Project design document form for CDM project activities

(Version 08.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Straw generation project in Wei county Hebei province, P.R. China
Version number of the PDD	5.3
Completion date of the PDD	01/08/2016
Project participant(s)	National Bio Energy Co., Ltd. (as the project owner) Climate Change Capital Carbon Managed Account Limited (UK) Climate Change Capital Carbon Managed Account Limited (Switzerland) (as the CER buyer)
Host Party	People's Republic of China
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	ACM0018: "Electricity generation from biomass residues in power-only plants" (Version 03.0)
Sectoral scope(s) linked to the applied methodology(ies)	Sectoral Scope: 1 Energy industries (renewable- / non-renewable sources)
Estimated amount of annual average GHG emission reductions	112,431tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Straw generation project in Wei county Hebei province, P.R. China (hereafter referred to as the project) is located in Wei county, Hebei province, P.R. China. The proposed project is a newly-built generation project with local surplus biomass residues (cotton straw, maize stalk, and wood residues) as fuel. The installed capacity of this project is 1×30MW and the water-cooling librated boiler of 1×130t/h will be installed in the project. The annual biomass residue consumption is about 291,678t, and 184,800MWh net electricity is delivered annually to North China Power Grid (NCPG).

When the project is put into operation, the GHG emission reductions are from two components. Firstly, it will substitute some electricity generation of NCPG dominated by fossil fuel electricity, and thus will reduce the coal consumption. Secondly, the project will use straw in high efficiency, which will reduce CH_4 emissions because the biomass is dumped or left to decay or burned in an uncontrolled manner in the absence of the project. The estimated annual average GHG emission reductions are 112,431 tCO_2e and the total GHG emission reductions for the 2^{nd} crediting period are 787,017 tCO_2e.

The existing scenario prior to the implementation of the proposed project is that the NCPG supplies the equivalent power generation, and the equivalent of biomass is dumped or left to decay under mainly aerobic conditions, as identified in the section B.4. The scenario existing prior to the implementation of the project activity is the same as the baseline scenario.

The project makes good use of the renewable straws as fuels. It will produce positive economic and environmental benefits and contributes to the local sustainable development through following aspects:

- By utilizing biomass residue as fuel, saving the amount of coal use and making the biomass utilization in high efficiency, which is consistent with China's national energy policy and industry policy;
- To reduce the biomass residue pollution on environment while being treated, thus improve the local environment.
- The ash as by-product of biomass residue burning can be turned back to the peasants as ash fertilizer for free, which is not only improve the environment but also benefit the peasants.
- To be helpful for advanced technology transfer to China since the key equipment and technology are from Denmark BWE Company.
- The project will offer 100 job opportunities and will facilitate the development of the relevant industries to be benefit for the local economic development.

The project can meet the demand of clean production from the aspects of resource utilizing in high efficiency, advanced technology promotion, energy saving, and pollution emission reduction, which will facilitate the local sustainable development. The project was put into trial operation in February 2007 and began full operation on 15 April 2007. It was registered as a CDM project with the UNFCCC on 25 June 2008. The project owner and operator is National Bio Energy Co., Ltd. (the "PP").

The project is not a CPA that has been excluded from a registered CDM project PoA as a result of erroneous inclusion of CPAs.

A.2. Location of project activity

A.2.1. Host Party

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People's Republic of China.

A.2.2. Region/State/Province etc.

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Heibei Province.

A.2.3. City/Town/Community etc.

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Heying town, Wei County, Xingtai city

A.2.4. Physical/Geographical location

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Wei County lies in southeast of Hebei Province, to its north is Shijiangzhuang City of 138km, and to its west is Xingtai City of 75km.

The project is located in 8km away from the north of Wei County centre. To its east is Xiangying of 1900m, to its southwest is Renliji of 1000m and to its southeast is Beitaiji of 1500m.

The detail location information of the project is shown in figure 1.

The project is located between north latitude of 37°03′45″ and 37°03′53″, east longitude of 115º16′42″ and 115º16′36″.

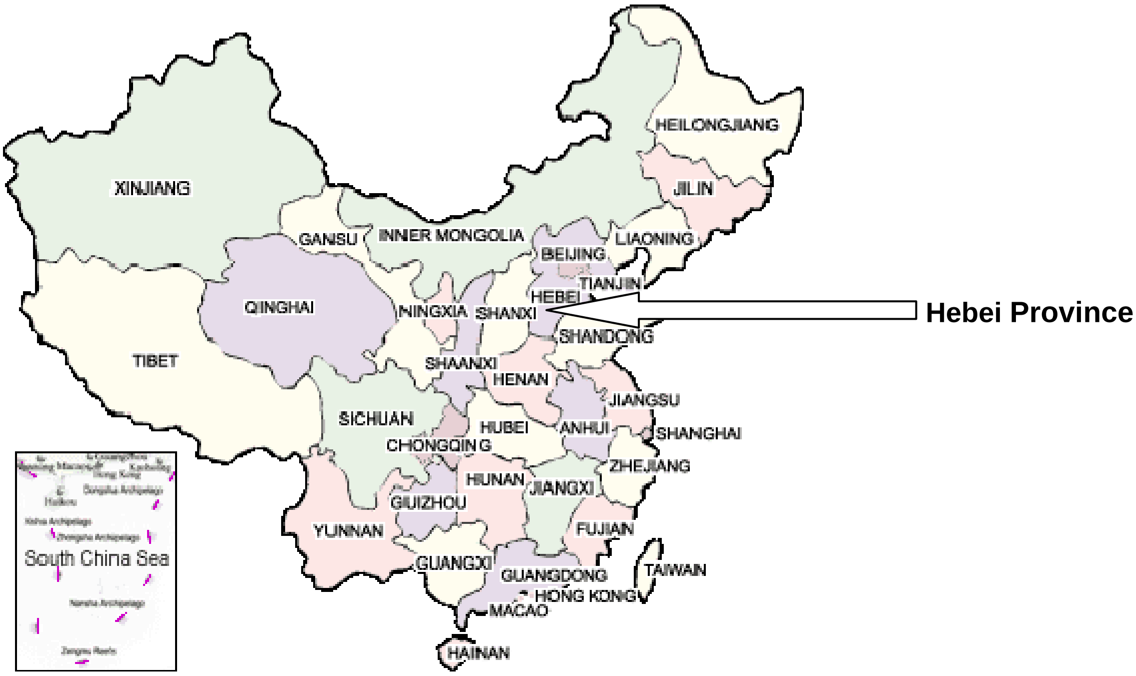

Figure 1: project location (Weixian County, Xingtai city, Hebei province, P R. China)

A.3. Technologies and/or measures

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Prior to the start of the implementation of this greenfield project activity, the electricity would have been continuously generated by other power plants connected to NCPG, and the equivalent of biomass is dumped or left to decay under mainly aerobic conditions.

The project has installed one set of water-cooling boiler of 1×130t/h with high temperature and high pressure. The equipment and advanced technology are imported from Denmark BWE Company, with burning completely and no knotting residue. This technology has been operated successfully in some European countries such as Denmark, England and Germany, etc.

The boiler technology remains the same as in the originally registered PDD, while the turbine and the generator were expanded. The key technical specifications of BWE boiler are listed as Table A-1 below. These were not required to be disclosed in the original PDD but subsequent amendments to the PDD form now lead to the requirement for such disclosure. The lifetime of the key equipments is 30 years and the load factor is calculated as 184,800MWh/30MW/8760h=70.32%.

Table A-1 Key Technical specifications of BWE boiler

Parameters Name	Unit	Value
Boiler maximum continuous rating	t/h	130
Superheated Steam pressure	MPa	9.2
Superheated Steam temperature	℃	540
Boiler feed-water temperature	℃	210
Boiler Exhaust Temperature	℃	130 ℃
Boiler Efficiency	%	≥92
Boiler Dirt-discharge Rate	%	2%

The installed capacity of the project is of 1×25MW with high temperature and high pressure, single-pumping. The centralized controlling room for boiler and a steam engine will be set up with DCS mode, and the control equipment is made in domestic. The boiler use one chimney with the height of 80 meters together .Natural cooling tower system of indirect will be used in the project.

The generator and the turbine capacity were expanded in May 2009, and the key technical specifications of turbine and generator before and after the expansion are listed as Table A-2 and Table A-3 respectively.

Table A-2 Key technical specifications of turbine

Parameters Name	Unit	Data (before expansion in May 2009)	Data(after expansion in May 2009)
Model	/	N25-8.83	N30-8.83
Rated Output	MW	25	30
Rated Speed	r/min	3000	3000
Inlet Pressure	MPa	8.83	8.83
Inlet Temperature	℃	535	535

Table A-3 Key technical specifications of Generator

Parameters Name	Unit	Data (before expansion in May 2009)	Data(after expansion in May 2009)
Model	/	QF-25-2	QF-30-2
Rated Output	MW	25	30
Rated Voltage	kV	6.3	6.3
Rated Electric Current	A	2863	3437
Rated Speed	r/min	3000	3000

Straws are packed by collecting stations as required and to be transported by cars to the factory after air-dried (sun-dried). And then straws will be crushed into broken segments (about 10kwh/ton

of straw electricity is estimated, and will be monitored ex-post), then to be put into the boiler by transferring machine. Steam generated is used for power generation, which is delivered to the NCPG. At the same time, the soot and smog are collected by the hop-pocket dust catcher and then carried into ash storeroom. The dry ash and the residue of the boiler will be collected and transferred mechanically.

The implement of the project will facilitate to the related advanced technology transfer from developed countries to China.

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)
People's Republic of China (host)	National Bio Energy Co., Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Climate Change Capital Carbon Managed Account Limited	No
Switzerland	Climate Change Capital Carbon Managed Account Limited	No

A.5. Public funding of project activity

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There is no public funding for the 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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Approved consolidated Methodology ACM0018: Electricity generation from biomass residues in power-only plant, Version 03.0.

http://cdm.unfccc.int/methodologies/DB/DAZTTA5JRVU3J4W4PEFMT4ZOQW0DFM

Methodological Tool: “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (Version 03.0.1).

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf/history_view

Methodological Tool: “Tool to calculate the emission factor for an electricity system” (Version 5.0).

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf/history_view

Methodological Tool: “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (Version 02).

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf/history_view

Methodological Tool: “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 02).

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v2.pdf/history_view

Methodological Tool: “Project and leakage emissions from transportation of freight” (Version 01.1.0).

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf/history_view

B.2. Applicability of methodology and standardized baseline

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The approved revised PDD employed the baseline and monitoring methodology ACM0006 “Consolidated methodology for electricity and heat generation from biomass”. However, the methodology applied in the registered PDD for the 1st crediting period, ACM0006, was restricted to power and heat projects due to the approval of a new consolidated methodology ACM0018 for power-only projects. As the Project is power generation only, instead of a cogeneration project, the lately developed methodology ACM0018 “Electricity generation from biomass residues in power-only plants” can be applied by the Project.

The approved consolidated baseline methodology: ACM0018 is applied here to determine the baseline of the proposed project. The project activity is a newly installed electricity capacity from biomass residues in the North China Power Grid. The proposed project activity includes the installation of a new power generation plant at a site where currently no power generation occurs. Therefore, it is a “greenfield” project.

Applicable conditions of the methodology ACM0018	The Project
The biomass residues used in the project activity may be produced on-site (e.g. if the project activity is based on the operation of a power plant located in an (agro-) industrial plant generating the biomass residues), or they can be obtained off-site from the nearby area, specific suppliers or purchased from a market.	Biomass from local surplus biomass residues (cotton straw, maize stalk, and wood residues) in local Weixian, Hebei Province; cotton straw and maize stalk are the by-products of agriculture crops and wood residues are collected from local wood work factories supplied by wholesalers and retailers.
No other biomass types than biomass residues, as defined in the methodology, are used in the project plant.	Biomass from local surplus biomass residues (cotton straw, maize stalk, and wood residues) in local Weixian, Hebei Province will be the fuel in the project.
Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired shall not exceed 80 per cent of the total fuel fired (i.e. fossil fuels and biomass) on an energy basis.	Only a very little amount of fossil fuel will be used to help the startups of the boiler.
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.	The cotton straw and maize stalk used by the project are by-products of agriculture crops, not from a production process; the biomass residues of wood residues are collected from local woodwork factories through wholesalers and retailers. For the wholesalers and retailers have provided statements to prove that all the wood residues supplied by them do not result in any increase of processing capacity of raw input or in other substantial process changes, and the wood residue would be left for decay in the baseline.
The biomass residues used by the project facility should not be stored for more than one year.	The maximum observed storage time to date of the three types of biomass residues used at the project for power plant are all significantly shorter than one year.
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.	No chemical process is involved in the project prior to biomass residues combustion. The biomass residues however will be processed physically prior to combustion.
No power and heat plant operates at the project site during the crediting period.	No power and heat plant is operating at the project site now or during the crediting period.
If any heat which is used 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	There is 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 be no heat generated during the crediting period and used for purpose other than power generation

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) 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.	
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.

