

JILIN LIAOYUAN 50MW LEVEL BIOMASS COGENERATION PROJECT

Document Prepared By National Bio Energy Co., Ltd.

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Prepared By	National Bio Energy Co., Ltd.
Contact	Address; Old Administration Building, No. 1 Beishatan, Deshengmen Wai, Chaoyang District, Beijing, 100083 E-Mail: zhaohui@nbe.cn Telephone: +86-10-58681537

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1 PROJECT DETAILS

1.1 Summary Description of Project

Jilin Liaoyuan 50MW Biomass Cogeneration Project (hereafter referred to as the Project) is located in Liaoyuan City, Jilin province. Liaoyuan City, with rich agricultural resources, is one of the biggest agriculture bases in the middle-south of Jilin province. The implementation of the project realized biomass comprehensive utilization in the province and serve as a demonstration project in China.

The project utilizes local surplus biomass residues (mainly as maize stalk) for generating heat and electricity. The install capacity is 30MW. The project has already installed one straw-fired boiler imported from Denmark BWE Company, which is a world leading company in biomass boilers production and biomass cogeneration. The project has also installed a set of turbine and generator, which are produced domestically. The construction of project was started on June 28th, 2006 and the project was put into operation on November 30th, 2007. The expected life-time of the project is 20 years. The project activity achieved emission reductions of 331,085 tCO₂e during this monitoring period from 30/11/2007 to 08/03/2010

The pre-project situation and the baseline scenario are identical: the electricity is produced within the Northeast China Power Grid, heat to supply consumers of Liaoyuan Industrial Development Zone is produced from burning fossil fuel, and straw is dumped or left for to decay in an uncontrolled manner or burnt in an uncontrolled manner without utilizing it for energy purpose. These are also the baseline scenarios of the Project.

1.2 Sectoral Scope and Project Type

sectoral scope 1: energy industries (Renewable sources)

The project is neither AFOLU project nor a grouped project.

1.3 Project Proponent

Project owner

Organization:	National Bio Energy Co.,Ltd
Street/P.O.Box:	Deshengmen Wai
Building:	Old Administration Building, No. 1 Beishatan
City:	Chaoyang District, Beijing
State/Region:	Beijing
Postcode/ZIP:	100083
Country:	People's Republic of China
Telephone:	+86-10-58681537
FAX:	+86-10-58681588
E-Mail:	zhaohui@nbe.cn

URL:	-
Represented by:	Hui Zhao
Title:	Manager
Salutation:	Sir
Last Name:	Zhao
Middle Name:	-
First Name:	Hui
Department:	CDM center
Mobile:	+86 186 0531 6708
Direct FAX:	+86-10-58681588
Direct tel:	+86-10-58681537
Personal E-Mail:	zhaohui@nbe.com

1.4 Other Entities Involved in the Project

EDF Trading Limited is a project participant of CDM project. There is no other entity involved in the VCS project.

1.5 Project Start Date

30/11/2007 (the date of which the project is put into commercial operation)

1.6 Project Crediting Period

The start date: 30/11/2007 (the date of which the project is put into commercial operation)

The end date: 08/03/2010 (The project is registered as CDM on UNFCCC on 09/03/2010
830 days in total, covering 2 years, 3 months and 9 days)

1.7 Project Location

The project site is located in Longshan Industrial Development Zone, Shoushan Town, which is 10 kilometers from the central area of Liaoyuan City. Liaoyuan City lies in the middle-south of Jilin province. The Project has geographical coordinates with east longitude of 125° 15'23" and north latitude of 42° 55'24"

1.8 Title and Reference of Methodology

The methodology applied to the project is Approved consolidated baseline and monitoring methodology ACM0006 (ver 06.2): "Consolidated methodology for grid-connected electricity generation from biomass residues".

This methodology also refers to the following tools and methodology:

- Version 02.2 of combined tool to identify the baseline scenario and demonstrate additionality.
- Version 1 of Tool to calculate baseline, project and/or leakage emissions from electricity consumption.
- Version 2 of Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion.
- Version 07 of ACM0002: Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The project started construction on June 28th, 2006 and started operation on November 30th, 2007. There is no long term overhaul and equipment exchange during the monitoring period. There is no special events happened during the monitoring period which may affect the applicability of the methodology. Maize stalk are used as fuel for power generation.

As for heat generation, the port of heat exported was set aside in construction period already, but the local heat network had not been finished by local government during the monitoring period, the project was not able to supply heat to any user during this monitoring period.

The project was registered as CDM on 09/03/2010. Post-registration change of PDD has been submitted and accepted on January 11th, 2011 (<http://cdm.unfccc.int/Projects/DB/TUEV-SUED1241699458.61/view>). The main change of PDD is that the installation capacity was changed from 50MW to 30MW. The installation of two straw-fired boilers and 2 sets of steam turbine with capacity of 25MW for each and 2 sets of generator with capacity of 30MW for each is the primary design plan, but after serious consideration, the project owner decided to install one straw-fired boiler and one set of steam turbine and generator with capacity of 30MW.

The project installed the Straw Direct Burning boiler of 1×130t/h with high temperature and high pressure, and the advanced technology of boiler are imported from Denmark BWE Company, with burning completely and no knotting residue. Other two key equipments, turbine and generator, are all developed by domestic manufacturers. The technical specifications of main equipments are listed as below:

Table 1 technical specifications of main equipments

Item	Quantity	Key technical specifications	date
Boiler	1 set	Type	HG-130/9.2-S.JG1
		Maximum continuous steam output	130t/h
		Rated steam pressure	9.2 MPa(a)
		Rated steam temperature	540℃
		Feed-water temperature	210℃
		Exhaust temperature	130℃
		Life time	30 years

		Manufacturer	Harbin Boiler Company Limited ¹
Steam turbine	1 set	Model	C30-8.83/0.981
		Rated output	30MW
		Rated rotation speed	3,000r/min
		Rated flow of main steam	110t/h;
		Rated pressure of main steam	8.83 MPa(a)
		Rated temperature of main steam	535°C;
		Life time	30 years
		Manufacturer	Qingdao Jieneng Steam Turbine Group Co., Ltd.
Generator	1 set	Model	QF-30-2
		Rated output	30MW
		Rated voltage	6.3kV
		Rated electric current	3437A
		Rated rotating speed	3,000r/min
		Life time	30 years
		manufacturer	Shandong Jinan Power Generation Equipment Plant

¹ The manufacturer of the boiler is Harbin Boiler Company Limited, who imported the technology from Denmark BWE Company.

