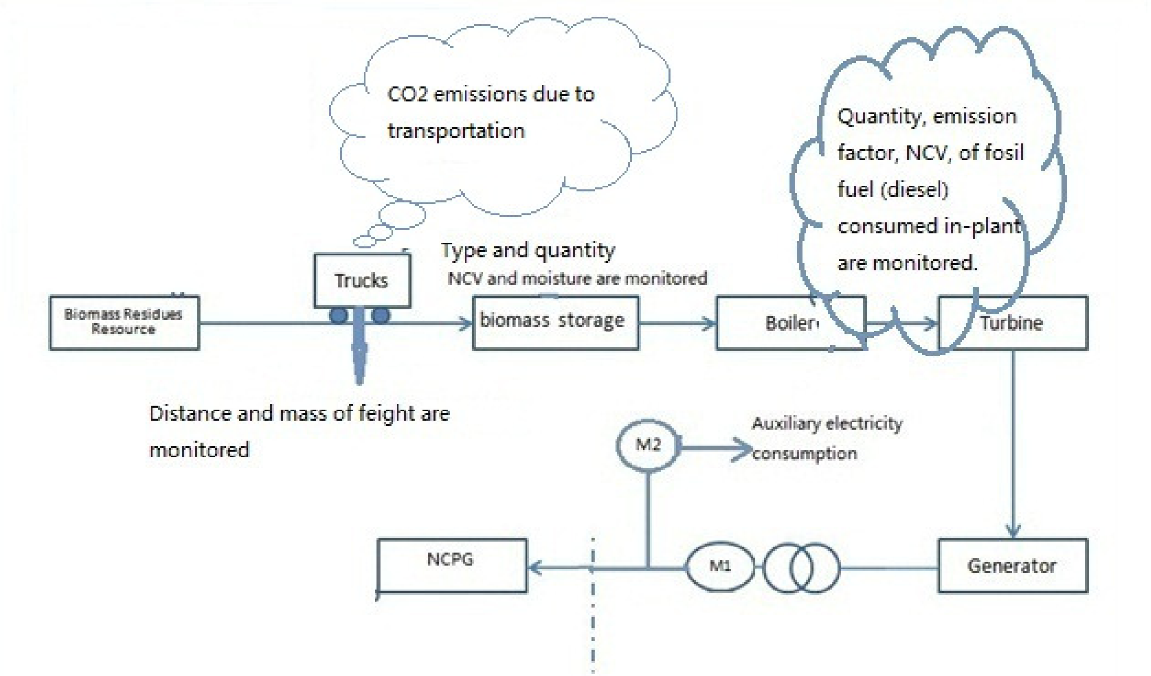


Figure 6 Monitoring structure of the Project

The project manager is responsible for 1) implementation and supervision of the monitoring activity 2) periodical training on the staff of the whole monitoring system 3) liaison of this CDM project. The data handling and reporting manager is responsible for managing, processing and submitting data. The QA & QC manager is responsible for calibration of meters and supervision of the whole process quality. The training manger is in charge of training plan and implementation for relevant staffs.

2. Electricity Monitoring

Instruments used are described in section B.7.1, and their locations are as below.



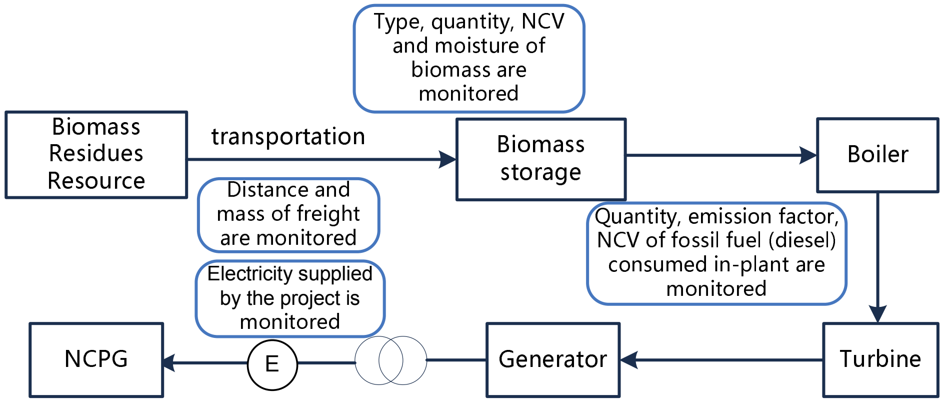


Figure 7 monitoring locations

It can be seen on Figure 7 above, there is one bidirectional electricity meter installed at the local substation for monitoring the quantity of electricity supplied by the plant to the grid, and the electricity delivered to the plant from the grid. The accuracy of the meter is no lower than 1.0, and the calibration of meter will be conducted at least once a year.

