Monitoring Report

Volume1
Version 1.0
15 Jun 2009

Start monitoring period: 20 March 2008
End monitoring period: 25 March 2009

Title: Shandong Gaotang 30MW Biomass Power Generation Project

UNFCCC Reference Number: 1375

Project owner
National Bio Energy Co., Ltd.

This Monitoring Report is approved by: Date:	National Bio Energy Co., Ltd. 15 Jun 2009
Project advisor: Chinese Renewable Energy Industries Association	Verifier: SGS

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1 Introduction

The purpose of this Monitoring Report is to calculate the emission reductions achieved by the project activity in the period covered by this report, and to serve as the basis for the verification of these reductions and issuance of the CERs.

1.1 Monitoring period

First monitoring period: 20 March 2008 –25 March 2009

2 Project description

2.1 Title

Shandong Gaotang 30MW Biomass Power Generation Project

2.2 UNFCCC Reference Number

1375

2.3 Project summary

The project activity is to collect and utilize biomass residues to generate electricity. The biomass residue fired power plant has a total installed capacity of 30 MW. The expected annual net generation of 145,000 MWh will be exported to the North China Power Grid.

2.4 Category of project activity

Using the approved methodology ACM0006 version 4, the category of the project activity is:

Sectoral scope 1: Energy industries
Category: grid connected renewable electricity

3 Project timeline

Table1. The project timeline

Commission and first electricity generation date	29 Jan 2007
CDM registration date	20 March 2008
Crediting period	First renewable crediting period (20 Mar 2008 - 19 Mar 2015)
This monitoring report	Volume 1
Start of this monitoring period	20 March 2008
End of this monitoring period	25 March 2009

4 Baseline methodology

4.1 Methodology

The project owner uses the approved consolidated monitoring methodology ACM0006 (version 4) regarding grid-connected electricity generation from biomass residues, in conjunction with ACM0002 (version 6) to establish the grid emissions factor for renewable energy projects. The grid emissions factor has been fixed for the first 7-year crediting period.

In each year the amount of CERs actually generated by the project will vary depending on the net electricity supplied to the grid, project emissions due to transport and fossil fuel use, on-site consumption of fossil fuels, electricity consumption and as well as methane emissions from the biomass combusted in the project scenario and avoided in the baseline as detailed in the PDD and summarized below.

4.2 Calculations Methodology

4.2.1 project emissions

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

$$PE_y = PET_y + PEFF\mathrm{y} + PE_{EC,\mathrm{y}} + GWP_{CH4} * PE_{\mathrm{Biomass},CH4,\mathrm{y}} \qquad (1)$$

Where：

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

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

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

$PE_{EC,y}$ are the CO_2 emissions during the year y due to electricity consumption by the proposed project during the year y in tons of CO_2 equivalents,

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

$PE_{Biomass,CH_4,y}$ are the CH_4 emissions from the combustion of biomass during the year y in tons of CH4..

a) Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass to the project plant (PET_y)

Following ACM0006 in the PDD, the project owner established the formulae for calculating the emissions from the transport of biomass residues to the project plant. The emissions were calculated in the PDD from the projected total amount of biomass residues combusted, the average truck load, average distance the biomass gets transported to the project plant, and the CO_2 emissions factor from fuel used for transportation. Because the number of truck trips are the result of the projected total amount of biomass residues divided by the average truck load, so during operation, the number of truck trips will be monitored so that the following formulae can be used:

$$PET_y = N_y \times AVD_y \times EF_{km,CO_2} \qquad (2)$$

Where：

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

N_y is the number of truck trips during the period y.

AVD_y is the average return trip distance between the biomass fuel supply site and the site of the project plant in kilometers (km).

EF_{km,CO_2} is the average CO_2 emission factor for the trucks measured in t CO_2/km.

TL_y is the average truck load of the trucks used measured in tons or volume of biomass.

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

A small quantity of fossil fuels may be combusted as auxiliary fuel for boiler start up. Following ACM0006 in the PDD, the project owner established the formulae for calculating the emissions from fossil fuel use in the project plant, using the quantity of each fuel used and the appropriate emissions coefficient, as follows:

$$PEFF_y = \sum_i (FF_{project,plant,i,y} + FF_{project,site,i,y}) * NCV_i * COEF_i \quad (3)$$

Where:

$PEFF_y$ are CO_2 emissions from on-site consumption of fossil fuels in the biomass power plant during the year y in tons of CO_2 equivalents,

$FF_{project,plant,i,y}$ is the quantity of fossil fuel type i combusted in the biomass power plant during the year y, which is zero.