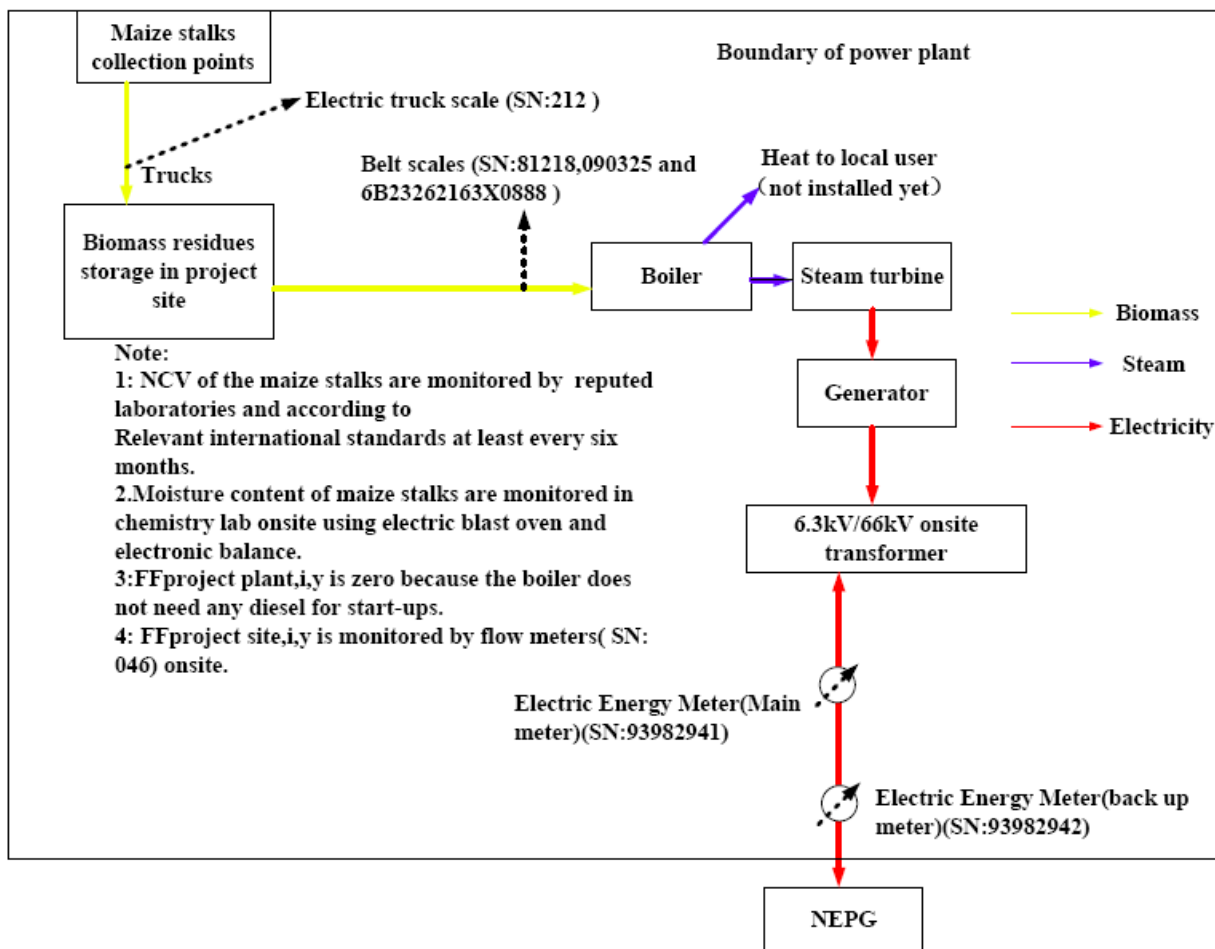


Figure 1 the boundary of the project

2.2 Project Description Deviations

There are two project description deviations

- The first deviation is the type of weighbridge. The type of weighbridge installed by the project during the monitoring is SCS-50t-QC rather than SCS-30 as described in PDD. The weighbridge with a larger measurement range has been installed by the project. As per the nameplate of SCS-50t-QC, its accuracy is Class III and according to the "Metrological Verification Regulation of P.R. China for Digital Indicating Weighing Instrument (JJG 539-1997)", its precision can reach 0-20kg". The accuracy of SCS-30 is 0-20kg, therefore the change of type has no influence on the precision of the measurement.
- The second deviation is the type of weight belts. According to the revised PDD registered as CDM, the weight belt planned to use type SCS-30 with accuracy of 0-20kg. But at the actual situation, three well belts were installed, two of them are type HY2105, the other one is type 6001B. The accuracy of HY2105 and 6001B are Class III, and according to "Metrological Verification Regulation of P.R. China for Digital Indicating Weighing

Instrument (JJG 539-1997)"the precision can reach 0-20kg, as per the calibration certificate of the weight belts. The accuracy of SCS-30 is 0-20kg, therefore the change of type has no influence on the precision of the measurement.

2.3 Grouped Project

The project is a not grouped project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	GWP_{CH_4}
Data unit:	tCO ₂ e/tCH ₄
Description:	Global Warming Potential for CH ₄
Source of data:	IPCC default value
Value applied:	21 for the first commitment period
Purpose of the data:	Used for baseline and project emission calculation
Any comment:	Shall be updated according to any future COP/MOP decisions.

Data Unit / Parameter:	$EF_{grid,y}$
Data unit:	tCO ₂ e/MWh
Description:	The combined baseline emission factor
Source of data:	Registered PDD, the value was fixed at the validation.
Value applied:	0.996
Purpose of the data:	Used for baseline emission calculation and project emission calculation
Any comment:	-

3.2 Data and Parameters Monitored

Data Unit / Parameter:	$EG_{projectplant,y}$
Data unit:	MWh/year
Description:	Net electricity generated in the project plant during the year y

Source of data:	Monitored through the gateway electricity energy meter			
Description of measurement methods and procedures to be applied:	Continuously measured by meters and monthly recorded			
Frequency of monitoring/recording:	Continuously measured by meters and monthly recorded			
Value monitored:	30/11/2007-24/12/2007	5,965.5816		
	25/12/2007-24/12/2008	115,790.2812		
	25/12/2008-24/12/2009	182,580.28272		
	25/12/2009-08/03/2010	22,278.90456		
Monitoring equipment:	The net electricity generated in the project plant during the year y is measured by electric energy meters installed in the project.			
		type	Serial number	accuracy
	Electricity energy meter (main)	ZMD402CT44	93982941	0.2s
	Electricity energy meter (Back-up)	ZMD402CT44	93982942	0.2s
QA/QC procedures to be applied:	According to national standard, the two meters have been calibrated annually. Both of the two meters were calibrated by certificated body Electric Supervision and Testing Center of Jilin province.			
	The data is monitored through the meter, and rechecked by comparing with the electricity receipt from power corporation monthly, and crosschecked by the annual energy balance (please refer to table 4 below).			
	Calibration date		Valid period	
	31/03/2007.		31/03/2007-30/03/2008.	
	29/03/2008.		29/03/2008-28/03/2009.	
	27/03/2009		27/03/2009-26/03/2010	
Calculation method:	-			
Any comment:	-			

Data Unit / Parameter:	$BF_{k,y}$
Data unit:	tons of dry maize stalks of dry mater
Description:	Quantity of biomass residue type k combusted in the project plant during the year y (k=maize stalks)
Source of data:	On-site continuous measurements

Description of measurement methods and procedures to be applied:	Use weight meters. Data monitored continuously and aggregated as appropriate (wet base). Adjust for the moisture content in order to determine the quantity of dry biomass.			
Frequency of monitoring/recording:	Continuously and monthly recording			
Value monitored:	30/11/2007-24/12/2007	8,728.78		
	25/12/2007-24/12/2008	141,385.46		
	25/12/2008-24/12/2009	229,494.02		
	25/12/2009-08/03/2010	32,569.38		
Monitoring equipment:	Use three weight meters installed under the biomass supplying lines in the front of the boiler			
	equipment	type	Serial No.	accuracy
	Weight belt 1	HY2105	081218	III
	Weight belt 2	HY2105	090325	III
	Weight belt 3	6001B	6B232621 63X0888	III
QA/QC procedures to be applied:	$BF_{k,y}$ has been crosschecked with an annual energy balance that is based on purchase receipt and stock change record for QA/QC (please refer to table 3 below).			
	The data was crosschecked by the annual energy balance (please refer to table 4 below)			
	The weight belts was calibrated twice per year by Liaoyuan City Weighing Instrument Verification and Repair Agency			
	Equipment	Calibration date	Valid period	
	Weight belt 1	21/12/2008	21/12/2008-20/06/2009	
		15/02/2009.	15/02/2009-14/08/2009	
		13/08/2009	13/08/2009-12/02/2010	
		11/02/2010	11/02/2010-10/08/2010	
	Weight belt 2	29/03/2009	29/03/2009- 28/09/2009	
		13/08/2009.	13/08/2009- 12/02/2010.	
		11/02/2010	11/02/2010-10/08/2010	
	Weight belt 3	21/10/2007	21/10/2007-20/04/2008	
		19/02/2008	19/02/2008-18/08/2008	
		17/08/2008	17/08/2008-16/02/2009	
		15/02/2009	15/02/2009-14/08/2009	
		13/08/2009	13/08/2009-12/02/2010	