3. Biomass Residues Consumption and Transportation
The biomass residues consumed by the proposed project are monitored and recorded by the project owner. All the parameters related in section B.7.1 are monitored, such as biomass residues type, quantity, NCV, moisture, and biomass resource. The accuracy level of all the monitoring equipments will be in line with relevant international standards. And for the biomass transportation, total mass of freight transported and transportation distance, will also be monitored and recorded.

4. Fossil Fuel Consumption
For the proposed project, a small quantity of diesel will be used in-plant. The diesel consumption will be continuously measured by weight meters and recorded in a log book. The accuracy of weight meters will be in line with relevant international standards, and the purchase receipts will be used for cross-check. The net calorific value and emission factor of diesel will be annually reviewed with the IPCC update.

5. Calibration
The electricity meters, weigh meters, and moisture analyzers of the Project will be calibrated by qualified third parties. And such calibration will be carried out in line with national norms.

6. Data Management System
Designated staff will be appointed by the project owner to take the overall responsibility for monitoring greenhouse gas emission reductions and keeping all the data collected as part of monitoring archived electronically and kept at least for two years after the end of the last crediting period.

7. QA/QC
The QA/QC manager is in charge of calibration and maintenance of the instruments to ensure their accuracy and reliability, verify the data monitored according to the QA/QC procedure described in Section B7.1 and the requirement of internal audit, report to the project manager immediately when find out any abnormal. In case of any malfunction or emergency, a conservative approach will be used to calculate the emission reductions.

B.7.4. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>
The application of methodology of the Project was completed on 10/09/2014 by:

Name/Origination	Project participate Yes/No
EDF Trading Limited Room 702, Tower 1, Henderson Center, No. 18 Jianguomennei Avenue, Dongcheng District (100005), Beijing, P. R. China Tel: +86-10-65180016 Fax: +86-10-65180056	Yes

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
18/03/2011 (The date of *Civil Engineering and Construction Contract* signed.)

C.1.2. Expected operational lifetime of project activity

>>
20y-0m

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Renewable crediting period. This is the first crediting period.

C.2.2. Start date of crediting period

>>
01/01/2013

C.2.3. Length of crediting period

7y-0m

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The Environmental Impact Statement Form was completed by Shandong University in May 2009. And it was approved by the Shandong Environment Protection Bureau on 27/05/2010 (Document No. [2010] 143). According to the Environmental Impact Statement Form, environmental impacts possibly caused by the Project and corresponding measures employed by the project owner are analyzed as follows:

(1) Atmosphere Environment

The major pollutant is flying-dust, and is mainly caused by transportation and construction. The influence area of transportation dust can be effectively reduced by sprinkling the road. The construction dust has no impact on all the environmental sensitive points, which are all away from the project plant.

(2) Waste water

The waste water is mainly concrete maintenance water, road sprinkling water and some domestic waste water. Temporary sedimentation tank and septic tank will installed to treat the waste water. The concrete maintenance water can be reused after treatment in the temporary sedimentation tank, and the domestic waste water can be discharged into the irrigation channel nearby after treated in the septic tank. Thus, the waste water will no impact the environment.

(3) Noise

Noises generated during construction period of the Project mainly stem from the operation of construction machines and equipments. The distance between the main construction site and the resident area is more than 500 m. Moreover, the Project Owner will strengthen the maintenance and conservation of equipments and limit the time of construction and transportation, in order to ensure that noises generated during the construction period will not impact local residents. During the operation period of the Project, noises will be generated mainly from operation of turbines. After attenuation, noises generated during the operation period of the Project will meet the requirement of Category I of *Emission Standard for Industrial Enterprises Noise at Boundary* (GB12348-2008).

(4) Solid waste

The solid wastes during construction are mainly discarded earth, waste construction materials, waste decorating materials and living garbage. The discarded earth, waste construction materials, and some waste decorating materials will be backfilled. The packaging boxes and bags will be selected and sold. The living solid waste will be collected and stored at specific site, and delivered to environmental sanitation administrative department. Thus the solid waste generated during the construction period will not impact the surroundings.