As analysis in Section B.4 below, the baseline scenario for power generation is scenario P5 and B1 for use of biomass residues, either of which is one of the applicability condition for applying the ACM0018 (Version 03.0) for the Project.

Therefore, the ACM0018 (Version 03.0) is applicable to the Project.

B.3. Project boundary

The proposed project is a greenfield biomass residue fired power plant. Local surplus biomass residues (cotton straw, maize stalk, and wood residues) are used as fuel for power generation. Prior to the implementation of the project, there was no power generation equipment operated at the project site. In the absence of the project, the same electricity generated by the project was supplied by the NCPG which the project is connected to. According to ACM0018 (Version 03.0), the spatial extent of the project boundary encompasses:

- The project activity power-only plant.
- All power plants connected physically to the NCPG.
- The trucks which transport biomass residues to the project site.
- The site where the biomass residues would have been left for decay or dumped.
- The biomass residues used in the proposed project only involve simple physical processing prior to combustion, and these processing equipments are also included in the project boundary. No waste water treatment facilities are used by the proposed project.

The diagram below present the project boundary, major equipments, energy flow and emission sources of the proposed project.

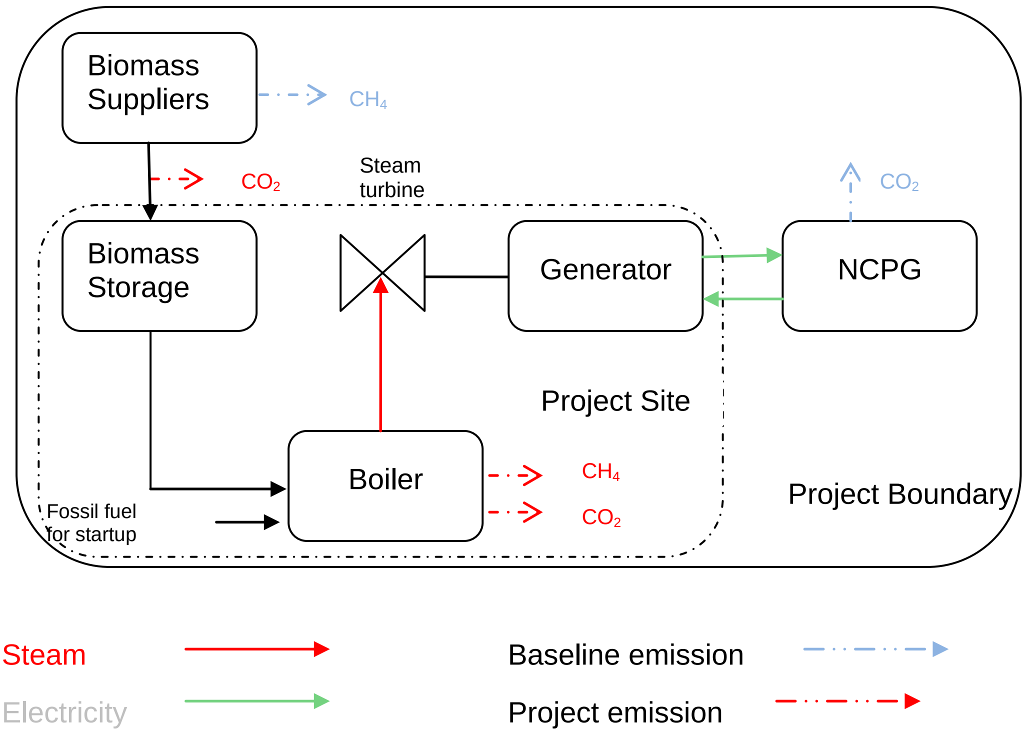

Table B-1 illustrates which emissions sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.

Table B-1: Emission sources included in or excluded from the project boundary

	Source	GHGs	Included?	Justification/Explanation
Baseline scenario	Electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
	Uncontrolled burning or decay of surplus biomass residues	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Yes	B1 is the most likely baseline scenario
		N_2O	No	Excluded for simplification. This is conservative
Project scenario	On-site fossil fuel consumption	CO_2	Yes	May be an important emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small
	On-site and off-site transportation and processing of biomass residues	CO_2	Yes	May be an important emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small
	Combustion of biomass residues for electricity	CO_2	No	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Yes	This emission source must be included if CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario are included
		N_2O	No	Excluded for simplification. This emission source is assumed to be small
	Storage of biomass residues	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small.
		N_2O	No	Excluded for simplification. This emissions source is assumed to be very small.
	Waste water from the treatment of biomass residues	CO_2	No	Based on the EIA report, there is no wastewater from the treatment of biomass residues, therefore, this emission sources is excluded.
		CH_4	No	Based on the EIA report, there is no wastewater from the treatment of biomass residues, therefore, this emission sources is excluded.
		N_2O	No	Based on the EIA report, there is no wastewater from the treatment of biomass residues, therefore, this emission sources is excluded.

B.4. Establishment and description of baseline scenario

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The establishment and description of baseline scenario is illustrated in the accepted revised PDD (Version 4.0) according to ACM0006 (version 04). The details of rational are demonstrated in

section B.5.

The baseline scenario identified for power generation is:

P4: The generation of power in existing and/or new grid-connected power plants.

The baseline scenario identified for use of biomass is:

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

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

The above combination baseline scenario in the accepted revised PDD (Version 4.0) is corresponding to P5+B1/B3 in the applied methodology ACM0018, version 03.0.

For the second crediting period, the continued validity of the original baseline should be assessed. According to the “Methodological Tool: Assessment of the validity of the original/current baseline and update the baseline at the renewal of the crediting period” (version 03.0.1), the stepwise procedure as follows should be adopted to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period:

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

In China, the Renewable Energy Law has been put into effect since 2006, which encourages the development of renewable energy projects[1.] However, although renewable energy projects have been developed rapidly in recently years, grid connected power generation in China is still dominated by fossil-fuel power plants[2].

A Notice about Prohibiting to Burn Agricultural Straw in an Uncontrolled Manner was issued by Ministry of Agriculture of the People’s Republic of China on 14/06/2007[3], and it is not eligible to burn biomass residues in an uncontrolled manner without any energy purpose. Therefore, the baseline scenario B3 (The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes) is excluded.

Step 1.2: Assess the impact of circumstances

There are no new relevant national and/or sectoral policies and/or circumstances in the biomass power generating sector applicable to the Project Activity, in comparison to the time of the submission of the project activity for validation, which could impact the validity of the current baseline for the next crediting period.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

The project activity consists of the implementation of biomass residues power plant where no electricity and heat was generated prior to its implementation. In the absence of the CDM project activity, the project owner would not have constructed the plant and electricity would have been generated by other power plants connected to the grid, and biomass residues used in the project would have been dumped or left to decay mainly under aerobic conditions.

Therefore, this *sub-step* is not applicable since the identified baseline scenario at the validation of

[1] http://www.gov.cn/ziliao/flfg/2005-06/21/content_8275.htm
[2] China Electric Power Yearbook 2013
[3] http://www.gov.cn/zwgk/2007-06/14/content_648934.htm

the project activity did not correspond to the *continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.*

Step 1.4: Assessment of the validity of the data and parameters

According to the "Methodological tool: *Assessment of the validity of the original/current baseline and update of the baseline at the renewal of a crediting period*" (Version 03.0.1), updates should be undertaken in the following cases:

• *Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC, for example, in guidelines for national GHG inventories, IPCC assessment report or special reports by the IPCC;*

• *Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity.*

The values used for the calculation of $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ and GWP_{CH4} are updated in the second crediting period.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The baseline for the second crediting period has been updated based on the latest approved version of the ACM0018 (Version 03.0). This update was applied in the context of the sectoral policies and circumstances that is applicable at the time of requesting for renewal of the crediting period. More details for the updated baseline emissions for the second crediting period can be seen in section B.6.

Step 2.2: Update the data and parameters

Considering the changes on circumstances related to calculation of CO_2 emission factor and other relevant parameters, such as GWP_{CH4}, and the baseline emissions were reviewed in this second crediting period following the latest version of the *"Methodological Tool: Tool to calculate the emission factor for an electricity system"(Version 5.0)*. See sections B.6.1, B.6.2 and B.6.3 of this PDD.

B.5. Demonstration of additionality

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The additionality of the proposed project is demonstrated and assessed by the approved Tool for the Demonstration and Assessment of Additionality in the approved revised PDD (version 4.0).

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (1)$$

Where:

ER_y	=	Emissions reductions during year *y* (t CO_2)
BE_y	=	Baseline emissions during year *y* (t CO_2)
PE_y	=	Project emissions during year *y* (t CO_2)
LE_y	=	Leakage emissions during year *y* (t CO_2)

Baseline emissions

As per ACM0018 (version 03.0), the baseline emissions are calculated as follows:

$$BE_y = BE_{EL,y} + BE_{BR,y} \tag{2}$$

Where:

BE_y	=	Baseline emissions during year *y* (t CO_2)
$BE_{EL,y}$	=	Baseline emissions due to generation of electricity in year *y* (t CO_2)
$BE_{BR,y}$	=	Baseline emissions due to uncontrolled burning or decay of biomass residues in year *y* (t CO_2e)

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:

$$BE_{EL,y} = EG_{PJ,y} \times EF_{BL,EL,y} \tag{3}$$

Where:

$BE_{EL,y}$	=	Baseline emissions due to generation of electricity in year *y* (t CO_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* (t CO_2/MWh)

Step 1.1: Determination of $EG_{PJ,y}$

The net quantity of electricity generated in 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 auxiliary electricity consumption required for the operation of the power plants at the project site ($EG_{PJ,aux,y}$).

$$EG_{PJ,y} = EG_{PJ,gross,y} - EG_{PJ,aux,y} \tag{4}$$

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 operation of the power plants at the project site (MWh)

According to ACM0018 (Version 03.0), it is assumed that transmission and distribution losses in the electricity grid are not influenced significantly by the project activity and are therefore not accounted for. However, PPs decide to voluntarily consider the transmission and distribution losses in the electricity grid, which is more conservative.

Therefore,

$$EG_{PJ,y} = EG_{facility,y} \quad (5)$$

Where:

$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh), which is conservative

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:

a) Use of biomass residues at the project site. Electricity could be generated with biomass residues in power plants at the project site.

b) Use of fossil fuels at the project site. Electricity could be generated with fossil fuels in power plants at the project site.

c) 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 the project activity, the project activity exports all electricity to the grid and no electricity would be produced at the project site in the baseline scenario.

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

$$EF_{BL,EL,y} = \frac{EG_{BL,FF,y} \times EF_{BL,FF,y} + EG_{BL,grid,y} \times EF_{grid,CM,y} + EG_{BL,FF/grid,y} \times \mathrm{MIN}\left(EF_{BL,FF,y}, EF_{grid,CM,y}\right)}{EG_{BL,BR,y} + EG_{BL,FF,y} + EG_{BL,grid,y} + EG_{BL,FF/grid,y}} \quad (6)$$

Where:

$EF_{BL,EL,y}$	=	Emission factor for electricity generation in the baseline in year *y* (t CO_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 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)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid-connected electricity generation in year *y* (t CO_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* (t CO_2/MWh)

In the following, first the 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 and 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 1.2.1 Determination of $EG_{BL,BR,y}$

In the baseline scenario for the project activity, there is no biomass residues would be used for electricity generation in power-only plants in the baseline. Therefore, according to ACM0018: $EG_{BL,BR,y}$ = 0.

Step 1.2.2 Determination of $EG_{BL,FF,y}$

In the baseline scenario for the project activity, there is no fossil fuels would be used for electricity generation in the baseline scenario at the project site. Therefore, according to ACM0018: $EG_{BL,FF,y}$ = 0.

Step 1.2.3 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, according to ACM0018 (Version 03.0), $EG_{BL,grid,y} = EG_{PJ,y}$.