		11/02/2010	11/02/2010-10/08/2010	
Calculation method:	-			
Any comment:	-			

Data Unit / Parameter:	$BF_{T,k,y}$			
Data unit:	tons of dry maize stalks			
Description:	Quantity of maize stalks that has been transported to the project site during the year y.			
Source of data:	On-site continuous measurements			
Description of measurement methods and procedures to be applied:	Use weight meters. Data monitored continuously and aggregated as appropriate (wet base). Adjust for the moisture content in order to determine the quantity of dry biomass.			
Frequency of monitoring/recording:	Continuously and monthly recording			
Value monitored:	30/11/2007-24/12/2007	9,378.94		
	25/12/2007-24/12/2008	169,533.43		
	25/12/2008-24/12/2009	210,099.51		
	25/12/2009-08/03/2010	33,196.26		
Monitoring equipment:	Use a weight meter installed at the entrance of the Project site			
	equipment	type	Serial No.	accuracy
	Weighbridge	SCS-50t-QC	212	III
QA/QC procedures to be applied:	$BF_{T,k,y}$ has been crosschecked with an annual energy balance that is based on purchase receipt and stock change record for QA/QC (please refer to table 3 below). The data can not be directly crosschecked with the quantity of electricity generated, because there is not direct connection between them. But it was indirectly crosschecked with the quantity of electricity generated. As it was crosschecked with the biomass consumed which was crosschecked with the electricity generated (i.e. the electricity generation divided by the quantity of biomass consumed resulted in a reasonable efficiency, refer to table 4 blow). The Weighbridge was calibrated twice per year by Liaoyuan City Weighing Instrument Verification and Repair Agency.			
	Equipment	Calibration date	Valid period	
	Weighbridge	21/08/2007	21/08/2007-20/02/2008	

		19/02/2008	19/02/2008-18/08/2008
		17/08/2008	17/08/2008-16/02/2009
		15/02/2009	15/02/2009-14/08/2009
		13/08/2009	13/08/2009-12/02/2010
		11/02/2010	11/02/2010-10/08/2010
Calculation method:	-		
Any comment:	-		

Data Unit / Parameter:	Moisture content of the biomass residues		
Data unit:	% Water content		
Description:	Moisture content of each biomass residue type <i>k</i>		
Source of data:	On-site measurements		
Description of measurement methods and procedures to be applied:	The biomass was sampled continuously and the moisture content of them was monitored by electric blast oven and electronic balance in the chemical laboratory of the power plant when they are transported to the plant and storage stations², and then inspected their values with national standard GB/T211-1996 applied, which were put down on the quality inspection report. Moisture content of maize stalks of every truck arrived in the power plant has been monitored. And then the monthly simple mean value of biomass is worked out.		
Frequency of monitoring/recording:	Measured when every truck arrived, and monthly simple mean value has been applied in the ER calculation.		
Value monitored:	See table 10 below		
Monitoring equipment:	equipment	type	Serial No.
	Electric	DHG-	0900466
			accuracy
			0.02

² None biomass collection station had been constructed during the monitoring period, so the moisture content was only monitored at the project plant.

	blast oven	9145A		
	Electronic balance	TE4101-L	24390302	III
QA/QC procedures to be applied:	The calibration of equipments was conducted once per year.			
	equipment	Calibration date	Valid period	
	Electric blast oven	05/09/2007	05/09/2007-04/092008	
		04/09/2008	04/09/2008-03/09/2009	
		03/09/2009	03/09/2009-02/09/2010	
	Electronic balance	04/09/2007	04/09/2007-03/09/2008	
		03/09/2008	03/09/2008-02/09/2009	
		02/09/2009	02/09/2009-01/09/2010	
	Calculation method:	-		
Any comment:	-			

Data Unit / Parameter:	$EF_{CH_4,BF}$
Data unit:	tCH ₄ /GJ
Description:	CH ₄ emission factor for the combustion of biomass residues in the project plant.
Source of data:	Default value
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	Check annually
Value monitored:	0.0000411 According to the IPCC 2006 default value provided in table 4 of ACM0006, the CH ₄ emission factor of combustion of biomass in agriculture is 0.03tCH ₄ /TJ. Considering a conservativeness factor of 1.37, the CH ₄ emission factor in this PDD is taken as 0.0000411tCH ₄ /GJ.
Monitoring equipment:	-

QA/QC procedures to be applied:	Check annually
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	NCV _k													
Data unit:	GJ / ton of dry matter(k=maize stalks)													
Description:	Net Calorific Value of maize stalks													
Source of data:	Measured													
Description of measurement methods and procedures to be applied:	Inspection reports from Electric Power Supervision and Testing Center of Heilongjiang Province supervisory and inspection centre Three samples has been analyzed at the same time by the test institution above and reported according to relevant international standards at least every six months, taking at least three samples for each measurement. And the average of NCV of these samples was adopted.													
Frequency of monitoring/recording:	Once half a year													
Value monitored:	<table><tr><td>Monitored date</td><td>NCV_k (GJ/ton) (dry base)</td></tr><tr><td>15/10/2007</td><td>17.810</td></tr><tr><td>13/03/2008</td><td>17.670</td></tr><tr><td>11/09/2008</td><td>17.380</td></tr><tr><td>09/03/2009</td><td>17.570</td></tr><tr><td>07/07/2009</td><td>17.250</td></tr></table>		Monitored date	NCV _k (GJ/ton) (dry base)	15/10/2007	17.810	13/03/2008	17.670	11/09/2008	17.380	09/03/2009	17.570	07/07/2009	17.250
Monitored date	NCV _k (GJ/ton) (dry base)													
15/10/2007	17.810													
13/03/2008	17.670													
11/09/2008	17.380													
09/03/2009	17.570													
07/07/2009	17.250													
Monitoring equipment:	-													
QA/QC procedures to be applied:	NCV _k was determined on the basis of dry biomass. The consistency of measurements by comparing the measurement results with the relevant literature was check. The NCV of maize stalks in the literature ³ is 17.247 GJ/ton, which did not differ significantly from the measurement results.													
Calculation method:	-													

³ <http://wenku.baidu.com/view/9669b373f242336c1eb95e47.html>

The average of NCV of maize stalk is 17.247 GJ/ton, as per "Measurement and Analysis on the Composition and NCV".

Any comment:	-
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Data Unit / Parameter:	AVD _y
Data unit:	Km
Description:	Average return trip distance (from and to) between biomass fuel supply sites and the project site
Source of data:	Determined once using vehicle odometer and recorded by project participants
Description of measurement methods and procedures to be applied:	The distance of each freight transportation activity from the original to the destination was determined once using vehicle odometer and was recorded when it arrived. The average value is adopted for every month.
Frequency of monitoring/recording:	Recording distance when every truck arrived at project site.
Value monitored:	See table 10 below
Monitoring equipment:	-
QA/QC procedures to be applied:	PO has checked consistency of distance records provided by the truckers by comparing recorded distances with maps for QA/QC.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	TL _y
Data unit:	Tons
Description:	Average load of the trucks used for transportation of biomass
Source of data:	Measurement and record
Description of measurement methods and procedures to be applied:	When the truck arrives in the power plant, the load of the trucks were measured by the weight bridge and the staff puts down the number in the data collection system
Frequency of monitoring/recording:	TL _y are determined by averaging the weights of each truck carrying biomass on dry base to the project plant.
Value monitored:	See table 10 below
Monitoring equipment:	weight bridge

QA/QC procedures to be applied:	The Weighbridge was calibrated twice per year by Liaoyuan City Weighing Instrument Verification and Repair Agency.		
	Equipment	Calibration date	Valid period
	Weighbridge	21/08/2007	21/08/2007-20/02/2008
		19/02/2008	19/02/2008-2008.8.18
		17/08/2008	17/08/2008-2009.2.16
		15/02/2009	15/02/2009-14/08/2009
		13/08/2009	13/08/2009-12/02/2010
		11/02/2010	11/02/2010-10/08/2010
Calculation method:	$TL_y = BF_{k,y} / n$ n is number of the trucks arrived in every monitoring month.		
Any comment:	-		