In summary, by means of pollution avoidance and control, the Project will not significantly impact the regional environment.

D.2. Environmental impact assessment

>>
The Project employs clean integrated resource utilization technology to generate electricity whose environmental impacts comply with relevant laws and regulations of the host country. Environmental impacts are considered not significant.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

Stakeholders of the Project are identified as the local residents of Huimin County and around the project site. In Nov. 2010, the project owner conducted a survey on the stakeholders of the Project. The survey was conducted through distributing and collecting responses to a questionnaire.

The questionnaire is distributed to the local residents near the Project site. For the total 30 questionnaires distributed to the stakeholders, 30 returned with a response rate of 100%. The structure of the samples are shown below.

Structure of gender		
Gender	**No.**	**Percentage (%)**
Male	24	80
Female	6	20

Structure of educational level		
Educational level	**No.**	**Percentage (%)**
Middle School	16	53
High School	4	13
College	10	34

Structure of age		
Age	**No.**	**Percentage (%)**
Below 30	6	20
30~39	11	37
40~49	5	17
50 and above	8	26

The questionnaires mainly focus on the following issues:

- The stakeholders' knowledge about biomass power generation projects;
- Impacts possibly introduced by the construction of the Project from the view of stakeholders;
- The attitude of the stakeholders on the construction of the Project.

E.2. Summary of comments received

>>

The summary of questionnaire survey is listed as the following:

- 60% of them very concern about the environmental protection of the Project;
- 58% of them know the Project well;
- 100% think the Project will promote the local economic growth;
- 100% of them think the Project will bring positive influence on living quality of local people;
- 16% of them worried about the noise issue, 26% of them worried about the wastewater issue, 22% of them worried about the air pollution issue, and 26% of them worried about the solid waste issue.
- 100% of them support the construction of the Project.

E.3. Report on consideration of comments received

>>

It can be known from the results of questionnaire statistics that the stakeholders support the construction of the Project.

Regarding the issues worried about by the stakeholders, such as noise, water pollution, air pollution, solid waste, it has been analyzed and provided corresponding measures to prevent and handle these issues in section D.1, ensuring these issues will not impact the local environment and residents.

Based on the comments received from the stakeholders, there has been no necessity to modify the Project in the aspect of design, construction and operation.

SECTION F. Approval and authorization

>>
The project was approved by Chinese DNA in August 2012 and by French DNA on 02/10/2012.

- - - - -

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	National Huimin Bio Energy Co., Ltd
Street/P.O. Box	No.1 Beishatan Deshengmen wai, Chaoyang District
Building	Old Administration Building,
City	Beijing
State/Region	
Postcode	100083
Country	People's Republic of China
Telephone	86 10 5868 1511
Fax	86 10 5868 1588
E-mail	wcl@nbe.cn
Website	
Contact person	
Title	
Salutation	Mr.
Last name	Wang
Middle name	
First name	Chunli
Department	
Mobile	
Direct fax	86 10 5868 1588
Direct tel.	86 10 5868 1511
Personal e-mail	wcl@nbe.cn

Project participant and/or responsible person/ entity	☒ Project participant ☒ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	EDF Trading Limited
Street/P.O. Box	80 Victoria Street
Building	Cardinal Place
City	London
State/Region	-
Postcode	-
Country	United Kingdom
Telephone	+44(0)20 7061 4000
Fax	+44(0) 20 7061 5000
E-mail	cdm.team@edftrading.com
Website	-
Contact person	Francois Joubert
Title	-
Salutation	Mr.
Last name	Joubert
Middle name	-
First name	Francois
Department	-
Mobile	-
Direct fax	+44(0) 20 7061 5000
Direct tel.	+44(0)20 7061 4000
Personal e-mail	cdm.team@edftrading.com

Appendix 2. Affirmation regarding public funding

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

Appendix 3. Applicability of methodology and standardized baseline

No supplementary information.

Appendix 4. Further background information on ex ante calculation of emission reductions

To determine the simple operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$) of the Project, data recommended in *Announcement to Publish 2011 Baseline Emission Factors for Regional Power Grids in China* for North China Power Grid are adopted.

The following tables summarise the numerical results from the equations listed in *Tool to Calculate the Emission Factor for an Electricity System*. Information provided by the tables includes data, data sources and the underlying calculations.