Step 1.2.4 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 grid 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 amount of electricity that would be generated by power plants in the 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:

$$EG_{BL,FF/grid,y} = EG_{PJ,y} - EG_{BL,BR,y} - EG_{BL,FF,y} - EG_{BL,grid,y} \quad (7)$$

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 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)

According to the analysis from Step 1.2.1 to Step 1.2.3, the above function about be calculated as below:

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

Step 1.2.5 Determination of $EF_{BL,FF,y}$

$EF_{BL,FF,y}$ should be determined using Option A or Option B below. 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 1.2.6 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 "Tool to calculate the emission factor for an electricity system, Version 5.0". The Tool is applied in the following six steps:

a) Step 1: Identify the relevant electricity systems;
b) Step 2: Choose whether to include off-grid power plants in the project electricity system (optional);
c) Step 3: Select a method to determine the operating margin (OM);
d) Step 4: Calculate the operating margin emission factor according to the selected method;
e) Step 5: Calculate the build margin (BM) emission factor;
f) Step 6: Calculate the combined margin (CM) emission factor.

This PDD uses the calculations published by the

The calculation of operating margin (OM), build margin (BM) and combined margin (CM) of the CCPG is done in the following steps:

<u>Step 1: Identify the relevant electricity systems</u>

In accordance with the "Methodology Tool: Tool to Calculate the Emission Factor for an Electricity System" (Version 5.0), the project electricity system of the project is identified according to the delineation of the project electricity system and connected electricity systems published by China's DNA[4] of P. R. China.

According to "2015 Baseline Emission Factors for Regional Power Grids in China" announced by Office of National Coordination Committee on Climate Change, National Development and Reform Commission (NDRC) of China (Chinese DNA) on 06/06/2016, NCPG is a regional power grid in China, which includes Beijing, Tianjin, Hebei province, Shanxi province, Shandong province, and Inner Mongolia. As the DNA of China (host country) has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. Hence the electric power system defined by DNA of China is applied and the relevant electric power system of the project electricity system is NCPG[5].

The NCPG has imported electricity from the Northeast Power Grid (NEPG) and Northwest Power Grid (NWPG). As per the methodological tool, referred to 2015 baseline emission factors for regional power grids in China, option (b), the simple Operating Margin emission factor of the electricity exporting grid, determined as described in Step 4 (a) was selected to calculate the CO_2 emission factor for net electricity imports from the NEPG and the NWPG by the NCPG.

Step 2. Choose whether to include off-grid power plants in the project electricity system

The following two options to calculate the operating margin and build margin emission factor can be chosen:
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.

For the Project activity, option I is used to calculate the OM and BM emission factor.

Step 3. Select a method to determine the operating margin (OM)

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

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

Of these, dispatch analysis, cannot be used, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used.

The Simple OM method (a) is applicable if low-cost/must run resources constitute less than 50% of the total amount of power generation in the grid in five most recent years, and average OM method (d) is applicable only if low-cost/must run resources[6] constitute more than 50% of total amount of power generation in the grid.

From 2008 to 2013, in the composition of gross annual generation power for the NCPG, low-cost/must run resources constitute less than 50% of total amount of grid generating output from

[4] http://cdm.ccchina.gov.cn/Detail.aspx?newsId=61599&TId=19

[5] http://cdm.ccchina.gov.cn/archiver/cdmcn/UpFile/Files/Default/20160606120244478242.pdf

[6] Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal-fired power is obviously a must-run, it should also be included in this list, i.e. excluded from the set of plants.

2008 to 2013 in the NCPG[7]. Based on these considerations, the OM has been calculated according to the Simple OM. Simple OM is appropriate because low cost/ must run resources that account for far less than 50% of the power generation in the NCPG in the most recent years.

For simple OM, the emission factor can be calculated using either of the two following data vintages:

- Ex ante option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD for validation, or
- Ex post option: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of the year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

The Project employs “ex-ante” for its OM calculation.

<u>Step 4. Calculate OM emission factor according to the selected method</u>

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. The “Tool to calculate the emission factor for an electricity system” (Version 5.0) offers two options for the calculating the Simple OM:

- 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.

Option B can only be used if:

(a) The necessary data for Option A is not available; and
(b) 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 sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in *Sub-Step 2*).

As the net electricity generation and a CO_2 emission factor of each power unit are not available in China, and the nuclear and renewable power generations are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known in china, at the same time, off-grid power plants are not included in the calculation. So the Project uses Option B for calculating the simple OM emission factor, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (8)$$

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 (GJ/mass or

[7] 1.19%,2.00%,3.13%, 3.76%, 5.00% and 6.12% from 2008 to 2013 respectively.

	volume unit)
$EF_{CO2,i,y}$	$=CO_2$ emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y	=Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i	=All fossil fuel types combusted in power sources in the project electricity system in year y, and
y	=Three most recent years for which data is available

The Operating Margin emission factors for 2011, 2012 and 2013 are calculated. The three-year average is calculated as a 3-year generation-weighted average of the emission factors. The Operating Margin emission factor of the baseline is calculated ex-ante and will not be renewed in the second crediting period of the project activity. The three-year average is calculated as a weighted average of the emission factors. The Operational Margin Emission Factor is 1.0416 tCO_2e/MWh.

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

According to the '*Tool to calculate the emission factor for an electricity system*', the sample group of power units *m* consists of:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently

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

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts the following deviation[8] in methodology application.

1) Capacity addition from one year to another is used as basis for determining the Build Margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1. 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.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available.

Option 1 is chosen for the Project and the BM keeps unchanged during the first crediting period.

[8] This is in accordance with the "Request for guidance: Application of AM0005 and AMS-I.D. in China", a letter from DNV to the Executive Board, dated 07/10/2005, available online at: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.This approach has been applied by several registered CDM projects using methodology ACM0002 so far.

The build margin emission factor is the generation-weighted average emission factor (tCO_2e/MWh) of all power units *m* during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \tag{9}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

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

$EF_{EL,m,y}$ =CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)

m =power units included in the build margin, and

y =most recent historical year for which power generation data is available

Since there is no way to separate the different generation technology capacities as fuel coal, fuel oil, fuel gas etc from thermal power based on the present statistical data, the following calculating measures will be taken:

- First, according to the statistical data of the most recent one year (Option B1), determine the ratio of CO_2 emissions produced by coal, oil and gas fuels consumption for power generation;
- Second, multiply this ratio by the respective emission factors based on (Option B2) commercially available best practice technology in terms of efficiency;
- Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Detailed steps and formulas are as below:

First: Calculate the share of CO_2 emissions of the solid, liquid and gaseous fuels in total emissions respectively.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \tag{10}$$

$$\lambda_{Gas} = \frac{\sum_{i \in gas} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \tag{11}$$

$$\lambda_{oil} = \frac{\sum_{i \in oil} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \tag{12}$$

Where:

$FC_{i,m,y}$ is the amount of fuel *i* consumed by relevant power unit m in year *y* (Mass or Volume unit)

$NCV_{i,y}$ is net calorific value (energy content) of fossil fuel type *i* (coal, oil and gas) in year *y* (GJ/Mass or Volume unit)

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

Coal, Oil and *Gas* is solid fuel, liquid fuel and gas fuel respectively

Second: Calculate the emission factor of the thermal power:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (9)$$

While $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the emission factors of advanced coal-fired, oil-fired and gas-fired power generation technology, see detailed parameter and calculation in Annex 3.

Third: Calculate BM of the power grid:

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (10)$$

Where CAP_{Total} represents the total newly-added capacity and $CAP_{Thermal}$ represents newly-added thermal power capacity.

λ are calculated on the basis of the weight of CO_2 emissions of each type of fuel in the total CO_2 emissions from thermal power. For details we refer to Annex 3.

With reference to the 2015 Baseline Emission Factors for Regional Power Grids in China issued by China's DNA, the Build Margin emission factor of the NCPG is 0.4780 tCO_2e/MWh.

<u>Step 6. Calculate the combined margin emissions factor</u>

The Baseline Emission Factor is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin.

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{om} + EF_{grid,BM,y} \times W_{BM} \quad (11)$$

The "Tool to calculate the emission factor for an electricity system" provides the following default weights during the second crediting period[9]: Operating Margin, W_{OM} = 0.25; Build Margin, W_{BM} = 0.75.

Thus, the combined margin grid Baseline Emission Factor is
1.0416*0.25 + 0.4780*0.75 = 0.6189 tCO_2e/MWh.

Step 2: Determination of baseline emissions due to uncontrolled burning or decay of biomass residues (*$BE_{BR,y}$*)

According to ACM0018 (Version 03.0) and analysis in Section B.4,

$$BE_{BR,y} = BE_{BR,B1/B3,y} \quad (12)$$

Where:

$BE_{BR,y}$	=	Baseline emissions due to uncontrolled burning or decay of biomass residues in year *y* (t CO_2)
$BE_{BR,B1/B3,y}$	=	Baseline emissions due to aerobic decay or uncontrolled burning of biomass residues in year *y* (t CO_2)

[9] For the second and third crediting period: Operating Margin, W_{OM} = 0.25; Build Margin, W_{BM} = 0.75

For the biomass residues categories, as described in the biomass residues categories table, for which the most likely baseline scenario is either that the biomass residues would be dumped or left to decay under mainly aerobic conditions (B1), or burnt in an uncontrolled manner without utilizing them for energy purposes (B3), baseline emissions are calculated assuming, for both scenarios (aerobic decay and uncontrolled burning), that the biomass residues would be burnt in an uncontrolled manner.

Baseline emissions are calculated by multiplying the quantity of biomass residues with the net calorific value and an appropriate emission factor, as follows:

$$BE_{BR,B1/B3,y} = GWP_{CH4} \times \sum_{n} BR_{n,B1/B3,y} \times NCV_{n,y} \times EF_{BR,n,y} \quad (13)$$

Where:

$BE_{BR,B1/B3,y}$	=	Baseline emissions due to aerobic decay or uncontrolled burning of biomass residues in year *y* (t CO_2)
GWP_{CH4}	=	Global warming potential of methane valid for the commitment period (t CO_2/t CH_4)
$BR_{n,B1/B3,y}$	=	Amount of biomass residues category *n* used in the project plant(s) included in the project boundary in year *y* for which B1 or B3 has been identified as the most plausible baseline scenario (tonnes on dry-basis)
$NCV_{n,y}$	=	Net calorific value of the biomass residues category *n* in year *y* (GJ/tonnes on dry-basis)
$EF_{BR,n,y}$	=	CH_4 emission factor for uncontrolled burning of the biomass residues category n during the year *y* (t CH_4/GJ)
n	=	Categories of biomass residues

To determine the CH_4 emission factor, project participants may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use 0.0027 t CH_4 per ton of biomass as default value for the product of $NCV_{n,y}$ and $EF_{BR,n,y}$.[10] Considering the uncertainty of the CH_4 emission factor ($EF_{BR,n,y}$) is greater than 100 per cent, a conservativeness factor of 0.73 is applied. Thus, emission factor of 0.001971 t CH_4/t biomass should be used.

Project emissions

Project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{EL,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y} \quad (14)$$

Where:

PE_y	=	Project emissions during year *y* (t CO_2e)
$PE_{FF,y}$	=	Emissions during the year *y* due to fossil fuel consumption (t CO_2)
$PE_{EL,y}$	=	Emissions during the year *y* due to electricity use off-site for the processing of biomass residues (t CO_2)

[10] 2006 IPCC Guidelines, Volume 4, Table 2.5, default value for agricultural residues.

$PE_{TR,y}$	=	Emissions during the year *y* due to transport of the biomass residues to the project plant (t CO_2)
$PE_{BR,y}$	=	Emissions from the combustion of biomass residues during the year *y* (t CO_2e)
$PE_{WW,y}$	=	Emissions from waste water generated from the treatment of biomass residues in year *y* (t CO_2e)

Determination of PE_{FFy}

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

(a) Emissions from on-site fossil fuel consumption for the generation of electric power. This includes all fossil fuels used at the project site in heat generators (e.g. boilers) for the generation of electric power;

(b) Emissions from on-site fossil fuel consumption of auxiliary equipment and systems related to the generation of electric power. This includes fossil fuels required for the operation of auxiliary equipment related to the power plants (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.) which are not accounted in the first bullet;

(c) 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.);

(d) If any fossilized or non-biodegradable materials are used in the processing of biomass residues and incorporated in the processed biomass residues (e.g. binders) then emissions arising from those materials should be accounted for when the processed biomass residues are combusted. For that purpose those materials should be deemed as fossil fuels. If net calorific values, carbon content and/or emission factors of those materials are available they should be used, otherwise the net calorific values, carbon content and/or emission factors of the most carbon intensive fossil fuel available in the country should be used.

As the Project will not co-fire fossil fuel and will not use any fossilized or non-biodegradable materials in the processing of biomass residues, only emission source c and emission source d listed above need to be considered.