Data Unit / Parameter:	$EF_{km,CO_2,y}$
Data unit:	tCO ₂ /km
Description:	Average CO ₂ Emission Factor for transportation of biomass with trucks
Source of data:	Default
Description of measurement methods and procedures to be applied:	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, Moderate Control index for US Heavy Duty Diesel Vehicles in Table 1-32, page 1.75
Frequency of monitoring/recording:	Check annually
Value monitored:	0.001011
Monitoring equipment:	-
QA/QC procedures to be applied:	Check annually
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$FF_{project\ plant, i, y}$
Data unit:	Tons
Description:	Quantity of fossil fuel type i combusted in the project plant during the year y.
Source of data:	Project Procurement department of plant
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	-
Value monitored:	0 The boiler does not need any diesel for start-ups, so no monitoring equipment has been settled to monitor $FF_{project\ plant, i, y}$ in the initial design stage. $FF_{project\ plant, i, y}$ is 0 and fixed during the whole project operation stage. Therefore it is not monitored.
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$FF_{project\ site,\ i,\ y}$			
Data unit:	tons			
Description:	Quantity of fossil fuel type i combusted at the project plant for other purposes that are attributable to the project activity during the year y.			
Source of data:	Measured by PP			
Description of measurement methods and procedures to be applied:	Measured every time used and aggregated monthly			
Frequency of monitoring/recording:	Continuously monitored, and calculated per month.			
Value monitored:	30/11/2007-24/12/2007	5.996		
	25/12/2007-24/12/2008	128.019		
	25/12/2008-24/12/2009	177.555		
	25/12/2009-08/03/2010	28.378		
Monitoring equipment:	equipment	type	Serial No.	accuracy
	Flow meter	LC11 - A	046	0.5
QA/QC procedures to be applied:	The consistency of metered fossil fuel consumption was crosschecked with an annual energy balance that is based on purchased quantities and stock changes (please refer to table 5 below). The calibration of the equipment was conducted			

	once per year.		
	equipment	Calibration date	Valid period
	Flow meter	05/09/2007	05/09/2007-04/09/2008
		04/09/2008	04/09/2008-03/09/2009
		03/09/2009	03/09/2009-02/09/2010
Calculation method:	The volumes of diesel are converted into weight using a conservative 0.88 ton/m ³ specific gravity value (see Asian Development Bank, Annex 6 of Opportunities for the CDM in the Energy Sector, China, http://www2.adb.org/Documents/TARs/PRC/tar-prc-3840-fr-app-d.pdf).		
Any comment:	-		

Data Unit / Parameter:	$NCV_{i,y}$
Data unit:	GJ/tonne
Description:	Net calorific value of fossil fuel type i in year y
Source of data:	China Energy Statistical Yearbook 2011
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	annually
Value monitored:	42.652
Monitoring equipment:	-
QA/QC procedures to be applied:	PO has checked the consistency of national data with default values by the IPCC, in table 1.2, Chapter 1, volum2 of IPCC 2006 manual, it stated that the Net Calorific Value of diesel is 0.043 TJ/tonne which differs little with updated China Energy Statistical Yearbook 2011. So, 42.652 GJ/ton was thought to be suitable and accurate. The uncertainty is low.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$EF_{CO2,FF,i}$
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Data unit:	tCO ₂ e/GJ
Description:	CO ₂ emission factor for fossil fuel type i
Source of data:	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Description of measurement methods and procedures to be applied:	Any future revision of the IPCC Guidelines should be taken into account
Frequency of monitoring/recording:	Annually
Value monitored:	0.0748
Monitoring equipment:	-
QA/QC procedures to be applied:	Check the latest IPCC Guidelines every year
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$EF_{\text{burning,CH}_4,k,y} * NCV_k$
Data unit:	tCH ₄ /ton biomass
Description:	CH ₄ emission factor for uncontrolled burning of the biomass residues
Source of data:	IPCC default value in the applied ACM0006
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	-
Value monitored:	0.001971 According page 44 of ACM0006 (version 06.2), the CH ₄ emission factor of combustion of biomass in power plant is 0.0027tCH ₄ /t. Considering a conservativeness factor of 0.73 (table 6 of ACM version 06.2), the CH ₄ emission factor in this PDD is taken as 0.001971tCH ₄ /ton.
Monitoring equipment:	-
QA/QC procedures to be applied:	The default value will be reviewed annually.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$EC_{PJ,y}$
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Data unit:	MWh per year			
Description:	On-site electricity consumption attributable to the project activity during the year y.			
Source of data:	monitored through the gateway electricity energy meter			
Description of measurement methods and procedures to be applied:	Continuously measured by meter and monthly recorded			
Frequency of monitoring/recording:	Continuously measured by meter and monthly recorded			
Value monitored:	30/11/2007-24/12/2007	130.823		
	25/12/2007-24/12/2008	642.312		
	25/12/2008-24/12/2009	346.896		
	25/12/2009-08/03/2010	264.869		
Monitoring equipment:		type	Serial number	accuracy
	Electricity energy meter (main)	ZMD402CT44	93982941	0.2s
	Electricity energy meter (Back-up)	ZMD402CT44	93982942	0.2s
QA/QC procedures to be applied:	According to national standard, the two meters have been calibrated annually. Both of the two meters were calibrated by certificated body Electric Supervision and Testing Center of Jilin province. The data is monitored through the meter, and rechecked by comparing with the electricity receipt from power corporation monthly.			
	Calibration date	Valid period		
	31/03/2007	31/03/2007-30/03/2008		
29/03/2008	29/03/2008-28/03/2009			
27/03/2009	27/03/2009-26/03/2010			
Calculation method:	-			
Any comment:	-			

Data Unit / Parameter:	$EG_{PJ,y}$
Data unit:	MWh per year
Description:	Electricity consumption at the biomass residue

	storage sites.
Source of data:	Measured by meters
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	Continuously
Value monitored:	0 there is no biomass storage sites outside the plant during the monitoring period
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	TDL_y
Data unit:	-
Description:	Average technical transmission and distribution losses for providing electricity to the Northeast China Power Grid in year y
Source of data:	As scenario A is used, the 20% default value is chosen in accordance with ACM0006 version 06.2
Description of measurement methods and procedures to be applied:	default value
Frequency of monitoring/recording:	-
Value monitored:	20%
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	-
Data unit:	Tons
Description:	Quantity of biomass residues of type k that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region, k=maize stalks.
Source of data:	Statistics from local governments
Description of measurement	-

methods and procedures to be applied:						
Frequency of monitoring/recording:	Annually					
Value monitored:	Unit: 10 ⁴ ton	Year 2007 (wet base)	Year 2008 (wet base)	Year 2009 (wet base)	Year 2010 (wet base)	
		maize stalks	maize stalks	maize stalks	maize stalks	
	Biomass utilized out of the project	47.5	51.8	56.9	47.3	
	Biomass utilized by the project ⁴	1.035	17.133	28.335	20.074	
	Total biomass utilized, including the project	48.535	68.933	85.235	67.374	
Monitoring equipment:	-					
QA/QC procedures to be applied:	The Statistic Data of Biomass in the region was provided by Liaoyuan city government which is official and authoritative, so there is no need for supplementary data sources and expert judgment.					
Calculation method:	-					
Any comment:	-					

Data Unit / Parameter:	-					
Data unit:	tons					
Description:	Quantity of biomass residues of type k in the region, k=maize stalks.					
Source of data:	Statistics from local governments					
Description of measurement methods and procedures to be applied:	-					
Frequency of monitoring/recording:	annually					
Value monitored:	Unit: 10 ⁴ ton	Year 2007	Year 2008	Year 2009	Year 2010	
		maize stalks	maize stalks	maize stalks	maize stalks	

⁴ These values are from the annual biomass consumed record.

	Available Biomass in the region	135.8	141.3	149.7	160	
Monitoring equipment:	-					
QA/QC procedures to be applied:	The Statistic Data of Biomass in the region was provided by Liaoyuan city government which is official and authoritative, so there is no need for supplementary data sources and expert judgment.					
Calculation method:	-					
Any comment:	-					

Data Unit / Parameter:	$EF_{CO_2,LE}$
Data unit:	tCO ₂ e/GJ
Description:	CO ₂ emission factor of the most carbon intensive fuel used in the country
Source of data:	-
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	-
Value monitored:	-
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	The parameter is only used to calculate the leakage effects. As the demonstration in section 4.3 of MR, the leakage effects can be ruled out according to the ACM0006 version 6.2. Thus, this value was not used for calculation and not necessary to monitor.

3.3 Description of the Monitoring Plan

1. Monitoring structure

The monitoring structure is shown by Figure 2 and implemented by the project owner.