$FF_{project,site,i,y}$ is the quantity of fossil fuel type i combusted at the project site for other purposes that are attributable to the project activity during the year y,

NCV_i is the Net calorific value of diesel（GJ/ton）, which is 42.652 GJ/ton,

$COEF_i$ is CO2 emission factor for the diesel（tCO2/GJ）, which is 0.0741 t CO2/GJ.

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

Almost all the on-site electricity consumption is provided by the proposed project itself, and power meters will be installed to measure the actual power purchased from the grid. Besides, the electricity consumption at the biomass residue storages sites is assumed 10 KWh/ton biomass..

Following ACM0006（Version 4）in the PDD, the project owner established the formulae for calculating the emissions from electricity consumption , using the quantity of electricity purchased and the appropriate emissions coefficient, as follows:

$$PE_{EC,y} = EC_{PG,y} * EF_{grid,y} \quad （4）$$

Where:

$PE_{EC,y}$ are CO_2 emissions from electricity consumption in the biomass power plant and the storages during the year y in tons of CO_2 equivalents,

$EC_{PG,y}$ is the quantity of electricity consumption in the biomass power plant and the storages during the year y,

$EF_{grid,y}$ is the CO_2 emission factor for the electricity consumped during the year y in tons of CO2/ MWh.

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

It was established in the PDD that the emissions can be calculated from the quantity of biomass that would not be used in absence of the project activity, with the net caloric value and the appropriate emissions factor, as follows:

$$PE_{Biomass,CH_4,y} = EF_{CH_4,BF} * \sum_{k} BF_{k,y} * NCV_k \quad (5)$$

Where:

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

$BF_{k,y}$ is the quantity of the biomass type k used as fuel in the project during the year y in a volume or mass unit,

NCV_k is the net calorific value of the biomass type k in terajoules (TJ) per mass or volume of biomass, and

$EF_{CH_4,BF}$ is the CH_4 emission factor for the combustion of biomass in the project in tons of CH_4 per TJ, which is 0.03 tCH4/TJ and the conservativeness factor is 1.37.

According to the recording of the project owner, cotton straw, maize straw, wood and cortices are used. For more information about these three types biomass, please refer to section7 of the monitoring report.

4.2.2 Baseline emissions

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

The project owner used ACM0002 in the PDD to establish the emissions factor for the net electricity generated by the project. Following this methodology, the emission reductions achieved by the project activity from electricity generation can be calculated by multiplying the net electricity supplied to the grid and the appropriate emissions factor of the grid.

The emission reductions from electricity $ER_{electricity,y}$ by the project activity during a given year y is

$$ER_{electricity,y} = EG_y \times EF_{electricity,y} \quad (6)$$

Where:

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

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

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

The emission factor $EF_{electricity,y}$ of the grid is represented as a combination of the Operating Margin and the Build Margin, and was fixed for the duration of the crediting period in the PDD. The Operating Margin emission factor $EF_{OM,y}$ was calculated in the PDD as 1.069 tCO_2e/MWh. The Build Margin emission factor $EF_{BM,y}$ was calculated as 0.880 tCO_2e/MWh. Where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., w_{OM} = w_{BM} = 0.5).So

$$EF_{electricity,y} = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y} = (1.069+0.880)/2=0.975 \ tCO_2/MWh$$

b) Baseline emissions due to uncontrolled burning of anthropogenic sources of biomass

($BE_{Biomass,y}$)

The project participants, using ACM0006（Version 4）, established in the PDD that methane emissions would occur in the baseline scenario. The biomass residue would have been burned in an uncontrolled manner or dumped and left to decay, generating significant methane emissions. Methane emissions from dumping biomass residues, and leaving them to decay, are higher than when they are burned in an uncontrolled manner. Therefore to be conservative, it is assumed, that all residues are burned.