As there is diesel consumption for the operation of equipment during biomass residues preparation and on-site transportation, only emission source c) should be considered for the Project.

“Methodological Tool: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (Version 02) should be used to calculate $PE_{FF,y}$.

$$PE_{FF,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \qquad (15)$$

Where:

$FC_{i,j,y}$	=	Is the quantity of 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 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 two options, depending on the availability of data on the fossil fuel type *i*. For the Project, necessary data of Option A are not available. Therefore, Option B is chosen to calculate $COEF_{i,y}$.

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (16)$$

Where:

$NCV_{i,y}$	=	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)

Determination of $PE_{EL,y}$

According to ACM0018 (Version 03.0), $PE_{EL,y}$ should account only for the off-site use of electricity, using “Methodological Tool: Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01) as below:

The off-site electricity is imported from the grid, according to “Methodological Tool: Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01), Option A1 (Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the “Tool to calculate the emission factor for an electricity system” (Version 05.0) is chosen for the $PE_{EL,y}$ calculation.

$$EF_{EL,j,y} = EF_{grid,CM,y} \quad (17)$$

$$PE_{EL,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}) \quad (18)$$

Where:

$EC_{PJ,j,y}$	=	Quantity of electricity consumed by the project electricity consumption source *j* in year *y* (MWh/yr)
$EF_{EL,j,y}$	=	Emission factor for electricity generation for source *j* in year *y* (tCO2/MWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*

According to “Methodological Tool: Tool to calculate baseline, project and/or leakage emissions from electricity consumption”(Version 01),

$EF_{EL,j,y} = EF_{grid,CM,y} =$ 0.6189 (tCO_2e/MWh)

$TDL_{j,y} = 20\%$

Determination of $PE_{TR,y}$

“Methodological Tool: Project and leakage emissions from transportation of freight” (Version 01.1.0) 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:

$$PE_{TR,m} = \sum_{f} D_{f,m} \times FR_{f,m} \times EF_{CO2,f} \times 10^{-6} \tag{19}$$

Where:

$PE_{TR,m}$	=	Project emissions from road transportation of freight monitoring period *m* (t CO_2e)
$D_{f,m}$		Return trip 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*

$PE_{TR,m}$ in the tool corresponds to the parameter $PE_{TR,y}$ in this methodology and the monitoring period *m* is one year.

Determination of $PE_{BR,y}$

$$PE_{BR,y} = GWP_{CH4} \times EF_{CH4,BR} \times \sum_{n} BR_{PJ,n,y} \times NCV_{n,y} \tag{20}$$

Where:

GWP_{CH4}	=	Global Warming Potential for methane valid for the relevant commitment period (t CO_2/t CH_4)
$EF_{CH4,BR}$	=	CH_4 emission factor for the combustion of biomass residues in the project plant (t CH_4/GJ)
$BR_{PJ,n,y}$	=	Quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y* (tonnes on dry-basis/yr)
$NCV_{n,y}$	=	Net calorific value of the biomass residues category *n* in year *y* (GJ/tonnes on dry-basis)

IPCC default value is used to determine the CH_4 emission factor, according to the IPCC default value provided in ACM0018, the CH_4 emission factor of combustion of wood waste and other solid biomass residues is 0.03 tCH 4/TJ. Considering a conservativeness factor of 1.37, the CH_4 emission factor in this PDD is taken as 0.0000411 tCH $_4$/GJ.

Determination of $PE_{WW,CH4,y}$

As there are no waste water treatment facilities, $PE_{WW,CH4,y}$ is not considered for the project activity.

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. $L_y=0$ tCO_2e.

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{grid,OM,y}$
Unit	tCO_2e/MWh
Description	The operating margin emission factor
Source of data	*2015 Baseline Emission Factors for Regional Power Grids in China*
Value(s) applied	1.0416
Choice of data or Measurement methods and procedures	The data obtained from the *2015 Baseline Emission Factors for Regional Power Grid in China* issued by China's DNA are reliable.
Purpose of data	Applied for calculating baseline emissions
Additional comment	-

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO_2e/MWh
Description	The building margin emission factor
Source of data	*2015 Baseline Emission Factors for Regional Power Grids in China*
Value(s) applied	0.4780
Choice of data or Measurement methods and procedures	The data obtained from the *2015 Baseline Emission Factors for Regional Power Grid in China* issued by China's DNA are reliable.
Purpose of data	Applied for calculating baseline emissions
Additional comment	-

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2e/MWh
Description	The combined margin emission factor
Source of data	*2015 Baseline Emission Factors for Regional Power Grids in China*
Value(s) applied	0.6189
Choice of data or Measurement methods and procedures	The data obtained from the *2015 Baseline Emission Factors for Regional Power Grid in China* issued by China's DNA are reliable.
Purpose of data	Applied for calculating baseline emissions
Additional comment	-

Data / Parameter	$GEN_{j,y}$
Unit	MWh
Description	Total power generation of province j of CCPG in year y
Source of data	*China Electric Power Yearbook* 2012~2014 edition
Value(s) applied	See Appendix 4 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	Applied for calculating OM
Additional comment	-

Data / Parameter	$r_{j,y}$
Unit	%
Description	Auxiliary electricity consumption rate of province j of CCPG in year y
Source of data	*China Electric Power Yearbook* 2012~2014 edition
Value(s) applied	See Appendix 4 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	Applied for calculating OM
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	*China Energy Statistical Yearbook* 2014 edition
Value(s) applied	See Appendix 4 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	Applied for calculating OM and BM
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 Appendix 4 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	Applied for calculating OM and BM
Additional comment	-

Data / Parameter	$CAP_{j,y}$
Unit	MW
Description	Total installed capacity of province j of CCPG in year y
Source of data	*China Electric Power Yearbook* 2011~2014 edition
Value(s) applied	See Appendix 4 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	Applied for calculating BM
Additional comment	-

Data / Parameter	$CAP_{Thermal}$
Unit	MW
Description	The amount of the installed capacity of newly added fuel-fired power plants of the CCPG in the year 2010-2013
Source of data	*China Electric Power Yearbook* 2011~2014 edition
Value(s) applied	See Appendix 4 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	Applied for calculating BM
Additional comment	-

Data / Parameter	CAP_{Total}
Unit	MW
Description	The amount of incremental installed capacity of the CCPG in the year 2010-2013
Source of data	*China Electric Power Yearbook* 2011~2014 edition
Value(s) applied	See Appendix 4 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	Applied for calculating BM
Additional comment	-

Data / Parameter	$FC_{i,j,y}$
Unit	t or m^3
Description	Consumption of fuel i of province j of province j of CCPG in year y
Source of data	*China Energy Statistical Yearbook* 2012~2014 edition
Value(s) applied	See Appendix 4 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	Applied for calculating OM and BM
Additional comment	-

Data / Parameter	$FC_{adv,coal}$
Unit	gce/kWh
Description	Weighted average fuel consumption for power generation of top 16 sets of 600 MW~1,000 MW coal fired power generation units set up in 2013 (taken as efficiency level of the best technology commercially available in China)
Source of data	*2015 Baseline Emission Factors for Regional Power Grid in China* issued by China's DNA
Value(s) applied	292.3
Choice of data or Measurement methods and procedures	The data obtained from the *2015 Baseline Emission Factors for Regional Power Grid in China* issued by China's DNA are reliable.
Purpose of data	Applied for calculating BM
Additional comment	-

Data / Parameter	$FC_{adv,oil/gas}$
Unit	gce/kWh
Description	Weighted average fuel consumption for power generation of 390 MW oil/gas fired combined cycle power generation units (taken as efficiency level of the best technology commercially available in China)
Source of data	*2015 Baseline Emission Factors for Regional Power Grid in China* issued by China's DNA
Value(s) applied	232.3
Choice of data or Measurement methods and procedures	The data obtained from the *2015 Baseline Emission Factors for Regional Power Grid in China* issued by China's DNA are reliable.
Purpose of data	Applied for calculating BM
Additional comment	-

Data / Parameter	GWP_{CH4}
Unit	t CO_2e/t CH_4
Description	Global warming potential for methane valid for the relevant commitment period
Source of data	IPCC
Value(s) applied	25 for the second commitment period according to the decision 4/CMP.7. Shall be updated according to any future COP/MOP decisions
Choice of data or Measurement methods and procedures	-
Purpose of data	Applied for calculating baseline emissions and project emissions
Additional comment	-

<table>
<tr><td>Data / Parameter</td><td>Biomass residues categories and quantities used for the selection of the baseline scenario selection and assessment of additionality</td></tr>
<tr><td>Unit</td><td>• Type ;
• Source;
• Fate in the absence of the project activity (Scenarios B);
• Use in the project scenario (Scenarios P);
• Quantity (tonnes on dry-basis)</td></tr>
<tr><td>Description</td><td>Refer to Table B-2 in section B.4</td></tr>
<tr><td>Source of data</td><td>Operation data according to the accepted revised PDD (Version 4.0)</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><th>Biomass residues category (k)</th><th>Biomass residues type</th><th>Biomass residues source</th><th>Biomass residues fate in the absence of the project activity</th><th>Biomass residues use in project scenario</th><th>Biomass residues quantity (tonnes on dry-basis)</th></tr>
<tr><td>1</td><td>Cotton straw</td><td>Off-site from local farmers and retailers</td><td>Dumped (B1)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>95,367</td></tr>
<tr><td>2</td><td>Wood residue</td><td>Off-site from wholesalers and retailers</td><td>Dumped (B1)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>123,818</td></tr>
<tr><td>3</td><td>Maize stalk</td><td>Off-site from local farmers and retailers</td><td>Dumped (B1)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>4,072</td></tr>
</table>
</td></tr>
<tr><td>Choice of data or Measurement methods and procedures</td><td>Operation data according to the accepted revised PDD (Version 4.0)</td></tr>
<tr><td>Purpose of data</td><td>Applied for calculating baseline emissions</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

B.6.3. Ex ante calculation of emission reductions

>>

B.6.3.1 Baseline emissions

B.6.3.1.1 Baseline emissions due to generation of electricity $\boldsymbol{BE_{EL,y}}$

According to Section B.6.1, $EF_{BL,EL,y} = EF_{grid,CM,y}$= 0.6189 tCO_2e/MWh

$EG_{PJ,y}$ = 184,800 MWh

$BE_{EL,y} = EG_{PJ,y} \times EF_{BL,EL,y}$ = 184,800 MWh ×0.6189 tCO_2e/MWh = 114,372tCO_2e

B.6.3.1.2 Baseline emissions due to uncontrolled burning or decay of biomass residues $\boldsymbol{BE_{BR,y}}$

According to ACM0018 (Version 03.0), GWP_{CH4} = 25 t CO_2/t CH_4

$NCV_{n,y} \times EF_{BR,n,y}$ = 0.001971 t CH_4/ton

$\sum_n BR_{n,B1/B3,y}$ = 223,257 ton

$BE_{BR,B1/B3,y} = GWP_{CH4} \times \sum_n BR_{n,B1/B3,y} \times NCV_{n,y} \times EF_{BR,n,y}$

= 25 t CO_2/t CH_4 ×0.001971 t CH_4/ton×223,257 ton = 11,000 tCO_2e

$BE_y = BE_{EL,y} + BE_{BR,y}$ = 114,372 tCO_2e +11,000 tCO_2e = 125,372 tCO_2e

B.6.3.2 Project emissions

B.6.3.2.1 Determination of PE_{FFy}

The proposed project is estimated to consume 40t diesel a year, $FC_{i,j,y}$= 40 t

The $NCV_{diesel,y}$ is 43.3 GJ/t and $EF_{CO2,diesel,y}$is 0.0748tCO_2e/GJ as IPCC default value.

$PE_{FF,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} = \sum_i FC_{i,j,y} \times (NCV_{i,y} \times EF_{CO2,i,y})$

= 40 t ×43.3 GJ/t ×0.0748tCO_2e/GJ = 130 tCO_2e

B.6.3.2.2 Determination of $PE_{EL,y}$

According to approved revised PDD, $EC_{PJ,j,y}$ = 2,916 MWh

$EF_{EL,j,y} = EF_{grid,CM,y} =$ 0.6189 tCO_2e/MWh

$TDL_{j,y} = 20\%$

$PE_{EL,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$ = 2,166 tCO_2e

B.6.3.2.3 Determination of $PE_{TR,y}$

$D_{f,m}$ =100 km

$FR_{f,m}$ = 291,678 t

$EF_{CO2,f}$ = 245 g CO_2 / t km for light vehicles, and this is conservative.