Table A1. Thermal power generation of North China Power Grid in 2007

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Beijing	22,300,000	7.51	20,625,270
Tianjin	39,900,000	6.53	37,294,530
HeBei	163,300,000	6.67	152,407,890
Shanxi	173,400,000	7.99	159,545,340
Inner Mongolia	180,100,000	7.77	166,106,230
Shandong	259,100,000	7.23	240,367,070
Total	838,100,000		776,346,330

Data source: China Electric Power Yearbook 2008.

Table A2. Thermal power generation of North China Power Grid in 2008

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Beijing	24,300,000	7.14	22,564,980
Tianjin	39,700,000	7.05	36,901,150
HeBei	158,000,000	6.9	147,098,000
Shanxi	176,200,000	8.22	161,716,360
Inner Mongolia	200,800,000	7.96	184,816,320
Shandong	268,900,000	7.14	249,700,540
Total	867,900,000		802,797,350

Data source: China Electric Power Yearbook 2009.

Table A3. Thermal power generation of North China Power Grid in 2009

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Beijing	24,100,000	6.55	22,521,450
Tianjin	41,300,000	6.8	38,491,600
HeBei	173,300,000	6.92	161,307,640
Shanxi	185,000,000	8.1	170,015,000
Inner Mongolia	213,500,000	7.82	196,804,300
Shandong	285,800,000	7.43	264,565,060
Total	923,000,000		853,705,050

Data source: China Electric Power Yearbook 20010.

Table A4. Calculation of the simple operating margin emission factor of North China Power Grid in 2007

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Emission factor	NCV	CO_2Emissions (tCO_2e)
									($kgCO_2$/TJ) G	(MJ/t,km3)	L=G×J×K/100000 (Mass Unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	J	K	L=G×J×K/10000 (Volume Unit)
Raw Coal	10^4tons	816.17	1753.99	7716.13	7510.06	10434.25	11884.83	**40115.43**	87,300	20,908	732,214,267
Cleaned coal	10^4tons						18.43	**18.43**	87,300	26,344	423,859
Other Washed Coal	10^4tons	5.76		156.89	478.81	48.57	756.84	**1446.87**	87,300	8,363	10,563,452
Moulded Coal	10^4tons	7.93					42.86	**50.79**	87,300	20,908	927,054
Coke	10^4tons			0.02			4.09	**4.11**	95,700	28,435	111,843
Coke Oven Gas	10^9m^3	0.07	0.72	3.13	25.46	2.58	13.61	**45.57**	37,300	16,726	2,843,020
Other Coke Gas	10^9m^3	11.8	7.6	88.38	72.8	28.17	29.64	**238.39**	37,300	5,227	4,647,821
Crude Oil	10^4tons							**0**	71,100	41,816	0
Petrol oil	10^4tons			0.01				**0.01**	67,500	43,070	291
Diesel Oil	10^4tons	0.33		2.35		0.62	5.08	**8.38**	72,600	42,652	259,490
Fuel Oil	10^4tons	4.74		0.18			2.35	**7.27**	75,500	41,816	229,522
Liquefied Petroleum Gas	10^4tons							**0**	61,600	50,179	0
Refinery Gas	10^4tons	0.06		2.85			1.65	**4.56**	48,200	46,055	101,225
Natural Gas	10^9m^3	5.03	0.73		0.54	4.22	0.01	**10.53**	54,300	38,931	2,225,993
Other Petroleum Products	10^4tons	1.72						**1.72**	72,200	41,816	51,929
Other Coke Products	10^4tons	4.74						**4.74**	95,700	28,435	128,986
Other Energy	10^4tons Standard Coal	11.94		77.25	360.26	30.75	163.48	**643.68**	0	0	0
Total emission of North China Power Grid (tCO_2e)									**754,728,750**		

Data source: China Energy Statistical Yearbook 2008

Table A5. Calculation of the simple operating margin emission factor of North China Power Grid in 2008