Unused biomass burned in open-air is a conservative scenario, because the quantity of the GHG produced from natural decay of biomass is far more than that from biomass burning in open-air. Therefore, the emission from the unused biomass is calculated on the following equation:

$$BE_{Biomass,y} = GWP_{CH_4} * \sum_{k} BF_{PJ,k,y} * NCV_k * EF_{burning,CH_4,k,y} \qquad (7)$$

Where：

$BE_{Biomass,y}$ is emissions from the unused biomass during the year y in tons of CO_2 equivalents,

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

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

$BF_{PJ,k,y}$ is the quantity of biomass type k used as fuel in the project plant during the year y, which would in the absence of the project activity not used, i.e. be dumped, left to decay or burned in an un controlled manner without utilizing it for energy purpose, in a volume or mass unit, which is equal to $BF_{k,y}$,

$EF_{burning,CH_4,k,y}$ is CH_4 emission factor for uncontrolled burning of the biomass type k in tons CH_4 per ton, which is 0.0027 tCH4/ton and the conservativeness factor is 0.73..

c) Emission Reductions due to displacement heat

There is no central heating system in the project site, so the emission reduction due to displacement of heat is not considered for the biomass power plant.

4.2.3 Leakage

As stated in the baseline and monitoring methodology of the proposed project activity, leakage emissions will be calculated due to insufficient biomass supply. If the biomass supply is insufficient, biomass transportation from other consumers to the project site will cause additional fossil fuel consumption around the project site. The biomass in surplus will be monitored and recorded annually. On the condition that biomass supply proves sufficient, the emission leakage is zero. There are three options in the baseline methodology to demonstrate that the biomass used in the project power plant will not increase the fossil fuel consumption elsewhere. Among them, option 2 is: “Demonstrate that there is an abundant surplus of the biomass in the region of the project activity which is not utilized”. For this purpose, the project owner has to demonstrate that the quantity of available biomass in the region is at

least 25% larger than the quantity of biomass that is utilized (e.g. for energy generation or as feedstock), including the project plant. So the project owner has got biomass availability from local government during the monitoring period. The project owner demonstrated that the leakage from the project activity is zero, as the surplus of biomass residues is far greater than the quantity of residues used in the project plant. Please refer to table 11 for more information.

4.2.4 Emission Reductions

The proposed project achieves the GHG emissions by the way of displacement of fossil fuel-fired power and heat generation with the biomass-fired power and heat generation. The emission reductions during the year y are the baseline emissions (including $ER_{heat,y}$, $ER_{electriciy,y}$, $BE_{Biomass,y}$) by deducting the project emissions (PE_y) and leakage emissions (L_y). The equation is as follows:

$$ER_y = ER_{heat,y} + ER_{electriciy,y} + BE_{Biomass,y} - PE_y - L_y \quad (8)$$

Where:

ER_y is emissions reductions of the project activity during the year *y* (tCO_2/yr)

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

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

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

PE_y is project emissions during the year *y* (tCO_2/yr)

L_y is leakage emissions during the year *y* (tCO_2/yr)

5 Monitoring data

5.1 Monitoring equipments

The following table indicates details of the monitoring equipments including their accuracy levels:

Table2 the Monitoring equipments of the project

No.	Name	Type	Description	Made by	Accuracy	Serial No.
1	Electric Energy Meter	DTSD341	To monitor the electricity export and import at the project site	Changsha weisheng	0.5s	200701041030314
2	Electric		To monitor			

	Energy Meter		the electricity output at the transformation station			200306083C0123
3	Calorimeter (set up in the power plant)	SDACM3000	To monitor the NCV_k of biomass	Hunan Sande technology development Co.,LTD	0.1%	1406128
4	electric truck scale	SCS-30	To monitor the weight of biomass transported to the power plant	Jinan Jingzhong Electronic Scale., Ltd	III	20061206
5	electric truck scale	SCS-30	To monitor the weight of biomass transported to the power plant	Jinan Jingzhong Electronic Scale., Ltd	III	20070701

5.2 Parameters monitored

The parameters which are monitored are:

a) **Biomass Type (** $Type$ **):** The type of biomass are recorded when they are transported to the plant. Cross-check will be conducted based on the invoice for biomass purchase. According the data, Cotton straw, Wood and cortices, Wheat bran are used in the power plant.

b) **The net calorific value of biomass type k (** NCV_k **):** The biomass will be sampled and the NCV of them will be monitored by calorimetric when they are transported to the plant. During the monitoring period, the project owner monitored them by themselves. First, the operator took one sample of the each kind of biomass every day and then inspected their values, which were put down on the quality inspection report. And then the monthly weighted average value of each kind of biomass is adopted. The monthly weighted average value is calculated as:

$$NCV_k = \frac{\sum (BF_{i,k} * NCV_{i,k})}{\sum BF_{i,k}}$$

Where:

NCV_k: is the monthly net caloric value of biomass k (TJ/ton),

$BF_{i,k}$: is the amount of biomass k transported to the power plant in day i (t)

$NCV_{i,k}$: is the net caloric value of biomass k in day i (TJ/ton),

k: is the type of biomass, includes Cotton straw, Wood cortices and Wheat bran.,

i: is the number of days in one month

c) **Biomass consumption ($BF_{k,y}$):** Measured using purchase and inventory data. All purchase records, invoices, Biomass available in the store and biomass quantity issued for production is available at the plant site for verification.

d) **The average return trip distance (AVD_y):** The project owner named each site and measured the distances of different collection site by map. The statistic finds which collection site it is from and put down the name of collection site when each truck arrives. And then distance of biomass can be identified and is put down in the data collection system. Finally, the weighted average value is adopted for every month. The monthly weighted average value is calculated as:

$$AVD_k = \frac{\sum (D_i * N_{i,k})}{\sum N_{i,k}}$$

Where:

AVD_k: the weighted average distance in month k(km),

$N_{i,k}$: the number of truck trips from collection site i in month k,

D_i: the distance from the collection site i to the power plant(km),

k: the number of month,

i: the number of the collection site i.

e) **Number of truck trips for the transportation of biomass (N_y):**Whenever the truck arrives in the power plant, the statistician puts down the number in the data collection system and it will be multiplied by 2 when calculating project emissions.

f) **Average CO_2 emission factor for transportation of biomass with trucks** (EF_{km,CO_2} **):** This is default values from the IPCC manual.

g) **CO_2 emission factor for the fuel type i:** The grass-grasping machine in project use diesel, and the CO_2 emission factor for diesel is 42.652 GJ/ton.

h) **The quantity of diesel oil to be used setups of the project ($FF_{projectplant,\,y}$):** The project does not use any fossil fuel and therefore it is not monitored.

i) **The quantity of diesel oil attributes to the project activity ($FF_{projecsite,\,y}$):**The grass-grasping machine in project use diesel and the amount will be monitored when these machines go for oiling.,

j) **The quantity of power electricity connected to the grid (EG_y):** The quantity of the electricity will be measured by the meter. There are two meters to be installed for the proposed project. One is in

the transformation station by the grid company and the other is in the project plant by the project owner. The meter installed by the grid company is the main meter and the meter installed by the project owner is just complementary to the main meter. The data from these two meters will be recorded in detail. And the main meter is calibrated by Liaocheng city power supply bureau.

k) The net quality of heat generated from the combined heart and power (Q_y): For some reason, there is no central heating system in the project site, so the project never supply heat to the users.

l) Amount of biomass used in other ways except used by the proposed project in the area from where the biomass is collected: This is obtained from official data. Please refer to table 11 for more details.

m) The quantity of biomass that is available in surplus in the area from where the biomass is collected: This is obtained from official data. Please refer to table 11 for more details.

6 Quality assurance and quality control measures

6.1 Roles and responsibilities

National Bio Energy Co., Ltd is the project owner. The staff from the onsite company will conduct the monitoring procedures and work based on the monitoring methodology described.

The monitoring data such as all kinds of tables for different monitoring parameters, reports will be processed and stored first in the plant office, and will be sent periodically to the National Bio Energy Co., Ltd headquarter for Quality Assurance and final processing.

The following table shows the responsibilities for carrying out the monitoring plan after the operation of proposed power plant.

Table3. the Monitoring equipments of the project

Main technical supervision	Zhu Liangyi
Data acquisition (continuously, monthly and annually)	Lin Li ang
Emission Reduction calculation (monthly and annually)	Yu Lu
Main monitoring supervision (continuously)	Yu Lu

6.2 Training

The staffs responsible for monitoring or for auditing these data have been trained according to the CDM monitoring and management methodology.

6.3 Calibrations

All metering equipments are calibrated and checked for accuracy in line with industry standards.

6.4 Quality control

Monitored data has been cross-checked with invoicing, approved and signed off.