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

=100 km ×291,678t ×245 g CO_2 / t km ×10^{-6} = 7,147 tCO_2e

B.6.3.2.4 Determination of $PE_{BR,y}$

According to ACM0018 (Version03.0), GWP_{CH4} = 25 t CO_2/t CH_4

$EF_{CH4,BR}$ = 0.0000411 tCH_4/GJ

$BR_{PJ,1,y}$=95,367 t, $BR_{PJ,2,y}$=123,818 t, $BR_{PJ,3,y}$= 4,072 t

$NCV_{1,y}$ = 0.01309TJ/t, $NCV_{2,y}$ = 0.01685TJ/t, $NCV_{3,y}$ = 0.01697 TJ/t

$PE_{BR,y} = GWP_{CH4} \times EF_{CH4,BR} \times \sum_n BR_{PJ,n,y} \times NCV_{n,y}$

= 25 t CO_2/t CH_4 ×0.0000411 tCH_4/GJ × (95,367 t × 0.01309 TJ/t +123,818 t × 0.01685 TJ/t +4,072 t × 0.01697 TJ/t) × 1000 = 3,498tCO_2e

$PE_y = PE_{FF,y} + PE_{EL,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y}$

= 130 tCO_2e + 2,166 tCO_2e + 7,147 tCO_2e + 3,498 tCO_2e = 12,941 tCO_2e

B.6.3.3 Leakage

L_y=0 tCO_2e

Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y - LE_y$ = 125,372 tCO_2e - 12,941 tCO_2e - 0 tCO_2e = 112,431 0 tCO_2e

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)
25/06/2015-24/06/2016	125,372	12,941	0	112,431
25/06/2016-24/06/2017	125,372	12,941	0	112,431
25/06/2017-24/06/2018	125,372	12,941	0	112,431
25/06/2018-24/06/2019	125,372	12,941	0	112,431
25/06/2019-24/06/2020	125,372	12,941	0	112,431
25/06/2020-24/06/2021	125,372	12,941	0	112,431
25/06/2021-24/06/2022	125,372	12,941	0	112,431
Total	**877,604**	**90,587**	**0**	**787,017**
Total number of crediting years	7			
Annual average over the crediting period	125,372	12,941	**0**	112,431

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	Biomass residues categories and quantities used in the project activity
Unit	• Type; • Source; • Fate in the absence of the project activity (Scenario B); • Use in the project scenario (Scenario P); • Quantity (tonnes on dry-basis)
Description	Biomass residues categories and quantities used in the project activity
Source of data	On-site measurements

<table>
<tr><td>Value(s) applied</td><td>
<table>
<tr><th>Biomass residues category (k)</th><th>Biomass residues type</th><th>Biomass residues source</th><th>Biomass residues fate in the absence of the project activity</th><th>Biomass residues use in project scenario</th><th>Biomass residues quantity (tonnes on dry-basis)</th></tr>
<tr><td>1</td><td>Cotton straw</td><td>Off-site from local farmers and retailers</td><td>Dumped (B1)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>95,367</td></tr>
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<tr><td>3</td><td>Maize stalk</td><td>Off-site from local farmers and retailers</td><td>Dumped (B1)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>4,072</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</td></tr>
<tr><td>Monitoring frequency</td><td>Data monitored continuously.
The weigh bridges (SCS/ZCS) will be operated by staffs appointed by the project company to be responsible for the record and monitor of biomass residues purchased and consumed in the project plant, and build biomass residues account rechecked by comparing with the purchase receipt and stock change record. The record will be reported and documented monthly. The weigh bridges will be calibrated annually according to national standard (for example: JJG 539-97). The accuracy of weight is III.</td></tr>
<tr><td>QA/QC procedures</td><td>Cross-check 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>Applied for calculating baseline and project emissions.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

Data / Parameter	For biomass residues categories for scenario B1 is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario
Unit	Tonnes
Description	- 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
Source of data	Surveys or statistics

Value(s) applied	The statistical reports on biomass resource in Wei County in 2010

	Cotton straw (10^4t)	Maize stalk (10^4t)	Wood residues (10^4t)
Total Biomass in the region	39.6867	2.7	110.8564
Available Biomass in the region	33.733695	2.295	94.22794
Biomass utilized out of the project	6.5	0.03	30.5688
Biomass utilized by the project	11.6866	0.5875	16.8937
Total biomass utilized, including the project	18.1866	0.6175	47.4625
Available Biomass/Total biomass utilized - 100%	118.22%	337.22%	133.57%

Measurement methods and procedures	-
Monitoring frequency	At the validation stage for biomass residues categories identified ex-ante, and always that new biomass residues categories are included during the crediting period.
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data / Parameter	$BR_{n,B1/B3,y}$
Unit	tonnes on dry-basis
Description	Amount of biomass residues category *n* used in the project plant(s) included in the project boundary in year *y* for which B1 or B3 has been identified as the most plausible baseline scenario
Source of data	On-site measurements
Value(s) applied	(see table below)

Biomass residues category (*k*)	**Biomass residues type**	**Biomass residues quantity (tonnes)**
1	Cotton straw	95,367
2	Wood residue	123,818
3	Maize stalk	4,072

Measurement methods and procedures	The weigh bridges (SCS/ZCS) will be operated by staffs appointed by the project company to be responsible for the record and monitor of biomass residues purchased and consumed in the project plant, and build biomass residues account rechecked by comparing with the purchase receipt and stock change record. The record will be reported and documented monthly. The weigh bridges will be calibrated annually according to national standard (for example: JJG 539-97). The accuracy of weight is III.
Monitoring frequency	Data monitored continuously and aggregated as appropriate
QA/QC procedures	Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes
Purpose of data	Applied for calculating baseline emissions

Additional comment	The biomass residue quantities used should be monitored separately for (a) each type of biomass residue (e.g.) and each source (e.g. produced on-site, obtained from biomass residues suppliers, obtained from a biomass residues market, obtained from an identified biomass residues producer, etc.)

Data / Parameter	$EF_{CH4,BR}$
Unit	t CH_4/GJ
Description	CH_4 emission factor for the combustion of biomass residues in the project plant
Source of data	Default value in ACM0018 version 03.0
Value(s) applied	IPCC default value is used to determine the CH_4 emission factor, according to the IPCC default value provided in ACM0018, the CH_4 emission factor of combustion of biomass of wood waste and other solid biomass residues is 30 kgCH_4/TJ. Considering a conservativeness factor of 1.37, the CH_4 emission factor in this PDD is taken as 0.0000411 tCH_4/GJ.
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Applied for calculating project emissions
Additional comment	-

Data / Parameter	$EG_{facility,y}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	On-site measurements
Value(s) applied	184,800
Measurement methods and procedures	This parameter will be continuously measured and monthly recorded. The relevant data will be kept during the crediting period and two years after. The net electricity delivered to the grid by the project will be calculated as follows: $EG_{facility,y} = EG_{PJ\ to\ GRID,y} - EG_{GRID\ to\ PJ,y} - EG_{backup}$, where $EG_{PJ\ to\ GRID,y}$ is the electricity delivered to the grid by the unit of the project, measured by main meters. $EG_{GRID\ to\ PJ,y}$ is the electricity consumed by the units from the grid, also measured through meter. EG_{backup} is measured by an meter connected with an emergence line to measure the electricity consumed by the project in case of emergence. The electricity meter will be operated by the power distribution company and adjusted according to relevant national standard including “Technical administrative code of electric energy metering” DL/T 448-2000, “Verification regulation of electric energy metering appliance” SD 109-83, “Electricity Law”, “Metrology law of the PR China”. The accuracy of the metering equipment is 0.5s. The metering equipment will be calibrated annually.
Monitoring frequency	Data monitored continuously and aggregated as appropriate

QA/QC procedures	The consistency of metered electricity generation should be cross-checked with receipts from electricity sales and the quantity of fuels fired
Purpose of data	Applied for calculating baseline emissions
Additional comment	According to ACM0018 (Version 03.0), it is assumed that transmission and distribution losses in the electricity grid are not influenced significantly by the project activity and are therefore not accounted for， i.e.,$EG_{PJ,y} = EG_{PJ,gross,y} - EG_{PJ,aux,y}$. However, PPs decide to voluntarily consider the transmission and distribution losses in the electricity grid, which is more conservative. According to accepted revised PDD (Version 4.0) and the Power Purchase Agreement signed by the project owner and the grid company, bidirectional electricity meter installed at the local substation is used for monitoring the quantity of $EG_{PJ\ to\ GRID,y}$ and $EG_{GRID\ to\ PJ,y}$. The baseline emissions are calculated using the result of $EG_{PJ\ to\ GRID,y}$ minus $EG_{GRID\ to\ PJ,y}$, which is more conservative than using $EG_{PJ,gross,\ y}$ minus $EG_{PJ,aux,y}$, since the monitoring point is at the grid side and power imported from the grid is deducted.

Data / Parameter	$EC_{PJ,j,y}$
Unit	MWh
Description	Quantity of electricity consumed by the project electricity consumption source *j* in year *y*
Source of data	On-site measurements
2,916	2,916
Measurement methods and procedures	The electricity consumed for the preparation of the biomass residue in all collection stations is continuously measured by meters installed at the out-site collection stations. The electricity meter will be operated by the power distribution company and adjusted according to relevant national standard including "Technical administrative code of electric energy metering" DL/T 448-2000, "Verification regulation of electric energy metering appliance" SD 109-83, "Electricity Law", "Metrology law of the PR China". The accuracy of the metering equipment is 0.5s. The metering equipment will be calibrated annually.
Monitoring frequency	Continuously
QA/QC procedures	The consistency of metered electricity generation should be cross-checked with receipts from electricity sales and the quantity of fuels fired.
Purpose of data	Applied for calculating project emissions
Additional comment	-

Data / Parameter	$TDL_{j,y}$
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*
Source of data	"Methodological Tool: Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 01)
Value(s) applied	20%
Measurement methods and procedures	Any future revision of the "Methodological Tool: Tool to calculate baseline, project and/or leakage emissions from electricity consumption" should be taken into account

Monitoring frequency	Annually.
QA/QC procedures	-
Purpose of data	Applied for calculating project emissions
Additional comment	-

Data / Parameter	$FC_{i,j,y}$
Unit	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description	Quantity of fuel type i combusted in process j during the year y
Source of data	On-site measurements
Value(s) applied	Diesel 40 ton/yr
Measurement methods and procedures	Use flow meter
Monitoring frequency	Continuously
QA/QC procedures	Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes. The quantity shall be cross-checked with the quantity of fuel purchase receipts and stock changes. The volume quantity of diesel will be multiplied by density of diesel ρ_{diesel} to get the mass quantity of diesel. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records. The accuracy of the flow meter(s) should be in line with national standard. The flow meter(s) will be calibrated periodically by qualified third party(ies) in line with national standard.
Purpose of data	Applied for calculating project emissions
Additional comment	-

Data / Parameter	ρ_{diesel}
Unit	kg/liter
Description	Density of diesel
Source of data	The national standard “automobile diesel fuel GB 19147-2013” or other equivalent /substitutional standards
Value(s) applied	0.85
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	Default value from national standards will be used and reviewed as appropriate
Purpose of data	Applied for calculating project emissions
Additional comment	-

Data / Parameter	$NCV_{i,y}$
Unit	GJ/mass or volume unit
Description	Net calorific value of the fossil fuel type i in year y

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	Diesel: 43.3
Measurement methods and procedures	-
Monitoring frequency	Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	-
Purpose of data	Applied for calculating project emissions
Additional comment	-

Data / Parameter	$EF_{FF,y,f}$
Unit	tCO_2e/GJ
Description	CO2 emission factor for fossil fuel type *i* in year *y*
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	Diesel: 0.0748
Measurement methods and procedures	-
Monitoring frequency	Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	-
Purpose of data	Applied for calculating project emissions
Additional comment	-

Data / Parameter	$D_{f,m}$
Unit	km
Description	Return trip 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	-
Monitoring frequency	Determined once for each freight transportation activity *f* for a reference trip using the vehicle odometer or any other appropriate sources. To be updated whenever the road distance changes.
QA/QC procedures	-
Purpose of data	Applied for calculating 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	291,678

Measurement methods and procedures	Use weight meters. Data monitored continuously and aggregated as appropriate. The accuracy level of the weight meters is III and the meters are calibrated annually.
Monitoring frequency	Continuously
QA/QC procedures	-
Purpose of data	Applied for calculating project emissions
Additional comment	-

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	Tool: Project and leakage emissions from transportation of freight, Version 01.1.0.
Value(s) applied	<table><tr><td>Vehicle class</td><td>Emission factor (g CO_2/t km)</td></tr><tr><td>Light vehicles</td><td>245</td></tr><tr><td>Heavy vehicles</td><td>129</td></tr></table>
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Applied for calculating project emissions
Additional comment	-

Data / Parameter	$BR_{PJ,n,y}$
Unit	tonnes on dry-basis
Description	Quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y*
Source of data	On-site measurements
Value(s) applied	<table><tr><th>Biomass residues category (*k*)</th><th>Biomass residues type</th><th>Biomass residues source</th><th>Biomass residues quantity (tonnes)</th></tr><tr><td>1</td><td>Cotton straw</td><td>Off-site from local farmers and retailers</td><td>95,367</td></tr><tr><td>2</td><td>Wood residue</td><td>Off-site from wholesalers and retailers</td><td>123,818</td></tr><tr><td>3</td><td>Maize stalk</td><td>Off-site from wholesalers and retailers</td><td>4,072</td></tr></table>
Measurement methods and procedures	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The accuracy level of the weight meters is III and the meters are calibrated annually.
Monitoring frequency	Data monitored continuously and aggregated as appropriate
QA/QC procedures	Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes
Purpose of data	Applied for calculating project emissions

Additional comment	The biomass residue quantities used should be monitored separately for (a) each type of biomass residue (e.g.) and each source (e.g. produced on-site, obtained from biomass residues suppliers, obtained from a biomass residues market, obtained from an identified biomass residues producer, etc.)