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Emission factor	NCV	CO_2Emissions (tCO_2e)
									($kgCO_2$/TJ) G	(MJ/t,km3)	L=G×J×K/100000 (Mass Unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	J	K	L=G×J×K/10000 (Volume Unit)
Raw Coal	10^4tons	755.75	1800.12	7353.33	7854.39	12607.82	12360.75	**42732.16**	87,300	20,908	779,976,613
Cleaned coal	10^4tons						23.88	**23.88**	87,300	26,344	549,200
Other Washed Coal	10^4tons	5.05		134.52	582.39	66.2	691.21	**1479.37**	87,300	8,363	10,800,731
Moulded Coal	10^4tons	5.66			32.49		45.38	**83.53**	87,300	20,908	1,524,647
Coke	10^4tons			0.02			6.07	**6.09**	95,700	28,435	165,723
Coke Oven Gas	10^9m^3	0.11	0.86	8.37	24.55	3.55	16.2	**53.64**	37,300	16,726	3,346,491
Other Coke Gas	10^9m^3	10.4	9.08	187.54	36	34.32	29.76	**307.1**	37,300	5,227	5,987,440
Crude Oil	10^4tons					0.02		**0.02**	71,100	41,816	595
Petrol oil	10^4tons							**0**	67,500	43,070	0
Diesel Oil	10^4tons	0.15		3.08		0.35		**3.58**	72,600	42,652	110,856
Fuel Oil	10^4tons	2.56		0.25				**2.81**	75,500	41,816	88,715
Liquefied Petroleum Gas	10^4tons							**0**	61,600	50,179	0
Refinery Gas	10^4tons	0.44		2.93				**3.37**	48,200	46,055	74,809
Natural Gas	10^9m^3	11.09	0.7		0.97	2.12		**14.88**	54,300	38,931	3,145,563
Other Petroleum Products	10^4tons	1.45						**1.45**	72,200	41,816	43,777
Other Coke Products	10^4tons	7.97		7.61				**15.58**	95,700	28,435	423,968
Other Energy	10^4tons Standard Coal	4.9	2.34	61.02	466	63.72	141.71	**739.69**	0	0	0
Total emission of North China Power Grid (tCO_2e)									**806,239,126**		

Data source: China Energy Statistical Yearbook 2009

Table A6. Calculation of the simple operating margin emission factor of North China Power Grid in 2009

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Emission factor	NCV	CO_2Emissions (tCO_2e)
									($kgCO_2$/TJ) G	(MJ/t,km3)	L=G×J×K/100000(Mass Unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	J	K	L=G×J×K/10000 (Volume Unit)
Raw Coal	10^4tons	665.16	1870.36	7623.94	8024.02	12538.57	12654.05	**43376.1**	87,300	20,908	791,730,246
Cleaned coal	10^4tons						11.7	**11.7**	87,300	26,344	269,080
Other Washed Coal	10^4tons	6.15		247.51	586.04	104.69	862.02	**1806.41**	87,300	8,363	13,188,417
Moulded Coal	10^4tons	3.73					31.83	**35.56**	87,300	20,908	649,065
Coke	10^4tons						10.43	**10.43**	95,700	28,435	283,824
Coke Oven Gas	10^9m^3	0.13	1.27	8.72	19.48	3.35	11.69	**44.64**	37,300	16,726	2,784,999
Other Coke Gas	10^9m^3	10.23	13.43	228.32	35.89	48.35	37.21	**373.43**	37,300	5,227	7,280,656
Crude Oil	10^4tons					0.13		**0.13**	71,100	41,816	3,865
Petrol oil	10^4tons						0.01	**0.01**	67,500	43,070	291
Diesel Oil	10^4tons	0.1		2.38		2.64	3.07	**8.19**	72,600	42,652	253,606
Fuel Oil	10^4tons	0.82		0.19		0.02	2.63	**3.66**	75,500	41,816	115,550
Liquefied Petroleum Gas	10^4tons							**0**	61,600	50,179	0
Refinery Gas	10^4tons	0.83		3.95			3.44	**8.22**	48,200	46,055	182,472
Natural Gas	10^9m^3	13.55	0.63		4.39	2.03	0.03	**20.63**	54,300	38,931	4,361,086
Other Petroleum Products	10^4tons	1.52					23.18	**24.7**	72,200	41,816	745,721
Other Coke Products	10^4tons	6.62		7.79			5.52	**19.93**	95,700	28,435	542,341
Other Energy	10^4tons Standard Coal		2.11	62.14	570.3	90.63	137.68	**862.86**	0	0	0
Total emission of North China Power Grid (tCO_2e)									**822,391,221**		