7 Emission reduction calculations

7.1 Project emissions

Project emissions are the sum of the emissions from transport, onsite fossil fuel use and methane emissions from burning biomass residues in the project plant:

a) Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass to the project plant (PET_y **)**

$$PET_y = N_y \times AVD_y \times EF_{km,CO_2}$$

Transport emissions are calculated from the number of truck round trips for the transportation of biomass. The radius from each collection site is used for the round trip distance the biomass gets transported to the project plant, and the CO_2 emissions factor from fuel used for transportation is fixed in PDD as 1.011kgCO_2/km.

Table 4. Monitored data for transport emissions and calculation of PET_y

Period	N_y	AVD_y (km)	$EF_{km,CO2}$ ($kgCO_2$/km)	PETy (tCO_2e)
	A1	B1	C1	D1=A1*B1*C1/1000
20/03/2008-29/03/2008	913	58.17	1.011	54
30/03/2008-28/04/2008	1609	60.9	1.011	100
29/04/2008-29/05/2008	1935	57.78	1.011	114
30/05/2008-28/06/2008	1809	55.25	1.011	102
29/06/2008-29/07/2008	2108	61.26	1.011	131
30/07/2008-28/08/2008	2193	53.06	1.011	118
29/08/2008-26/09/2008	1590	36.48	1.011	59
27/09/2008-25/10/2008	1124	33.95	1.011	39
26/10/2008-25/11/2008	1628	44.71	1.011	74
26/11/2008-25/12/2008	3996	41.79	1.011	169
26/12/2008-22/01/2009	3811	47.1	1.011	182
23/01/2009-22/02/2009	1898	38.61	1.011	75
23/02/2009-25/03/2009	4102	48.29	1.011	201
Total				1418

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

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

Table 5. Monitored data for emissions from on-site consumption of fossil fuels ($PEFF_y$ **)**

Period	$FF_{project\ plant,i,y}+FF_{project\ site,i,y}$（t）	NCV_i（GJ/ton）	$COEF_i$(tCO2/GJ)	PEFFy (tCO_2e)
	A2	B2	C2	D2=A2*B2*C2
20/03/2008-29/03/2008	2.03	42.652	0.0741	7
30/03/2008-28/04/2008	7.1	42.652	0.0741	23
29/04/2008-29/05/2008	7.15	42.652	0.0741	23
30/05/2008-28/06/2008	6.97	42.652	0.0741	23
29/06/2008-29/07/2008	8.42	42.652	0.0741	27
30/07/2008-28/08/2008	7.25	42.652	0.0741	23
29/08/2008-26/09/2008	8.44	42.652	0.0741	27
27/09/2008-25/10/2008	7.29	42.652	0.0741	24
26/10/2008-25/11/2008	8.8	42.652	0.0741	28
26/11/2008-25/12/2008	10.56	42.652	0.0741	34
26/12/2008-22/01/2009	6.17	42.652	0.0741	20
23/01/2009-22/02/2009	7.84	42.652	0.0741	25
23/02/2009-25/03/2009	8.6	42.652	0.0741	28
Total	96.62			312

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

$$PE_{EC,y} = EC_{PG,y} * EF_{grid,y}$$

The electricity consumption at the biomass residue storages sites is assumed 10 KWh/ton biomass.

Table 6. Monitored data for emissions from on-site consumption of fossil fuels ($PE_{EC,y}$)

Period	$EG_{PG,y}$（MWh）	$EF_{electricity,y}$ (tCO_2e/MWh)	$PE_{EC,y}$ (tCO_2e)
	A4	B4	C4
20/03/2008-29/03/2008	77.415	0.975	75
30/03/2008-28/04/2008	205.241	0.975	200
29/04/2008-29/05/2008	187.590	0.975	183
30/05/2008-28/06/2008	187.814	0.975	183
29/06/2008-29/07/2008	135.369	0.975	132
30/07/2008-28/08/2008	228.096	0.975	222
29/08/2008-26/09/2008	148.668	0.975	145
27/09/2008-25/10/2008	139.366	0.975	136
26/10/2008-25/11/2008	148.164	0.975	144
26/11/2008-25/12/2008	311.595	0.975	304
26/12/2008-22/01/2009	359.231	0.975	350
23/01/2009-22/02/2009	192.549	0.975	188
23/02/2009-25/03/2009	530.257	0.975	517
Total	2851.355		2779

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

$$PE_{Biomass,CH_4,y} = EF_{CH_4,BF} * \sum_{k} BF_{k,y} * NCV_{k}$$

Methane emissions in both the baseline and project scenario are calculated from the amount of biomass residue burned in the project plant. Three kinds of biomass are used. The quantities and energy content are monitored. With the GWP_{CH4} = 21, and the methane emissions factor for burning biomass in a controlled manner $EF_{CH4,i}$ = 30 $kgCH_4/TJ$ with a conservativeness factor of 1.37.