Data / Parameter	$NCV_{n,y}$
Unit	GJ/tonnes on dry-basis
Description	Net calorific value of biomass residues of category *n* in year *y*
Source of data	On-site measurements
Value(s) applied	Biomass residues category (*k*) / Biomass residues type / NCV (GJ/t): 1 / Cotton straw / 13.09 2 / Wood residue / 16.85 3 / Maize stalk / 16.97
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	At least every six months, taking at least three samples for each measurement
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	Applied for calculating project emissions
Additional comment	-

Biomass residues category (*k*)	Biomass residues type	NCV (GJ/t)
1	Cotton straw	13.09
2	Wood residue	16.85
3	Maize stalk	16.97

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	Biomass residues category (*k*) / Biomass residues type / Moisture (%): 1 / Cotton straw / 18.26% 2 / Wood residue / 26.81% 3 / Maize stalk / 30.02%
Measurement methods and procedures	Moisture content of the biomass residues is on site measured by moisture analyzer. The moisture analyzer will be calibrated once a year by qualified third party(ies) in line with national standard..
Monitoring frequency	The moisture content should 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
QA/QC procedures	-
Purpose of data	Applied for calculating baseline emissions and project emissions
Additional comment	I. In case of dry biomass, monitoring of this parameter is not necessary

B.7.2. Sampling plan

>>

Not applicable to the proposed project.

B.7.3. Other elements of monitoring plan

>>

The monitoring plan is shown as follows:

1. Monitor operational and management scheme

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

Chinese CDM project director：Receive the report from monitoring manager; manage the CDM project jointly with CERs buyer; Coordinate with the Chinese Government and stakeholders; submit the monitoring report to DOE and deliver to CERs.

Monitoring manager: Based on monitoring manual guideline, records the net electricity supplied monthly and aggregately annually, prepares the monitoring report, etc. Monitoring manager is responsible to the Chinese CDM project director.

2. Measuring meters O&M and calibration

Measuring meters will be used and calibrated according to requirements of B.7.1.

In addition, the project owner will train the appointed monitoring manager and monitoring engineers to operate these meters.

The monitoring plan will be incorporated into the existing monitoring system, implemented according to special monitoring manual to ensure reliable, transparent and comprehensive monitoring.

3. deviations treatment

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

4. Monitoring report

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

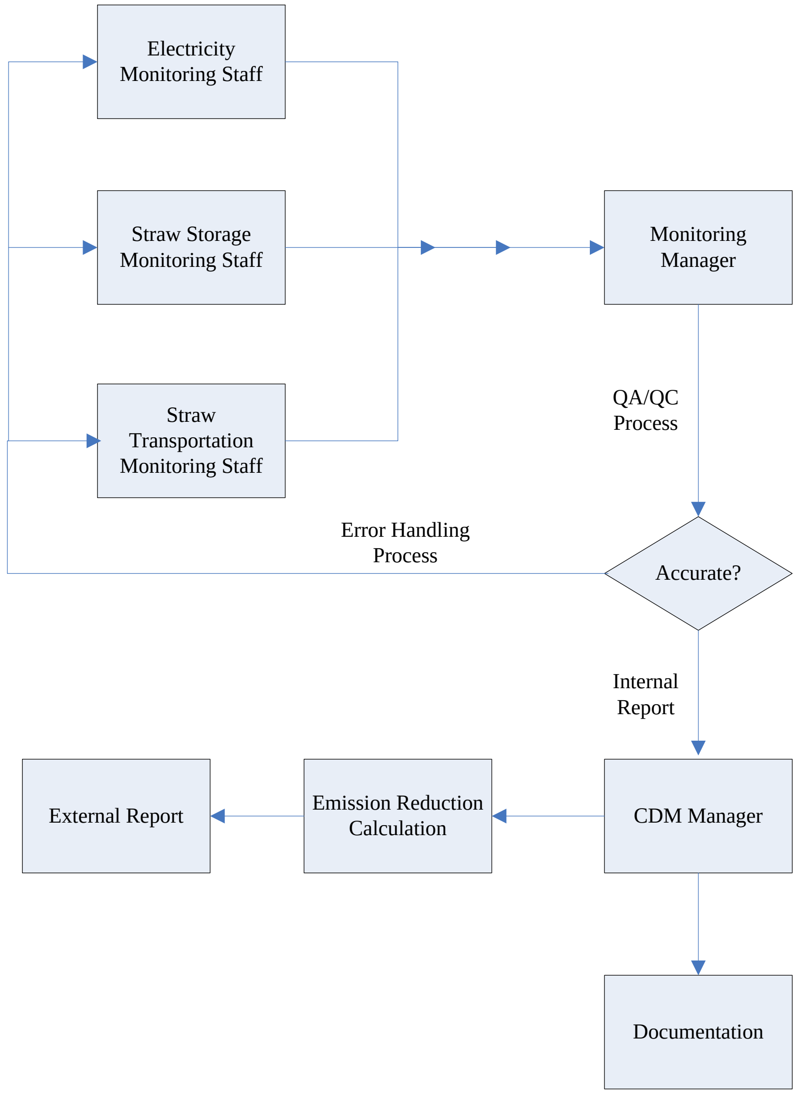
5. monitoring data

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

6. monitoring points and record frequency

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

This monitoring plan will be implemented by professional staff authorized by the project sponsor. The management structure is illustrated as follows:



Parameter to be monitored

Please refer to section B 7.1 of this PDD.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>

Date of completion of application of methodology and standardized baseline: 02/02/2016 by:

Contact information of responsible entities:

LI Zheng, National Bio Energy Co., Ltd.

Email: lizheng@sgecs.sgcc.com.cn

The entity is also a project participant listed in Annex 1.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

15/07/2006 (start construction date)

C.1.2. Expected operational lifetime of project activity

>>

25 years 0 month

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

The Project applies the renewable crediting period (7years×3). The first crediting period is from 25/06/2008 to 24/06/2015, and the second crediting period is from 25/06/2015 to 24/06/2022.

C.2.2. Start date of crediting period

>>

25/06/2015

C.2.3. Length of crediting period

7 years 0 month

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

The environmental impact assessment (EIA) for this project has approved by Hebei Environmental Protection Bureau in March 2006. For detailed information, please refer to "Environmental impact report of straw biomass generation project, Wei County, Hebei Province".

The EIA report shows that the proposed project is the resources comprehensive utilization project, which is consistent with China's national energy policy and industry policy. Since the project owner has taken all effective measures to make sure the pollutants emission meet the requirements, the proposed project will have no significant impact on the local environment.

Environmental impact during the period of construction

The pollutions caused in construction period are summarized as follows:

Noise: Noise from construction materials, equipment transportation vehicles is about 90dB (A); the noise from construction machinery, such as building foundation excavation and concrete preparation, casting is between 75 and 105dB (A).

Waste gas: A secondary dust caused by dust of building materials: cement, lime and foundation excavation temporarily stockpiling and those of transport vehicles entering and leaving the factory site.

Solid waste: Construction solid waste is from excavating the foundation. According to the "Hazardous Waste Identification Standards (" GB5085.1~5085.3-1996), such solid waste is not hazardous waste.

The project owner will take some measures to prevent or mitigate the above negative impact, such as making noisy equipment operate in the shed, not building at the noon (12:00～14:00) and at night (22:00～ 6:00) to alleviate the negative impact of noise on residents living. In addition, to reduce dust by establishing preventing dust net and spraying water. The construction noise and dust are temporary impact, through the project owner taking the appropriate measures, and it will have no significant impact on the surrounding environment.

Environmental impact during the period of operation

Environmental impact conclusions during operation time are as follows:

Waste water

Waste water of the proposed project mainly includes residential drainage and industrial effluent wastewater. Residential drainage will be treated using secondary biological treatment and the treated water will be utilized comprehensively; Industrial effluent water meets the level II quality of "wastewater discharge standards" (GB8978-1996) and will direct emits. In addition, the COD of the waste water will be continuous monitored automatically.

Waste gas

Crop straws, mainly cotton straw, are used as fuels in the project. Comparing to the traditional coal-fired power plant, the sulphur and ash in the biomass is low, which will have little impact on the surrounding atmosphere. the proposed project installs the hop-pocket dust catcher (dust removal efficiency is 99%) to collect the ash and soot, and also use a 80m—high chimney to dilute emitting soot, which meets the "waste gas pollutants emission standards for thermal plants" (GB13223-2003). the smoke and flue gas by-produced by the project activity shall be monitored and shall not exceed the upper limit of the relevant national standards: the dust, SO2 and NOx emission will be less than 16.2mg/m3, 219.8mg/m3 and 300mg/m3 respectively (EIA).

Solid waste

The solid waste in the proposed project are mainly slag and fugitive ash and collected by dust catcher,, the ash is a good fertilizer and can be directly used in the field.

Noise

The noise sources of the proposed project are from fan, steam generator and pumps, etc. The project owner will install noise elimination in fans and sound insulation by putting noisy equipment into workshop, and plant trees in the project plant and other measures to decrease the noise influences.

Ecological Environmental Impact Analysis

The project owner will strengthen virescence work, making green vegetation in the plant area cover more than 30% and also setting up 10m-wide green belt around a fence and thus compensating the damage caused to the ecological environment and gradually improving the quality of the ecological environment.

Fuel transportation impact on the environment

The fuels of the proposed project are straws collected from collecting stations and then to be transported to the factory. No sensitive areas along transportation routes and straws transported are all packed and will not produce secondary dust. Transport vehicles avoid crossing neighbourhood areas in order to reduce the impact on the residents.

In short, the project has reached an advanced level in saving energy, reducing emissions purity and amount of pollutants and other aspects by choosing clean production equipment and advanced technology, so there is little impact on of the surrounding environment of the project's operation.

D.2. Environmental impact assessment

>>

The environmental impacts of the Straw generation project in Wei county Hebei province, P.R. China are not considered significant.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

1. The project owner has carried out investigation on the public's comments on this project by questionnaires and collected comments and suggestions by local stakeholders (EIA requirments).

2. The questionnaire of stakeholders comments for CDM activity requirements

1. Stakeholders comments collection required by China EIA

According to China's environmental protection laws and regulatory requirements, public participation investigations of environmental impact assessment should be carried out, collect the suggestions of local residents, to improve the environmental and social benefits.

Survey Formats

Public participation investigations have been carried out on the local stakeholder of the surrounding areas by questionnaires, which reflect the public views on the present environment in the region and their suggestions and demands on environmental protection of the proposed projects.

Investigation scope by questionnaires

Questionnaires have been distributed to varied local residents in the project location in a fair and all-sided manner. The Investigated stakeholders are mainly residents from several villages nearby, such as those of xiangying village, renliji village, etc.

49 questionnaires were distributed and all of them had been returned. The investigation had taken fully account into the public advice of different ages, civilizations and occupations to make the investigated stakeholders more representative. Of all the investigated stakeholders, 42 are men, accounting for 85.7%; 7 are women, 14.3%; there are also some local government officers ,workmen, peasants and other occupations, including 2 leaders, accounting for 4.1%; 5 are government officers, 10.2%;2 are workmen, 4.1%; 40 are peasants, 81.6%.