Data source: China Energy Statistical Yearbook 2010

Table A7. Power import by North China Power Grid from 2006 to 2008

	2007	**2008**	**2008**
Net electricity import from Central China Power Grid (MWh)	803,000		
Emission factor of Central China Power Grid (tCO_2e/MWh)	1.10197		
Net electricity import from Northeast China Grid (MWh)	1,789,750	5,286,140	6,982,610
Emission factor of Northeast China Power Grid (tCO_2e/MWh)	1.08186	1.10489	1.06915
Total emission of North China Power Grid (tCO_2e)	757,549,895	812,079,707	829,856,644
Total Power supply of North China Power Grid (MWh)	778,939,080	808,083,490	860,687,660
Emission Factor of North China Power Grid(tCO_2e/MWh)	**0.97254**	**1.00495**	**0.96418**

Based on the data provided in Table A1~A7, the operating margin emission factor of North China Power Grid is **0.9803** tCO_2e/MWh.

Table A8. Data and results of Step a.

		Beijing	**Tianjin**	**Hebei**	**Shanxi**	**Shandong**	**Inner Mongolia**	**Total**	**NCV**	**Emission Factor**	**CO2 Emissions （tCO2e）**
Fuel Type	Unit	A	B	C	D	E	F	G=A+…+F	H	I	K=G*H*I/1000,000
Raw Coal	10^4tons	665.16	1,870.36	7,623.94	8,024.02	12,654.05	12,538.57	43,376.10	20,908	87,300	791,730,246
Cleaned Coal	10^4tons	0	0	0	0	11.7	0	11.70	26,344	87,300	269,080
Other Washed Coal	10^4tons	6.15	0	247.51	586.04	862.02	104.69	1,806.41	8,363	87,300	13,188,417
Moulded Coal	10^4tons	3.73	0	0	0	31.83	0	35.56	20,908	87,300	649,065
Coke	10^4tons	0	0	0	0	10.43	0	10.43	28,435	95,700	283,824
Other Coke Products	10^4tons	6.62	0	7.79	0	5.52	0	19.93	28,435	95,700	542,341
Sub-total								0.00			806,662,974
Crude Oil	10^4tons	0	0	0	0	0	0.13	0.13	41,816	71,100	3,865
Gasoline	10^4tons	0	0	0	0	0.01	0	0.01	43,070	67,500	291
Diesel oil	10^4tons	0.1	0	2.38	0	3.07	2.64	8.19	42,652	72,600	253,606
Fuel oil	10^4tons	0.82	0	0.19	0	2.63	0.02	3.66	41,816	75,500	115,550
Other Petroleum Products	10^4tons	1.52	0	0	0	23.18	0	24.7	41,816	72,200	745,721
Sub-total								0			1,119,034
Natural Gas	10^7m^3	135.5	6.3	0	43.9	0.3	20.3	206.3	38,931	54,300	4,361,086
Coke Oven Gas	10^7m^3	1.3	12.7	87.2	194.8	116.9	33.5	446.4	16,726	37,300	2,784,999
Other Coke Gas	10^7m^3	102.3	134.3	2283.2	358.9	372.1	483.5	3734.3	5,227	37,300	7,280,656
Liquefied Petroleum Gas	10^4tons	0	0	0	0	0	0	0	50,179	61,600	0
Refinery Gas	10^4tons	0.83	0	3.95	0	3.44	0	8.22	46,055	48,200	182,472
Sub-total											14,609,213
Total											**822,391,221**

Data source: China Energy Statistical Yearbook 2010.

Table A8 (a) Calucation of $EF_{Coal,Adv,y}$, $EF_{Oil, Adv,y}$ and $EF_{Gas, Adv,y}$.

	Parameter	Efficiency of Power Supply (%)	Emission Factor of Fuel ($kgCO_2/TJ$)	Oxidation rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/10,000×B×C
Coal-fired power plant	$EF_{Coal, Adv,y}$	39.45	87,300	1	0.7967
Gas-fired power plant	$EF_{Oil,Adv,y}$	51.77	75,500	1	0.5250
Oil-fired power plant	$EF_{Gas,Adv,y}$	51.77	54,300	1	0.3776

Calculated with the data provided in Table A8 and formula (4)~(6), the value of $\lambda_{Coa,yl}$ is 98.08%, the value of $\lambda_{Oil,y}$ is 0.14% and the value of $\lambda_{Gas,y}$ is 1.78%. Therefore, $EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$ =0.7889 tCO_2e/MWh.