Table 7. Monitored biomass fuel quantities $BF_{k,y}$, NCV_k and calculation of $PE_{Biomass,CH_4,y}$

Period	BF_1(t)	NCV_1(TJ/t)	BF_2(t)	NCV_2(TJ/t)	BF_3(t)	NCV_3(TJ/t)	EF_{CH4} (tCH4/TJ)	Conservative factor	$PE_{biomass,CH4,y}$ (tCH4)
	A3	B3	C3	D3	E3	F3	G3	H3	I3=(A3*B3+C3*D3+E3*F3)*G3*H3
20/03/2008-29/03/2008	3373.21	0.01318	4143.11	0.01229	225.16	0.01275	0.03	1.37	5
30/03/2008-28/04/2008	3726.1	0.01229	11663.69	0.01125	118.35	0.01176	0.03	1.37	8
29/04/2008-29/05/2008	3750.37	0.01177	9907.54	0.01241	745.13	0.00972	0.03	1.37	8
30/05/2008-28/06/2008	5006.38	0.01192	5547.47	0.01160	439.53	0.01120	0.03	1.37	6
29/06/2008-29/07/2008	5768.64	0.01063	6800.46	0.01191	43.82	0.01312	0.03	1.37	6
30/07/2008-28/08/2008	5273.95	0.01086	10521.31	0.01139	546.34	0.01238	0.03	1.37	8
29/08/2008-26/09/2008	349.3	0.01186	11868.75	0.01243	2516.7	0.01358	0.03	1.37	8
27/09/2008-25/10/2008	663.95	0.01165	6197.91	0.01153	2322.76	0.01176	0.03	1.37	5
26/10/2008-25/11/2008	2984.75	0.01155	7433.64	0.01199	438.04	0.01090	0.03	1.37	6
26/11/2008-25/12/2008	16730.66	0.01174	7785.54	0.00939	2815.26	0.00827	0.03	1.37	13
26/12/2008-22/01/2009	18452.54	0.00915	8090.04	0.00912	1460.56	0.00734	0.03	1.37	11
23/01/2009-22/02/2009	7707.18	0.01185	3124.07	0.01053	2483.64	0.00734	0.03	1.37	6
23/02/2009-25/03/2009	9647.39	0.01257	36976.48	0.01091	1253.78	0.00824	0.03	1.37	22
Total	83434.42		130060.01		15409.07				112

Note: BF_1 =Cotton straw, BF_2 = wood and cortices, BF_3 =wheat bran

Table 8. Project Emission（ PE_y ）calculation

Period	PETy (tCO_2e)	PEFFy (tCO_2e)	$PE_{biomass,CH4,y}$ (tCH4)	$PE_{EC,y}$ (tCO2e)	GWP_{CH4} (tCO_2e/tCH_4)	PEy (tCO_2e)
	A5=D1	B5=D2	C5=I3	D5=C4	E5	F5=A5+B5+D5+C5*E5
20/03/2008-29/03/2008	54	7	5	75	21	241
30/03/2008-28/04/2008	100	23	8	200	21	491
29/04/2008-29/05/2008	114	23	8	183	21	488
30/05/2008-28/06/2008	102	23	6	183	21	434
29/06/2008-29/07/2008	131	27	6	132	21	416
30/07/2008-28/08/2008	118	23	8	222	21	531
29/08/2008-26/09/2008	59	27	8	145	21	399
27/09/2008-25/10/2008	39	24	5	136	21	304
26/10/2008-25/11/2008	74	28	6	144	21	372
26/11/2008-25/12/2008	169	34	13	304	21	780
26/12/2008-22/01/2009	182	20	11	350	21	783
23/01/2009-22/02/2009	75	25	6	188	21	414
23/02/2009-25/03/2009	201	28	22	517	21	1208
Total	1418	312	112	2779		6861

7.2 Baseline emissions

Baseline emissions are the sum of the emissions from displaced electricity, and the methane emissions from the burning of biomass residues in an uncontrolled manner in the baseline scenario:

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

$$ER_{electricity,y} = EG_y \times EF_{electricity,y}$$

Project net electricity generation is monitored through the use of onsite metering equipment. With the emissions factor fixed for the crediting period, net electricity generation is calculated from total supply to the grid and total imports from the grid at the power plant. With EF_y established and fixed in the PDD as 0.9421 tCO_2e/MWh

All metering equipment is calibrated regularly in line with industry standards. In addition, total supply and total imports are checked against invoices.