Major investigated issues

For detailed information, please refers to E.2: Comments from the questionnaires

2. Stakeholders comments collection required by CDM requirements

To facilitate the local stakeholders know about CDM activity, the addition questionnaire activity is also carried out after the project owner made a introduction of CDM activity and the how to GHG emission reduction occurs from the proposed project activity.

The questionnaires distribution is similar as above. And totally 95 questionnaires were distributed and all of them had been returned. Among the 95 people, of whom 28 were women and 67 were men, with an average age of 45.29 years old, The investigation participants are from near villages, including Heying township (BeiTaiji Village, xiangying Village，Dongzhongying Village, Renlixi village, Xizhongying Village, Zhao Village), Hulu township (ZhangHulu Village, Yanhonglong Village, Qianzaoke Village). The Investigators has lived there at least 19 years.

The Investigation scope and the Comments from the questionnaires please refer to E.2:.

E.2. Summary of comments received

>>

Comments from the questionnaires are summarized below：

1. Stakeholders comments collection required by China EIA

Issues		Stat. Result		
view on environment	options	Care very much	care	don’t care
	persons	34	14	1
	%	69.4	28.6	2.0
The degree of knowing about the project	options	know	Generally know	Don't know
	persons	11	21	17
	%	22.4	42.9	34.7
The economic benefits of the project	options	promote	decrease	Generally promote
	persons	42	0	7
	%	85.7	0	14.3
Impact on residents’ living	options	Good than bad	Bad than good	General impact
	persons	43	0	6
	%	87.8	0	12.2
Location reasonable?	options	reasonable	unreasonable	Not care
	persons	44	0	5
	%	89.8	0	10.2
Attitude to the project	options	support	Not support	Not care
	persons	42	0	7
	%	85.7	0	14.3

2. Stakeholders comments collection required by CDM requirements

According to the questionnaires result, 100% support the construction of the proposed project. Most of them think it will reduce pollution from biomass residues dump or uncontrolled burnt, Increase income, Increase job opportunity, Improve living.

8 persons think it will result in waster decrease, 32 persons think it will result in fuel price increase and 8 persons think it will result in increase environment pollution.

E.3. Report on consideration of comments received

>>

As shown above, the local public know much about the project, the majority of respondents support the project and they think the project can promote local economic development and improve living conditions of local residents. For the project site, the public in general agree and think it is reasonable.

Because certain power plant construction will affect the local environment, the public participant also made some rational recommendations. For example, "choose efficient pollution control facilities, and to ensure its stable operation," "strengthen the management of transport vehicles." and so on. Therefore, project owner should give sufficient attention to the public suggestions and strengthen environmental protection facilities maintenance and management in their day-to-day operation, and strengthen the management of transport vehicles, avoiding impact on residents.

In short, the public strongly support the proposed project.

SECTION F. Approval and authorization

>>

The letter of approval from People’s Republic of China (the host Party) for the project activity was obtained on 05/03/2007.

The letter of approval from the United Kingdom for the project activity was obtained on 25/07/2007.

The letter of approval from Switzerland for the project activity was obtained on 28/08/2008.

- - - - -

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 Bio Energy Co., Ltd.
Street/P.O. Box	No.1 Beishatan Deshengmen wai, Chaoyang District,
Building	150 P.O.B.,Old Administration Building
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State/Region	-
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Fax	+86 10 63505330
E-mail	lizheng@sgecs.sgcc.com.cn
Website	http://www.sgecs.sgcc.com.cn/
Contact person	
Title	CDM Manager
Salutation	Mr.
Last name	LI
Middle name	-
First name	Zheng
Department	
Mobile	
Direct fax	+86 10 63505330
Direct tel.	+86 10 63505330
Personal e-mail	lizheng@sgecs.sgcc.com.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	Climate Change Capital Carbon Managed Account Limited
Street/P.O. Box	49 Grosvenor Street
Building	
City	London
State/Region	-
Postcode	W1K 3HP
Country	United Kingdom
Telephone	+44(0)207 290 7040
Fax	+44(0)207 290 3593
E-mail	apearson@c-c-capital.com
Website	www.climatechangecapital.com
Contact person	
Title	CDM Manager
Salutation	Mr.
Last name	Pearson
Middle name	-
First name	Andrew
Department	Carbon Finance
Mobile	
Direct fax	+44 (0) 207 290 3593
Direct tel.	+44 (0) 207 290 7048
Personal e-mail	apearson@c-c-capital.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

Not applicable.

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

To determine the simple OM emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$) for the Project, data recommended in the *2015 Baseline Emission Factors for Regional Power Grid in China* issued by China's DNA are adopted.

The following tables summarise the numerical results from the equations listed in the *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 Electricity generation of the NCPG

year	**2011**			**2012**			**2013**		
Province	**EG**	**AER**	**EDG**	**EG**	**AER**	**EDG**	**EG**	**AER**	**EDG**
	(MWh)	(%)	(MWh)	(MWh)	(%)	(MWh)	(MWh)	(%)	(MWh)
Beijing	25,800,000	6.00	24,252,000	28,300,000	5.40	26,711,800	32,900,000	5.57	31,067,470
Tianjin	61,200,000	6.40	57,283,200	58,200,000	6.30	54,533,400	59,100,000	6.14	55,471,260
Hebei	215,100,000	6.50	201,118,500	217,800,000	6.40	203,860,800	227,500,000	6.17	213,463,250
Shanxi	229,600,000	8.00	211,232,000	245,400,000	7.60	226,749,600	252,700,000	7.44	233,899,120
Inner Mongolia	288,900,000	7.60	266,943,600	302,900,000	7.40	280,485,400	321,300,000	7.36	297,652,320
Shandong	312,900,000	6.80	291,622,800	324,100,000	5.70	305,626,300	350,300,000	5.83	329,877,510
Total			**1,052,452,100**			**1,098,027,300**			**1,161,430,930**

Data source: China electric power yearbook, 2012-2014
EG- Electricity generation, AER- Auxiliary electricity consumption Rate, EDG-Electricity delivered to the grid.

Table A2. Calculation of simple OM emission factor of the NCPG in 2011

Energy	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total fuel	Emission factor	NCV	Emission
									$kgCO_2/TJ$	$MJ/t,km^3$	tCO_2
		A	**B**	**C**	**D**	**E**	**F**	**G=Sum(A:F)**	**H**	**I**	***J**
Coal	kt	6,809.70	28,284.50	100,703.10	103,260.00	189,983.80	137,846.80	**566,887.90**	87,300	20,908	1,034,722,570
Cleaned coal	kt	-	-	-	119.30	28.40	16.70	**164.40**	87,300	26,344	378,092
Other washed coal	kt	-	-	858.60	6,424.70	1,850.90	7,248.10	**16,382.30**	87,300	8,363	11,960,552
briquettes	kt	12.30	-	-	-	-	323.40	**335.70**	87,300	20,908	612,743
Coke	kt	-	-	-	-	-	-	**-**	95,700	28,435	0
Coal gangue	kt	-	-	27,936.00	210,112.00	89,655.00	96,013.00	**423,716.00**	87,300	8,363	30,935,077
Coke oven gas	Mm^3	-	152.00	1,847.00	2,201.00	600.00	1,555.00	**6,355.00**	37,300	16,726	3,964,756
BFG	Mm^3	-	1,608.00	29,860.00	3,690.00	6,032.00	15,941.00	**57,131.00**	219,000	3,763	47,081,486
LDG	Mm^3	-	175.00	1,062.00	102.00	-	1,269.00	**2,608.00**	145,000	7,945	3,004,481
Other gas	Mm^3	-	-	-	-	-	53.00	**53.00**	37,300	5,227	10,333
oil	kt	-	-	-	-	-	-	**-**	71,100	41,816	0
gasoline	kt	-	-	-	-	-	-	**-**	67,500	43,070	0
Diesel	kt	0.90	-	19.60	-	5.60	17.60	**43.70**	72,600	42,652	135,319
Fuel oil	kt	2.50	-	0.80	-	0.20	16.80	**20.30**	75,500	41,816	64,089
Naphtha	kt	-	-	-	-	-	-	**-**	72,600	43,906	0
Lubricating Oil	kt	-	-	-	-	-	-	**-**	72,900	41,398	0
Paraffin	kt	-	-	-	-	-	-	**-**	72,200	39,934	0
Solvent Oil	kt	-	-	-	-	-	-	**-**	72,200	42,945	0
Petroleum asphalt	kt	-	-	-	-	-	-	**-**	69,300	38,931	0
Petroleum coke	kt	58.70	154.20	-	-	-	136.30	**349.20**	82,900	31,947	924,823
LPG	kt	0.10	-	-	-	-	-	**0.10**	61,600	50,179	309
Refinery gas	kt	4.10	0.20	20.20	-	-	32.70	**57.20**	48,200	46,055	126,975
Natural gas	Mm^3	157.00	5.70	1.50	58.50	1.20	1.30	**225.20**	54,300	38,931	4,760,623
Other oil products	kt	8.70	-	23.20	-	-	49.10	**81.00**	72,200	41,816	244,548
Other coke products	kt	-	-	98.10	-	-	12.90	**111.00**	95,700	28,435	302,056
Other energy	kt Ce	185.60	142.90	607.00	659.80	126.30	530.00	**2,251.60**	-	-	0
										subtotal	**1,139,228,834**

Thermal electricity delivered to the North China Power Grid (MWh)	1,052,452,100

Net electricity import from the Northeast China Power Grid to the North China Power Grid (MWh)	10,045,670
The simple OM emission factor of the Northeast China Power Grid (tCO_2/MWh)	1.1546
Net electricity import from the Northwest China Power Grid to the North China Power Grid (MWh)	25,697,020
The simple OM emission factor of the Northwest China Power Grid (tCO_2/MWh)	0.9404
Total emission of the North China Power Grid (tCO_2)	1,174,992,213
Total electricity delivered to the North China Power Grid (MWh)	1,088,194,790
Simple OM emission factor of the North China Power Grid in 2011 (tCO_2/MWh)	1.0798

* $J = G \times H \times I / 1{,}000{,}000$

Data sources: China energy statistical yearbook 2012
2006 IPCC guideline for national greenhouse gas inventories, volume 2 energy

Table A3. Calculation of simple OM emission factor of the NCPG in 2012

Energy	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total fuel	Emission factor	NCV	Emission
									$kgCO_2/TJ$	$MJ/t,km^3$	tCO_2
		A	**B**	**C**	**D**	**E**	**F**	**G=Sum(A:F)**	**H**	**I**	***J**
Coal	kt	6,495.60	27,463.80	95,771.40	108,363.3	202,263.90	132,763.50	**573,121.50**	87,300	20,908	1,046,100,563
Cleaned coal	kt	-	-	-	162.30	10.60	55.20	**228.10**	87,300	26,344	524,591
Other washed coal	kt	-	-	890.40	6,946.70	342.00	20,858.50	**29,037.60**	87,300	8,363	21,200,058
briquettes	kt	14.80	-	-	-	-	310.30	**325.10**	87,300	20,908	593,395
Coke	kt	-	-	-	-	-	-	**-**	95,700	28,435	0
Coal gangue	kt	-	-	1,704.40	20,495	6,115.6	5,912.6	**34,227.60**	87,300	8,363	24,989,225
Coke oven gas	Mm^3	-	110.00	1,746.00	2,031.00	614.00	1,694.00	**6,195.00**	37,300	16,726	3,864,935
BFG	Mm^3	-	1,169.00	32,233.00	4,480.00	5,072.00	23,153.00	**66,107.00**	219,000	3,763	54,478,580
LDG	Mm^3	-	233.00	1,811.00	127.00	-	1,709.00	**3,880.00**	145,000	7,945	4,469,857
Other gas	Mm^3	-	-	-	-	-	74.00	**74.00**	37,300	5,227	14,428
oil	kt	-	81.20	-	-	0.5	-	**81.7**	71,100	41,816	242,904
gasoline	kt	-	-	-	-	-	0.1	**0.1**	67,500	43,070	291
Diesel	kt	1.00	-	13.20	-	7.10	20.60	**41.90**	72,600	42,652	129,745
Fuel oil	kt	1.30	-	0.30	-	0.10	5.00	**6.70**	75,500	41,816	21,153
Naphtha	kt	-	-	-	-	-	-	**-**	72,600	43,906	0
Lubricating Oil	kt	-	-	-	-	-	-	**-**	72,900	41,398	0
Paraffin	kt	-	-	-	-	-	-	**-**	71,900	43,070	0
Solvent Oil	kt	-	-	-	-	-	-	**-**	72,200	42,945	0
Petroleum asphalt	kt	-	-	-	-	-	-	**-**	69,300	38,931	0
Petroleum coke	kt	56.90	174.30	-	-	-	155.70	**386.90**	82,900	31,947	1,024,668
LPG	kt	-	-	-	-	-	-	**-**	61,600	50,179	-
Refinery gas	kt	4.80	0.30	6.0	-	-	20.30	**31.4**	48,200	46,055	69,703
Natural gas	Mm^3	2,122	61	27	521	13	13	**2,757**	54,300	38,931	5,828,169
Other oil products	kt	6.0	-	22.60	-	-	1.00	**29.60**	72,200	41,816	89,366
Other coke products	kt	-	-	134.30	-	-	33.50	**167.80**	95,700	28,435	456,622
Other energy	kt Ce	196.70	126.50	1,219.70	855.40	454.90	609.60	**3,462.80**	-	-	0
										subtotal	**1,164,098,254**