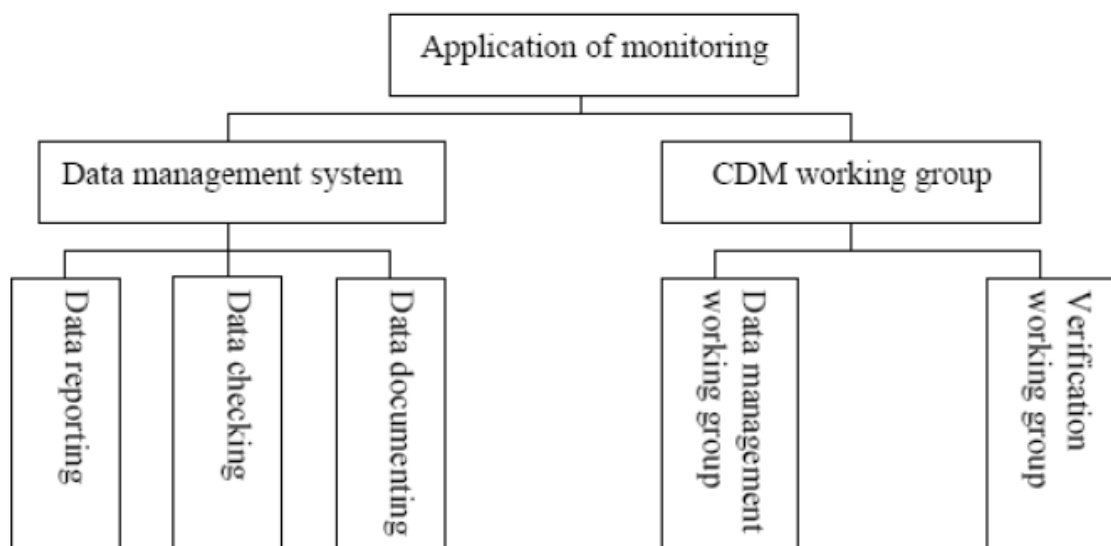


Figure 2. Monitoring structure of the Project

The monitoring data such as all kinds of tables for different monitoring parameters, reports and other documents are processed and stored first in the plant office by operating manager and biomass purchase department manager, and the emissions reductions calculation and internal verification are done by Mr.Lizheng, and then the results will be sent periodically to Mr.Zhaohui, CDM project director for quality assurance.

The personal responsibilities of the project are:

Operating manager of the plant: Overall management of power plant operation and in charge of collecting monitoring data as requested by the monitoring plan.

Biomass purchase department manager: Biomass collection and summarizing the data collected at the collection stations in terms of types, amount, and transportation record, etc of straws. Ensuring the biomass onsite will not be stored over half year.

Mr. Zhaohui: Internal verification including checking the monitoring data emission reductions calculation.

2. Installation of meters

The installation of meters is shown below:

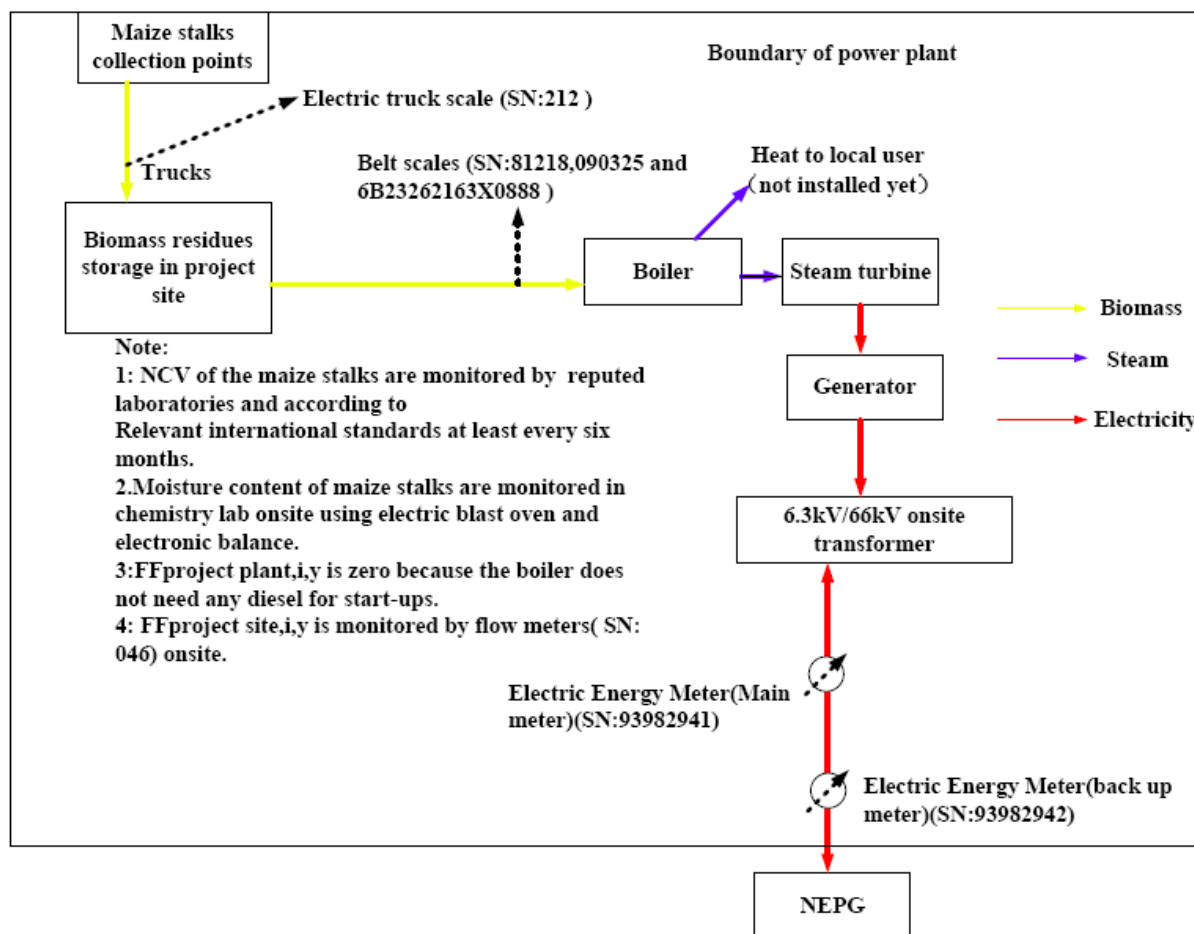


Figure 3 monitoring system and power system connection

3. Calibration

The electricity energy meters, flow meter, electric blast oven and electronic balance of the Project will be calibrated once a year by qualified third parties and weight meters will be calibrated twice a year by qualified third parties. And such calibration will be carried out in line with national norms.

4. Data Management System

The data will be recorded automatically if possible. Otherwise, they will be written down. The monitoring data such as all kinds of tables for different monitoring parameters, reports and other documents are processed and stored first in the plant office by operating manager and biomass purchase department manager, and the emissions reductions calculation and internal verification are done by Mr. Lizheng, and then the results will be sent periodically to Mr. Zhaohui, CDM project director for quality assurance.

All the electronic and paper documents relevant to CDM must be archived for more than two years since the end of the crediting period.

5. QA/QC

The QA/QC manager is in charge of calibration and maintenance of the instruments to ensure their accuracy and reliability; verify the data monitored according to the QA/QC procedure described in table 2

and the requirement of internal audit; report to the project manager immediately when find out any abnormal.

Table 2 Calibration of monitoring equipment

parameter	equipment	type	Serial No.	accuracy	Calibration date	Valid period
$EG_{project}$ $plant, y$ $EC_{PJ, y}$	Electricity energy meter (main)	ZMD402 CT44	93982941	0.2s	31/03/2007	31/03/2007-30/03/2008
					29/03/2008	29/03/2008-28/03/2009
					27/03/2009	27/03/2009-26/03/2010
	Electricity energy meter (Back-up)	ZMD402 CT44	93982942	0.2s	31/03/2007	31/03/2007-30/03/2008
					29/03/2008	29/03/2008-28/03/2009
					27/03/2009	27/03/2009-26/03/2010
$BF_{T, k, y}$	Weighbridge	SCS-50t-QC	212	III	21/08/2007	21/08/2007-20/02/2008
					19/02/2008	19/02/2008-18/08/2008
					17/08/2008	17/08/2008-16/02/2009
					15/02/2009	15/02/2009-14/08/2009
					13/08/2009	13/08/2009-12/02/2010
					11/02/2010	11/02/2010-10/08/2010
$BF_{k, y}$	Weight belt 1 ⁵	HY2105	081218	III	21/12/2008	21/12/2008-20/06/2009
					15/02/2009	15/02/2009-14/08/2009
					13/08/2009	13/08/2009-12/02/2010
					11/02/2010	11/02/2010-10/08/2010
	Weight belt 2 ⁶	HY2105	090325	III	29/03/2009	29/03/2009-28/09/2009
					13/08/2009	13/08/2009-12/02/2010
					11/02/2010	11/02/2010-10/08/2010
	Weight belt 3	6001B	6B232621 63X0888	III	21/10/2007	21/10/2007-20/04/2008
					19/02/2008	19/02/2008-18/08/2008
					17/08/2008	17/08/2008-16/02/2009
					15/02/2009	15/02/2009-14/08/2009
					13/08/2009	13/08/2009-12/02/2010
					11/02/2010	11/02/2010-10/08/2010
$FF_{project}$ $Site, i, y$	Flow meter	LC11 – A	046	0.5	05/09/2007	05/09/2007-04/09/2008
					04/09/2008	04/09/2008-03/09/2009
					03/09/2009	03/09/2009-02/09/2010
Moisture content of the biomass residues	Electric blast oven	DHG-9145A	0900466	0.02	05/09/2007	05/09/2007-04/09/2008
					04/09/2008	04/09/2008-03/09/2009
					03/09/2009	03/09/2009-02/09/2010
	Electronic balance	TE4101 -L	24390302	III	04/09/2007	04/09/2007-03/09/2008
					03/09/2008	03/09/2008-02/09/2009
					02/09/2009	02/09/2009-01/09/2010