Table A9. Installed capacity of the North China Power Grid in 2009

Installed Capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Coal	MW	5,120	10,030	35,140	39,150	48,300	58,860	196,600
Hydro	MW	1,050	10	1,790	1,610	830	1,060	6,350
Nuclear	MW	0	0	0	0	0	0	0
Other(wind)	MW	50	0	1,360	120	6,420	860	8,810
Total	MW	6,220	10,040	38,290	40,880	55,550	60,780	211,760

Data source: China Electric Power Yearbook 2010.

Table A10. Installed capacity of the North China Power Grid in 2008

Installed Capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Coal	MW	4,760	7,490	29,870	35,250	45,740	55,930	179,040
Hydro	MW	1,050	0	1,540	790	830	1,050	5,260
Nuclear	MW	0	0	0	0	0	0	0
Other(wind)	MW	0	0	700	0	2,300	370	3,370
Total	MW	5,810	7,490	32,110	36,040	48,860	57,350	187,660

Data source: China Electric Power Yearbook 2009.

Table A11. Installed capacity of the North China Power Grid in 2007

Installed Capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Coal	MW	3,900	6,920	29,020	30,950	39,870	54,140	164,800
Hydro	MW	1050	10	780	790	830	1,050	4,510
Nuclear	MW	0	0	0	0	0	0	0
Oher(wind)	MW	2.7	0	410	0	1,096.5	210	1,719.2
Total	MW	4,952.7	6,930	30,210	31,740	41,796.5	55,400	171,029.2

Data source: China Electric Power Yearbook 2008.

Calculation of BM emission factor of North China Power Grid

	Installed Capacity in 2007	**Installed Capacity in 2008**	**Installed Capacity in 2009**	**New Capacity Additions 2007-2009**	**New Capacity Additions 2008-2009**	**The portion of Capacity Additions**
	A	B	C	D	E	F
Coal(MW)	164,800	179,040	196,600	39,270	21,422	81.46%
Hydro(MW)	4,510	5,260	6,350	1,849	1,090	3.84%
Nuclear(MW)	0	0	0	0	0	0.00%
Wind(MW)	1,719.2	3,370	8,810	7,091	5,440	14.71%
Total (MW)	171,029.2	187,660	211,760	48,210	27,952	100.00%
The portion of installed capacity in 2009				22.77%	13.20%	

$EF_{BM,y}$=0.7889×81.46%=0.6426 tCO_2/MWh

Therefore, the EF_{ELEC} of North China Power Grid is:
$EF_{ELEC} = 0.5*EF_{OM}+0.5*EF_{BM} = 0.5*0.9803+0.5*0.6426 = 0.81145 tCO_2e/MWh$

Appendix 5. Further background information on monitoring plan

No other additional information.

Appendix 6. Summary of post registration changes

In the registered PDD (version 02, dated 15/10/2012), $EG_{PJ,gorss,y}$ (the gross quantity of electricity generated in power plant) and $EG_{PJ,aux,y}$ (total auxiliary electricity consumption required for the operation of the power plant) are monitored.

According to the Power Purchase Agreement signed by the project owner and the grid company, one bidirectional electricity meter installed at the local substation is used for monitoring the quantity of electricity supplied to the grid by the Project ($EG_{PJ\ toGRID,y}$) and quantity of electricity delivered to the Project from the grid ($EG_{GRID\ toPJ,y}$). The power sales receipts are issued on the base of the monitoring results of the meter.

The baseline emissions are calculated using the result of $EG_{PJ\ toGRID,y}$- $EG_{GRID\ toPJ,y}$, which is more conservative than using $EG_{PJ,gross,\ y}$ - $EG_{PJ,aux,y}$, since the monitoring point is at the grid side and power imported from the grid is deducted.

According to Appendix 1 of *CDM project standard Version 07.0*, changes to the monitoring of the registered CDM project activity of a type listed below do not require prior approval by the Board:
(c) Change of location of meter(s) as per a power purchase agreement (PPA).

In the Project, change of location of the electricity meter is as per power purchase agreement (PPA). Hence it does not require prior approval by the Board.

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Document information

Version	*Date*	*Description*
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from *F-CDM-PDD* to *CDM-PDD-FORM;* • Editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b

Version	*Date*	*Description*
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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