Thermal electricity delivered to the North China Power Grid (MWh)	1,098,027,300
Net electricity import from the Northeast China Power Grid to the North China Power Grid (MWh)	10,926,140
The simple OM emission factor of the Northeast China Power Grid (tCO_2/MWh)	1.1225
Net electricity import from the Northwest China Power Grid to the North China Power Grid (MWh)	27,079,710
The simple OM emission factor of the Northwest China Power Grid (tCO_2/MWh)	0.9546
Total emission of the North China Power Grid (tCO_2)	1,202,212,118
Total electricity delivered to the North China Power Grid (MWh)	1,088,194,790
Simple OM emission factor of the North China Power Grid in 2012 (tCO_2/MWh)	1.0583

* $J=G\times H\times I/1,000,000$

Data sources: China energy statistical yearbook 2013
2006 IPCC guideline for national greenhouse gas inventories, volume 2 energy

Table A4. Calculation of simple OM emission factor of the NCPG in 2013

Energy	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total fuel	Emission factor	NCV	Emission
									$kgCO_2/TJ$	$MJ/t,km^3$	tCO_2
		A	B	C	D	E	F	G=Sum(A:F)	H	I	*J
Raw coal	10^4 t	631.97	2702.33	9515.31	11554.8	18419.87	13744.01	**56568.29**	87,300	20,908	1,032,523,122
Clean coal	10^4 t				13.96	1.24	0.66	**15.86**	87,300	26,344	364,753
Other washed coal	10^4 t			100.35	702.9	17.83	639.52	**1460.60**	87,300	8,363	10,663,693
Briquettes	10^4 t	0.93				0.65	33.09	**34.67**	87,300	20,908	632,821
Coke	10^4 t							**0**	95,700	28,435	0
Coal gangue	10^4 t			168.19	1020.91	642.69	519.62	**2351.41**	87,300	8,363	17,167,407
Coke oven gas	10^8 m^3		1.4	19.72	18.49	6.24	18	**63.85**	37,300	16,726	3,983,473
BFG	10^8 m^3		14.89	500.17	48.2	49.85	242.78	**855.89**	219,000	3,763	70,533,638
LDG	10^8 m^3		2.4	22.47	1.34		19.3	**45.51**	145,000	7,945	5,242,866
Other gas	10^8 m^3						1.02	**1.02**	37,300	5,227	19,887
Other coking products	10^4 t						3.47	**3.47**	95,700	41,816	94,427
Crude oil	10^4 t		7.9			0.01		**7.91**	71,100	43,070	235,174
Gasoline	10^4 t						0.01	**0.01**	67,500	42,652	291
Diesel	10^4 t	0.2		1.49		0.73	1.84	**4.26**	72,600	41,816	131,912
Fuel oil	10^4 t			0.03		0.05	1.42	**1.50**	75,500	43,906	47,357
Naphtha	10^4 t							**0**	72,600	41,398	0
Lubricating Oil	10^4 t							**0**	71,900	43,070	0
Paraffin	10^4 t							**0**	72,200	42,945	0
Solvent Oil	10^4 t							**0**	72,200	38,931	0
Petroleum asphalt	10^4 t							**0**	69,300	31,947	0
Petroleum coke	10^4 t	3.69	16.51	1.29			7.3	**28.79**	82,900	50,179	762,476
LPG	10^4 t		0.02					**0.02**	61,600	46,055	618
Refinery gas	10^4 t	0.19		0.84			1.95	**2.98**	48,200	38,931	66,152
Natural gas	10^8 m^3	29.46	0.51	0.65	6.24	0.25	0.11	**37.22**	54,300	41,816	7,868,134
Other petroleum products	10^4 t	0.73		1.7			0.11	**2.54**	72,200	51,434	76,686
LNG	10^4 t							**0.0**	54,300	-	-
Other E (standard coal)	10^4 Tce	16.47	10.96	83.72	85.23	8.89	248.04	**453.31**	-	-	-

										subtotal	**1,150,414,884**

Thermal electricity delivered to the North China Power Grid (MWh)	1,161,430,930
Net electricity import from the Northeast China Power Grid to the North China Power Grid (MWh)	17,930,720
The simple OM emission factor of the Northeast China Power Grid (tCO2/MWh)	1.11020
Net electricity import from the Northwest China Power Grid to the North China Power Grid (MWh)	25,344,730
The simple OM emission factor of the Northwest China Power Grid (tCO2/MWh)	0.94240
Total emission of the North China Power Grid (tCO2)	1,204,706,380
Total electricity delivered to the North China Power Grid (MWh)	1,194,206,443
Simple OM emission factor of the North China Power Grid in 2013 (tCO2/MWh)	0.9913

* J=G×H×I/1,000,000

Data sources: China energy statistical yearbook 2014
2006 IPCC guideline for national greenhouse gas inventories, volume 2 energy

Calculated with the data provided in Table A1~Table A4, the OM emission factor of the NCPG is calculated as 1.0416 tCO_2/MWh.
The calculation of average OM emission factor of the Northeast China Power Grid is as follow:

The section Baseline emissions factor detailed the calculation of BM emission factor of North China Power Grid, as per *2015 baseline emission factors for regional power grids in China* published by China DNA on 06/06/2016, details as follows:

Sub-step 1: Calculation of the share of CO_2 emissions from solid, liquid and gaseous fuels.

Calculated with the data provided in Table A4 and equations (4), (5) and (6), $\lambda_{Coal,y}$ =92.27%, $\lambda_{Oil,y}$ =0.11%, $\lambda_{Gas,y}$ =7.62%

Sub-step 2: with weight of the proportion calculated in Step1, Calculated the emission factor of thermal power based on the emission factors of the best efficient and commercial generation technologies as follow:

Thermal Power Technologies	variable	Electricity supply efficiency (%)	Emission factor of fuel($kgCO_2$)	Emission factor(tCO_2/MWh)
		A	B	C=3.6/A/1,000,000×B
Coal fired power plants	$EF_{Coal,Adv,y}$	42.00%	87,300	**0.7483**
Oil fired power plants	$EF_{Oil,Adv,y}$	52.90%	75,500	**0.5138**

Gas fired power plants	$EF_{Gas,Adv,y}$	52.90%	54,300	**0.3695**

As per equation (7)

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

=92.27%×0.7483+0.11 %×0.5138+7.62%×0.3695

=0.71915 tCO_2e/MWh

Sub-step 3: take the thermal power emission factor calculated in the Step 2 multiplied by the proportion count for 20% of capacity addition of the grid as the Build Margin emission factor ($EF_{grid,BM,y}$)

Table A5. Installed capacity of the North China Power Grid in 2013

Installed capacity	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power (MW)	6,760	11,120	41,870	52,050	63,860	70,980	246,640
Hydro power (MW)	1,010	10	1,810	2,430	1080	1,078	7,418
Nuclear power (MW)	-	-	-	-	-	-	-
Wind power and Other (MW)	150	246	8,517	3195	19,908	5,118	37,134
Total (MW)	**7,920**	**11,376**	**52,197**	**57,675**	**84,848**	**77,176**	**291,192**

Data source: China electric power yearbook 2014.

Table A6. Installed capacity of the North China Power Grid in 2012

Installed capacity	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total

Thermal power (MW)	6,140	11,100	39,990	50,110	60,190	68,180	235,710
Hydro power (MW)	1,020	5	1,790	2,430	1,080	1,077	7,402
Nuclear power (MW)	-	-	-	-	-	-	-
Wind power and Other (MW)	150	232	6,900	2,007	17,140	3,886	30,315
Total (MW)	**7,310**	**11,337**	**48,680**	**54,547**	**78,410**	**73,143**	**273,427**

Data source: China electric power yearbook 2013.

Table A7. Installed capacity of the North China Power Grid in 2011

Installed capacity	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Total**
Thermal power (MW)	5,140	10,830	38,100	46,510	59,550	64,480	224,610
Hydro power (MW)	1,050	10	1,790	2,430	850	1,069	7,199
Nuclear power (MW)	-	-	-	-	-	-	-
Wind power and Other (MW)	150	130	4,617	927	14,657	2,497	22,978
Total (MW)	**6,340**	**10,970**	**44,507**	**49,867**	**75,057**	**68,046**	**254,787**

Data source: China electric power yearbook 2012.

Table A8. Installed capacity of the North China Power Grid in 2010

Installed capacity	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Total**
Thermal power (MW)	5,140	10,910	36,640	42,100	54,020	60,020	208,830

Hydro power (MW)	1,050	10	1,790	1,820	850	1,070	6,590
Nuclear power (MW)	-	-	-	-	-	-	-
Wind power and Other (MW)	110	30	3,720	370	9,730	1399	15,359
Total (MW)	**6,300**	**10,950**	**42,150**	**44,290**	**64,600**	**62,489**	**230,779**

Data source: China electric power yearbook 2011.

Table A9. Calculation of BM emission factor of the North China Power Grid

	Installed capacity in 2010	**Installed capacity in 2011**	**Installed capacity in 2012**	**Installed capacity in 2013**	**Capacity additions from 2010 to 2013**	**Capacity additions from 2011 to 2013**[11]	**Share in total capacity additions**
Unit	**MW**	**MW**	**MW**	**MW**	**MW**	**MW**	
	A	**B**	**C**	**D**	**E**	**F**	**G**
Thermal power	208,830	224,610	235,710	246,640	43,618	24,919	66.47%
Hydro power	6,590	7,199	7,402	7,418	228	219	0.35%
Nuclear power	-	-	-	-	0	0	0.00%
Wind power and Other	15,359	22,978	30,315	37,134	21,775	14,156	33.18%
Total	230,779	254,787	273,427	291,192	65,621	39,294	100.00%

[11] The data is the newly added installed capacity after taking into consideration of installed capacity, capacity for closing and stopping the unit, capacity for pumping and storing energy.

Share in total installed capacity of 2013					**22.54%**	**13.49%**	

$EF_{grid,BM,y}$ =0.71915*66.47%=0.4780CO$_2$/MWh

The defaults weights value for the second crediting period and for subsequent crediting periods are used as specified in the “Tool to calculate the emission factor for an electricity system ($w_{OM} = 0.25; w_{BM} = 0.75$).

$EF_{grid,CM,y} = 0.25 \times EF_{grid,OM,y} + 0.75 \times EF_{grid,BM,y}$ =0.25×1.0416+0.75×0.4780=0.6189(tCO$_2$e/MWh).

The value of parameters above that are not monitored throughout the second crediting period are based on the most recent data source available at the time of submission of the PDD.

Appendix 5. Further background information on monitoring plan

Please refer to B.7.3.

Appendix 6. Summary of post registration changes

Permanent changes from project description in registered PDD occurred during the project actual activities has been proposed by the Project participant, include:

Change 1: Biomass residue types and biomass residue consumption;

Change 2: Annual operation hours;

Change 3: The installed capacity was expanded to 30MW;

Change 4: Self-consumption of electricity generated;

Change 5: Description and source of data to be used for Parameter $BF_{k,y}$;

Change 6: Accuracy and type of the monitoring equipment for moisture content of the biomass residues;

Change 7: Measurement methods and procedures to be applied for $FF_{project,plant,d,y}$;

Change 8: Description and source of data to be used for $FF_{project,site,d,y}$;

Change 9: Description of measurement methods and AQ/QC procedures for Parameter NCV_k;

Change 10: Deletion of Parameter DPK_y;

Change 11: Source of data to be used and measurement method and QA/QC procedures for parameter $EF_{km,CO2,y}$

These changes described in the revised PDD version 4.0 have been approved by EB on 01/03/2012.

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Document information

Version	*Date*	*Description*
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
08.0	4 July 2016	Published within annex 13 to the annotated agenda of EB90. Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).

Version	*Date*	*Description*
06.0	9 March 2015	Revisions to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; Editorial improvement.
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
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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