Table 3 Balance for Biomass Purchase Quantity and Stock Changes

⁵ The weight belt 1 was installed on 22 December 2008

⁶ The weight belt 2 was installed on 1 April 2009

Year ⁷	Purchase Quantity (tonnes)	Combusted quantity (tonnes)	Stocks at the beginning of the period (tonnes)	Stocks at the end of the period (tonnes)
01/12/2007-24/12/2007	10,958.06	9,404.37	1,875.77	3,429.46
25/12/2007-24/12/2008	206,944.230	171,329.45	3,429.46	39,044.24
25/12/2008-24/12/2009	261,355.950	283,353.18	39,044.24	17,047.01
25/12/2009-24/02/2010	46,675.61	45,360.31	17,047.01	18,362.31

From the table above, it is showed that annually biomass consumption is less than purchase quantity, which is in line with actual situation and energy balance.

Table 4 The energy input and electricity generation in the project activity in this period

period	BF _{k,y} (ton) (dry base)	NCV _k (GJ/ton)	Energy input (GJ)	Electricity output (MW)	Energy output (GJ)	Efficiency (%)
30/11/2007 - 24/12/2008	150,114.24	17.624	2,645,590.343	121,755.86280	438,321.10608	16.57%
25/12/2008 - 08/03/2010	262,063.40	17.395	4,558,680.231	204,859.18728	737,493.07421	16.18%

According to the Technology Agreement of boiler, turbine and its thermodynamic system and generator, the efficiency of them are 91.3%, 36.74%, 97.6%. The electricity consumption rate by the project itself is 12%⁸. Therefore the efficiency of electricity supplied of project is $91.3\% \times 36.74\% \times 97.6\% \times (1 - 12\%) = 28.8\%$. The actual efficient of the project is lower than its theoretical value at optimal working condition, thus the value is reasonable.

Table 5. Balance for fossil fuel quantity and stock changes

Year ⁹	FC _{diesel,project,y} Purchase Quantity (liter)	FC _{diesel,project,y} consumed (liter)	Stocks at the beginning of the period (liter)	Stocks at the end of the period (liter)
23/11/2007-24/12/2007	16,187.05	10,758.38	143.95	5,572.62
25/12/2007-24/12/2008	147,449.44	145,475.86	5,572.62	7,546.20
25/12/2008-24/12/2009	197,269.00	201,767	7,546.20	3,048.20
25/12/2009-24/02/2010	25,765.17	25,567.65	3,048.20	3,245.72

6. Emergency procedures

⁷ The project owner conducted the stock-taking of biomass on 01/12/2007. After that, the project owner conducted stock-taking on 24th of each month. So, the values of stock at the start date and end date of monitoring period (i.e. 30/01/2007 and 08/03/2010) were not available. Therefore, the period of "Balance for Biomass purchase Quantity and Stock Changes" is not fully consistent with the monitoring period

⁸ This data is the average of monthly electricity consumption rate by the project itself covering from Dec 2007 to Feb 2010, which is calculated based on the electricity record using the formula "[total electricity generated by the project-net electricity supplied to grid]/ total electricity generated by the project"]

⁹ The project owner conducted the stock-taking of diesel on 22/11/2007 before the commissioning of the project. After the project was commissioned, the project owner conducted stock-taking on 24th of each month. So, the values of stock at the start date and end date of monitoring period (i.e. 30/01/2007 and 08/03/2010) were not available. Therefore, the period of "Balance for Fossil Fuel Quantity and Stock Changes" is not fully consistent with the monitoring period.

If the monitoring system occurred emergency accident, the data handling and reporting manager would report to project manager immediately and record the monitored data when the accident occurred and settled. And the emission reduction during this period would be estimated on conservative measures. If conservative measures were not available, the emission reduction should not be claimed during the failure period.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Based on the description of the methodology, the emission reductions by the project activity during a given year y can be calculated as follows:

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

Where:

- ER_y are emissions reductions of the project activity during the year y (tCO₂ e/yr)
- $ER_{electricity,y}$ are the emission reductions due to displacement of electricity during the year y (tCO₂ e/yr)
- $ER_{heat,y}$ are emission reductions due to displacement of heat during the year y (tCO₂ e/yr)
- $BE_{biomass,y}$ are Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year y (tCO₂e/yr)
- PE_y are Project emissions during the year y (tCO₂e/yr)
- L_y are Leakage emissions during the year y (tCO₂e/yr)

a) Baseline Emission due to displacement of electricity ($ER_{electricity,y}$)

$$ER_{electricity,y} = EG_{project\ plant,y} * EF_{electricity,y}$$

Where:

- $ER_{electricity,y}$ are the emission reductions due to displacement of electricity during the year y (tCO₂e/yr)
- $EG_{project\ plant,y}$ are the net quantity of electricity generation of the project activity during the year y in MWh,
- $EF_{electricity,y}$ is the CO₂ emission factor for the electricity displaced due to the project activity during the year y (CO₂e/ MWh).

Table 6 Baseline Emission due to displacement of electricity ($ER_{electricity,y}$)

Period	EG _{project plant,y} (MWh)	EF _{electricity,y} (tCO ₂ e/MWh)	ER _{electricity,y} (tCO ₂ e)
30/11/2007-24/12/2007	5,965.5816	0.996	5,941.719
25/12/2007-24/12/2008	115,790.2812	0.996	115,327.120
25/12/2008-24/12/2009	182,580.28272	0.996	181,849.962
25/12/2009-08/03/2010	22,278.90456	0.996	22,189.789

b) Emission reductions due to displacement of heat ($ER_{heat,y}$)

Table 7 Emission reductions due to displacement of heat ($ER_{heat,y}$)

Period	ER _{heat,y} (tCO ₂ e)
30/11/2007-24/12/2007	0

25/12/2007-24/12/2008	0
25/12/2008-24/12/2009	0
25/12/2009-08/03/2010	0

c) Baseline emissions due to nature decay or burning of anthropogenic sources of biomass ($BE_{biomass,y}$)

$$BE_{biomass,y} = GWP_{CH_4} * \sum_k BF_{PJ,k,y} * NCV_k * EF_{burning,CH_4,k,y}$$

Where:

$BE_{Biomass,y}$ is baseline emissions due to natural decay or burning of anthropogenic sources of biomass residue during the year y (tCO₂e/year) ,

GWP_{CH_4} is the Global Warming Potential for methane valid for the relevant commitment period (21tCO₂/tCH₄),

NCV_k is the net calorific value of the biomass residue type k in GJ/ton,

$BF_{PJ,k,y}$ is the incremental quantity of biomass type k used as a result of the project activity in the project plant during the year y (ton).,

$EF_{burning,CH_4,k,y}$ is CH₄ emission factor for uncontrolled burning of the biomass residue type k during year y (tCH₄/GJ)

$NCV_k * EF_{burning,CH_4,k,y} = 0.001971$ tCH₄/ton

Table 8 Baseline emissions due to nature decay or burning of anthropogenic sources of biomass ($BE_{biomass,y}$)

Period	BF _{k,y} (ton, dry base)	NCV _k * EF _{burning,CH₄,i} (tCH ₄ /ton)	GWP _{CH₄} (tCO ₂ e/tCH ₄)	BE _{biomass,y} (tCO ₂ e)
30/11/2007-24/12/2007	8,728.78	0.001971	21	361.293
25/12/2007-24/12/2008	141,385.46	0.001971	21	5,852.086
25/12/2008-24/12/2009	229,494.02	0.001971	21	9,498.987
25/12/2009-08/03/2010	32,569.38	0.001971	21	1,348.079

4.2 Project Emissions

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH_4} * PE_{Biomass,CH_4,y}$$

Where:

PE_y are Project CO₂ emissions during the year y (tCO₂)

PET_y are Project emission during the year y due to transportation of the biomass to the project (tCO₂)

$PEFF_y$ are the CO₂ emissions during the year y due to fossil fuels co-fired by the generation facility or other fossil fuels consumption at the project site that is attributable to the project activity (tCO₂e/year),

$PE_{EC,y}$ are the CO₂ emissions during the year y due to electricity consumption at the proposed project that is attributable to the project activity (tCO₂e/year) .