Table 9. Monitored electricity data and calculation of $ER_{electricity,y}$

Period	EG_y (MWh)	$EF_{electricity,y}$ (tCO_2e/MWh)	$ER_{electricity,y}$ (tCO_2e)
	A6	B6	C6=A6*B6
20/03/2008-29/03/2008	5427.84	0.975	5292
30/03/2008-28/04/2008	12101.76	0.975	11799
29/04/2008-29/05/2008	14388	0.975	14028
30/05/2008-28/06/2008	13405.92	0.975	13070
29/06/2008-29/07/2008	14621.64	0.975	14256

30/07/2008-28/08/2008	11808.72	0.975	11513
29/08/2008-26/09/2008	15475.68	0.975	15088
27/09/2008-25/10/2008	14320.68	0.975	13962
26/10/2008-25/11/2008	14982	0.975	14607
26/11/2008-25/12/2008	17463.6	0.975	17027
26/12/2008-22/01/2009	15028.2	0.975	14652
23/01/2009-22/02/2009	15805.68	0.975	15410
23/02/2009-25/03/2009	15330.48	0.975	14947
Total	180160.2		175651

b) Baseline emissions due to uncontrolled burning of anthropogenic sources of biomass ($BE_{Biomass,y}$ **)**

Unused biomass burned in open-air is a conservative scenario, because the quantity of the GHG produced from natural decay of biomass is far more than that from biomass burning in open-air. Therefore, the emission from the unused biomass is calculated on the following equation:

$$BE_{Biomass,y} = GWP_{CH_4} \times \sum_i BF_{i,y} \times NCV_{Biomass,i} \times EF_{burning,CH_4,i}$$

With the GWP_{CH_4} = 21, and the methane emissions factor for burning biomass in an uncontrolled manner $EF_{burning,CH_4,i}$ = 300 kgCH4/TJ with a conservativeness factor of 0.73.

Table 10. Monitored biomass fuel quantities $BF_{i,y}$, NCV_i and calculation of $BE_{Biomass,y}$

Period	BF_1(t)	NCV_1(TJ/t)	BF_2(t)	NCV_2(TJ/t)	BF_3(t)	NCV_3(TJ/t)	$EF_{burning,CH4,i}$ (tCH4/Ton)	Conservative factor	GWP_{CH4} (tCO_2e/tCH_4)	$BE_{biomass,y}$ (tCO_2e)
	A8=A3	B8=B3	C8=C3	D8=D3	E8=E3	F8=F3	G8	H8	I8	J8=(A8+C8+E8)*G8*H8*I8
20/03/2008-29/03/2008	3373.21	0.01318	4143.11	0.01229	225.16	0.01275	0.0027	0.73	21	320
30/03/2008-28/04/2008	3726.1	0.01229	11663.69	0.01125	118.35	0.01176	0.0027	0.73	21	642
29/04/2008-29/05/2008	3750.37	0.01177	9907.54	0.01241	745.13	0.00972	0.0027	0.73	21	596
30/05/2008-28/06/2008	5006.38	0.01192	5547.47	0.01160	439.53	0.01120	0.0027	0.73	21	455
29/06/2008-29/07/2008	5768.64	0.01063	6800.46	0.01191	43.82	0.01312	0.0027	0.73	21	522
30/07/2008-28/08/2008	5273.95	0.01086	10521.31	0.01139	546.34	0.01238	0.0027	0.73	21	676
29/08/2008-26/09/2008	349.3	0.01186	11868.75	0.01243	2516.7	0.01358	0.0027	0.73	21	610
27/09/2008-25/10/2008	663.95	0.01165	6197.91	0.01153	2322.76	0.01176	0.0027	0.73	21	380
26/10/2008-25/11/2008	2984.75	0.01155	7433.64	0.01199	438.04	0.01090	0.0027	0.73	21	449
26/11/2008-25/12/2008	16730.66	0.01174	7785.54	0.00939	2815.26	0.00827	0.0027	0.73	21	1131
26/12/2008-22/01/2009	18452.54	0.00915	8090.04	0.00912	1460.56	0.00734	0.0027	0.73	21	1159
23/01/2009-22/02/2009	7707.18	0.01185	3124.07	0.01053	2483.64	0.00734	0.0027	0.73	21	551
23/02/2009-25/03/2009	9647.39	0.01257	36976.48	0.01091	1253.78	0.00824	0.0027	0.73	21	1982
Total	83434.42		130060.01		15409.07					9473

Note: BF_1 =cotton straw, BF_2 = wood and cortices, BF_3 =wheat bran

c) Emission Reductions due to displacement heat

The power plant did not supply heat during this monitoring period. So $ER_{heat,y}$ =0.