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

$PE_{Biomass,CH_4,y}$ is the CH₄ emissions from the combustion of biomass during the year y(tCH₄/year).

Table 9 Project emissions

Period	PET _y (tCO ₂ e)	PEFF _y (tCO ₂ e)	GWP _{CH₄} * PE _{biomass,CH₄,y} (tCO ₂ e)	PE _{EC,y} (tCO ₂ e)	PE _y (tCO ₂ e)
30/11/2007-24/12/2007	98.788	19.129	134.177	156.359	408.453
25/12/2007-24/12/2008	888.780	408.427	2,140.463	767.691	4,205.362
25/12/2008-24/12/2009	1,147.834	566.466	3,453.013	414.610	5,581.923
25/12/2009-08/03/2010	192.091	90.536	484.908	316.571	1,084.106

a) Carbon dioxide emissions from combustion of fossil fuels for transportation of maize stalks (**PET_y**)

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} \cdot AVD_y \cdot EF_{km,CO_2,y}$$

Where:

PET_y are CO₂ emissions during the year y due to transport of biomass residues to the project plant (tCO₂e/year).

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

EF_{km,CO₂,y} is the average CO₂ emission factor for the trucks measured in t CO₂e/km.

BF_{T,k,y} is the quantity of biomass residue type k that has been transported to the project site during the year y (ton of dry matter)..

TL_y is the average truck load of the trucks used (ton) during the year y

Table 10 Carbon dioxide emissions from combustion of fossil fuels for transportation of maize stalks

Period	Σ BF _{T,k,y} (tons, wet base)	Moisture (%)	Σ BF _{T,k,y} (tons, dry base)	TL _y (tons)	AVD _y (km)	EF _{km,CO₂} (tCO ₂ e/km)	PET _y (tCO ₂ e)
30/11/2007-24/12/2007	11,117.87	15.64%	9,378.94	7.54	78.53	0.001011	98.788
Total 20/11/2007-24/12/2007	11,117.87		9,378.94				98.788
25/12/2007-24/01/2008	15,807.59	14.38%	13,533.70	7.98	49.76	0.001011	85.274
25/01/2008-24/02/2008	19,530.82	22.71%	15,095.98	10.81	46.18	0.001011	65.206
25/02/2008-24/03/2008	9,783.91	15.74%	8,243.83	8.89	50.37	0.001011	47.237
25/03/2008-24/04/2008	13,741.21	13.88%	11,834.16	9.50	46.62	0.001011	58.693
25/04/2008-24/05/2008	11,290.18	27.83%	8,148.67	8.64	51.92	0.001011	49.478
25/05/2008-24/06/2008	12,204.72	13.87%	10,512.27	8.63	46.27	0.001011	56.968
25/06/2008-24/07/2008	16,961.38	18.77%	13,778.39	7.32	49.03	0.001011	93.261
25/07/2008-24/08/2008	11,608.72	14.80%	9,890.50	9.56	44.34	0.001011	46.364
25/08/2008-24/09/2008	21,896.28	25.40%	16,334.60	10.75	45.92	0.001011	70.516
25/09/2008-24/10/2008	22,916.18	20.54%	18,209.63	8.24	51.38	0.001011	114.795
25/10/2008-24/11/2008	23,880.20	14.05%	20,524.43	13.38	47.49	0.001011	73.656
25/11/2008-24/12/2008	27,323.04	14.26%	23,427.25	8.96	48.19	0.001011	127.332
Total 25/12/2007-24/12/2008	206,944.23		169,533.43				888.780
25/12/2008-24/01/2009	18,476.53	16.64%	15,401.80	8.04	49.51	0.001011	95.891
25/01/2009-24/02/2009	11,158.13	15.83%	9,391.77	8.83	50.74	0.001011	54.580
25/02/2009-24/03/2009	31,347.73	16.91%	26,046.13	7.37	53.81	0.001011	192.347

25/03/2009-24/04/2009	24,291.63	15.28%	20,579.20	7.52	49.21	0.001011	136.095
25/04/2009-24/05/2009	15,154.31	18.65%	12,327.43	9.63	46.92	0.001011	60.695
25/05/2009-24/06/2009	22,843.04	18.03%	18,725.46	10.69	45.90	0.001011	81.261
25/06/2009-24/07/2009	29,366.25	20.01%	23,489.80	13.13	47.30	0.001011	85.525
25/07/2009-24/08/2009	17,937.57	18.05%	14,699.54	9.10	47.75	0.001011	77.968
25/08/2009-24/09/2009	14,823.56	20.22%	11,826.92	8.73	46.46	0.001011	63.631
25/09/2009-24/10/2009	12,900.10	20.21%	10,293.30	9.53	44.23	0.001011	48.310
25/10/2009-24/11/2009	25,740.18	19.11%	20,820.69	9.98	47.34	0.001011	99.842
25/11/2009-24/12/2009	37,316.92	28.99%	26,497.47	8.56	48.46	0.001011	151.689
Total 25/12/2008-24/12/2009	261,355.95		210,099.51				1147.834
25/12/2009-24/01/2010	33,640.51	34.30%	22,102.85	7.23	39.41	0.001011	121.802
25/01/2010-24/02/2010	13,035.10	27.83%	9,407.57	8.61	51.82	0.001011	57.245
25/02/2010-08/03/2010	2,386.71	29.37%	1,685.85	6.43	49.23	0.001011	13.044
Total 25/12/2009-08/03/2010	49,062.32		33,196.26				192.091

b) Carbon dioxide emissions from on-site consumption of fossil fuels ($PEFF_y$)

$$PEFF_y = \sum_{i,j} FF_{j,i,y} * COEF_{i,y}$$

$$COEF_{i,y} = NCV_{i,y} * EF_{CO_2,FF,i}$$

Where:

$FF_{j,i,y}$ 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 fossil fuel type i in year y (tCO_2 /mass or volume unit of fossil fuel);

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

$NCV_{i,y}$ weighted average net calorific value of fossil fuel type i in year y (GJ/mass or volume unit), which is 42.652GJ/ton for diesel¹⁰.

$EF_{CO_2,FF,i}$ CO_2 emission factor for the fossil fuel type i (tCO_2 /GJ), which can be estimated at 0.0748 tCO_2 /GJ for diesel¹¹.

Table 11 Carbon dioxide emissions from on-site consumption of fossil fuels ($PEFF_y$)

Period	$FF_{project\ plant,i,y}$ (liter)	$FF_{project\ site,i,y}$ (liter)	density of diesel (kg/liter diesel)	$FF_{project\ plant,i,y}$ + $FF_{project\ site,i,y}$ (tons, from plant daily logs)	$NCV_{diesel,y}$ (GJ/ton)	$EF_{CO_2,FF,diesel}$ (tCO_2 /GJ)	$PEFF_y$ (tCO_2e)
30/11/2007-24/12/2007	0	6,813.49	0.88	5.996	42.652	0.0748	19.129
25/12/2007-24/12/2008	0	145,476.86	0.88	128.019	42.652	0.0748	408.427

¹⁰ China Energy Statistical Yearbook 2011

¹¹ Data source: Upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.

25/12/2008-24/12/2009	0	201,767	0.88	177.555	42.652	0.0748	566.466
25/12/2009-08/03/2010	0	32,247.65	0.88	28.378	42.652	0.0748	90.536

c) Carbon dioxide emissions from electricity consumption ($PE_{EC,y}$)

$$PE_{EC,y} = (EC_{PJ,y} + EG_{PJ,y}) \times EF_{grid,y} \times (1 + TDL_y)$$

Where:

$PE_{EC,y}$ is the project emissions from electricity consumption by the project activity during the year y (tCO₂e/year).

$EC_{PJ,y}$ is the quantity of electricity consumed by the project activity during the year y (MWh),

$EG_{PJ,y}$ is the quantity of electricity consumption at the biomass residue storage sites (MWh)

$EF_{grid,y}$ is the emission factor for the grid in year y (tCO₂e/ MWh)

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

Table 12 Carbon dioxide emissions from electricity consumption ($PE_{EC,y}$)

Period	Electricity consumed (MWh)	$EF_{grid,y}$ (tCO ₂ e/MWh)	TDL_y	$PE_{EC,y}$ (tCO ₂ e)
30/11/2007-24/12/2007	130.82256	0.996	20%	156.359
25/12/2007-24/12/2008	642.312	0.996	20%	767.691
25/12/2008-24/12/2009	346.896	0.996	20%	414.610
25/12/2009-08/03/2010	264.86856	0.996	20%	361.571

d) Methane emissions from combustion of maize stalks ($PE_{Biomass,CH_4,y}$)

$$PE_{Biomass,CH_4,y} = EF_{CH_4,BF} * \sum_k BF_{k,y} * NCV_k$$

Where:

$PE_{Biomass,CH_4,y}$ are methane emissions from combustion of maize stalks (tCO₂e/year),

$BF_{k,y}$ is the quantity of maize stalks used as fuel in the project plant during the year y in tons in dry matter (ton),

NCV_k is the net calorific value of the maize stalks in TJ per tons

$EF_{CH_4,BF}$ is the CH₄ emission factor for controlled burning of the maize stalks in tCH₄/TJ.

Methane emissions in both the baseline and project scenario are calculated from the amount of biomass residue burned in the project plant. The quantities and energy content are monitored. With the $GWP_{CH_4} = 21$, and the methane emissions factor for burning biomass in a controlled manner $EF_{CH_4,i} = 30$ kgCH₄/TJ with a conservativeness factor of 1.37.

Table 13 Methane emissions from combustion of maize stalks ($PE_{Biomass,CH_4,y}$)

Period	BFk,y(ton) (wet base)	Moisture (%)	BFk,y (ton) (dry base)	NCV _k (GJ/ton) (dry base)	EF _{CH₄,BF} (tCH ₄ /GJ)	GWP (tCO ₂ e/CH ₄)	GWP _{CH₄*} PE _{biomass,CH₄,y} (tCO ₂ e)
30/11/2007-24/12/2007	10,347.17	15.64%	8,728.78	17.810	0.0000411	21	134.177
Total 30/11/2007-24/12/2007							134.177
25/12/2007-24/01/2008	9,284.51	14.38%	7,948.95	17.810	0.0000411	21	122.190
25/01/2008-24/02/2008	10,382.47	22.71%	8,024.94	17.810	0.0000411	21	123.358
25/02/2008-24/03/2008	12,478.23	15.74%	10,514.04	17.810	0.0000411	21	161.620
25/03/2008-24/04/2008	12,918.35	13.88%	11,125.50	17.670	0.0000411	21	169.675
25/04/2008-24/05/2008	0.00	27.83%	0.00	17.670	0.0000411	21	0.000
25/05/2008-24/06/2008	11,357.18	13.87%	9,782.26	17.670	0.0000411	21	149.189
25/06/2008-24/07/2008	11,242.71	18.77%	9,132.89	17.670	0.0000411	21	139.286
25/07/2008-24/08/2008	10,484.48	14.80%	8,932.66	17.670	0.0000411	21	136.232
25/08/2008-24/09/2008	23,865.20	25.40%	17,803.41	17.380	0.0000411	21	267.063
25/09/2008-24/10/2008	21,616.18	20.54%	17,176.63	17.380	0.0000411	21	257.661
25/10/2008-24/11/2008	21,990.77	14.05%	18,900.51	17.380	0.0000411	21	283.521
25/11/2008-24/12/2008	25,709.37	14.26%	22,043.67	17.380	0.0000411	21	330.670
Total 25/12/2007-24/12/2008							2,140.463
25/12/2008-24/01/2009	25,357.28	16.64%	21,137.51	17.380	0.0000411	21	317.077
25/01/2009-24/02/2009	26,369.09	15.83%	22,194.80	17.380	0.0000411	21	332.937
25/02/2009-24/03/2009	24,156.13	16.91%	20,070.79	17.570	0.0000411	21	304.367
25/03/2009-24/04/2009	18,838.48	15.28%	15,959.44	17.570	0.0000411	21	242.020
25/04/2009-24/05/2009	26,528.48	18.65%	21,579.87	17.570	0.0000411	21	327.251
25/05/2009-24/06/2009	29,381.38	18.03%	24,085.23	17.570	0.0000411	21	365.244
25/06/2009-24/07/2009	28,351.07	20.01%	22,677.77	17.570	0.0000411	21	343.901
25/07/2009-24/08/2009	11,079.38	18.05%	9,079.36	17.570	0.0000411	21	137.686
25/08/2009-24/09/2009	25,102.33	20.22%	20,027.79	17.250	0.0000411	21	298.183
25/09/2009-24/10/2009	20,579.00	20.21%	16,420.48	17.250	0.0000411	21	244.476
25/10/2009-24/11/2009	24,838.22	19.11%	20,091.11	17.250	0.0000411	21	299.126
25/11/2009-24/12/2009	22,772.34	28.99%	16,169.86	17.250	0.0000411	21	240.745
Total 25/12/2008-24/12/2009							3,453.013
25/12/2009-24/01/2010	24,545.85	34.30%	16,127.38	17.250	0.0000411	21	240.112
25/01/2010-24/02/2010	20,814.46	27.83%	15,022.01	17.250	0.0000411	21	223.655
25/02/2010-08/03/2010	2,010.33	29.37%	1,419.99	17.250	0.0000411	21	21.142
total 25/12/2009-08/03/2010							484.908

Note: k=maize stalks

4.3 Leakage

A detailed survey of the biomass supply/demand situation in the area has been arranged annually. The result is shown below:

Table14 Demonstration of an abundant surplus of the maize stalks in the region of the project activity which is not utilized.

Unit: 10 ⁴ ton	Year 2007	Year 2008	Year 2009	Year 2010
Available Biomass in the region	135.8	141.3	149.7	160
Biomass utilized out of the project (civil burning use, livestock feed and fufural plant consumption and etc)	47.5	51.8	56.9	47.3
Biomass utilized by the project	1.035	17.133	28.335	20.074
Total biomass utilized, including the project	48.535	68.933	85.235	67.374
Available Biomass/Total biomass utilized	280%	205%	176%	237%
Available Biomass/Total biomass utilized -100%	180%	105%	76%	137%
Abundant surplus? (More than 25%)	Yes	Yes	Yes	Yes
Note: The data of available biomass and biomass utilized out of the project in the region was calculated from official data provided by Liaoyuan City government. The data of biomass utilized by the project was from the annual biomass consumed record by project owner.				

From the above-mentioned background, it was known that the biomass supply is far more than the demand by the project. The conclusion is the biomass supply to the project during the monitoring period was sufficient and did not lead to the displacement of the current use of biomass as a fuel.

And, because the biomass residues collection range is with 50 km which was defined in PDD, leakage for the project is considered zero, according to ACM0006 version6.2.

4.4 Summary of GHG Emission Reductions and Removals

Years	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
30/11/2007-24/12/2007	6,303	409	0	5,894
25/12/2007-24/12/2008	121,179	4,206	0	116,973
25/12/2008-24/12/2009	191,348	5,582	0	185,766
25/12/2009-08/03/2010	23,537	1,085	0	22,452
Total	342,367	11,282	0	331,085

A comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the VCS-PD is shown below:

period	Values applied in ex-ante calculation	Actual values reached during
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	of the VCS-PD (tCO ₂ e)	the monitoring period (tCO ₂ e)
30/11/2007-24/12/2007 (25 days)	13,023	5,894
25/12/2007-24/12/2008	190,139	116,973
25/12/2008-24/12/2009	190,139	185,766
25/12/2009-08/03/2010 (74 days)	38,549	22,452
Total	431,850	331,085

5 ADDITIONAL INFORMATION

no information