7.3 Leakage emissions

As for the project, the maximum radius for biomass collection is 100 km, which is between 20 km and 200km, and therefore the radius meets the requirements of the methodology. The radius covers eight counties:Gaotang,Xiajin,Guanxian,Linqing,Pingyuan,Wucheng,Yucheng,Chiping. And the project owner has consigned the Statistic Bureau of these eight counties, to do some survey about biomass. The eight local official bureaus provided the statistic data of available biomass and biomass ulilised in the three counties. Please refer to table 11 formore details.

Table 11 Demonstration of abundant surplus of biomass availability

	Cotton Straw (t)	Wood and cortices (t)	Wheat bran (t)
Available Biomass in the region	966614	1226463	90450
Biomass utilised out of the project	204070	316150	13300
Biomass utilised by the project	83434.42	130060.01	15409.07
Total biomass utilised, including the project	287504.42	446210.01	28709.07
Available Biomass/Total biomass utilised	336%	275%	315%
Available Biomass/Total biomass utilised -100%	236%	175%	215%
Abundant surplus? (more than 25%)	Yes	Yes	Yes

From table 11, it can be concluded that the available quantity of each kind of biomass in the region is 25% larger than the quantity of biomass that is utilized, including the project. And According to the description in section 4.2.3, leakage from this project is zero during this monitoring period.

7.4 Summary of emission reductions during the monitoring period

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

Table 12. Emissions reductions calculation (tCO_2e)

Period	$ER_{electricity,y}$ (tCO_2e)	$ER_{heat,y}$ (tCO_2e)	$BE_{biomass,y}$ (tCO_2e)	PE_y (tCO_2e)	L_y (tCO_2e)	ER_y (tCO_2e)
	A10=C6	B10=A7	C10=J8	D10=F5	E10=A9	F10=A10+B10+C10-D10 -E10
20/03/2008-29/03/2008	5292	0	320	241	0	5371
30/03/2008-28/04/2008	11799	0	642	491	0	11950
29/04/2008-29/05/2008	14028	0	596	488	0	14136
30/05/2008-28/06/2008	13070	0	455	434	0	13091
29/06/2008-29/07/2008	14256	0	522	416	0	14362
30/07/2008-28/08/2008	11513	0	676	531	0	11658
29/08/2008-26/09/2008	15088	0	610	399	0	15299
27/09/2008-25/10/2008	13962	0	380	304	0	14038
26/10/2008-25/11/2008	14607	0	449	372	0	14684
26/11/2008-25/12/2008	17027	0	1131	780	0	17378
26/12/2008-22/01/2009	14652	0	1159	783	0	15028
23/01/2009-22/02/2009	15410	0	551	414	0	15547
23/02/2009-25/03/2009	14947	0	1982	1208	0	15721
Total	175651	0	9473	6861	0	**178263**

Annex 1: The energy balance calculation for the verification period

The total inputs of all types of fuels combusted and useful output of electricity from the project are presented below. From this data the conversion efficiency of the project in this period is calculated as 25.44%.

Table 13. The energy input and electricity generation in the project activity in this period

	BFi（t）	NCVi（(TJ/t)	Energy（TJ）
BF1	83434.42	0.01123	936.90
BF2	130060.01	0.01124	1461.55
BF3	15409.07	0.00990	152.58
Fossil Fuel	96.62	0.042652	4.12
	$EG_{imported}$（MWh）		562.32
Total			2557.17
electricity exported（MWh）			180722.52
efficiency			25.44%

Energy Balance：

Etotal=Ebiomass1+Ebiomass2+Ebiomass3+EFossil Fuel+ EGimported =2557.17 TJ
Electricity exported= 180722.52 MWh=650.6 TJ
Efficiency= Electricity generation/ Etotal =25.44%