

Monitoring Report

Volume 1

Version 3.0

1 June 2010

Start monitoring period: 25 June 2008

End monitoring period: 31 Jan 2009

**Title: Straw generation project in Wei county Hebei province,
P.R. China**

UNFCCC Reference Number: 1546

Project developer

National Bio Energy Co., Ltd.,

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Date:	1 June 2010
Project Owner:	National Bio Energy Co., Ltd.,

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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

Monitoring period: 25 June 2008 – 31 Jan 2009

2 Project description

2.1 Title

Straw generation project in Wei county Hebei province, P.R. China

2.2 UNFCCC Reference Number

1546

2.3 Implementation status

The project activity is to collect and utilise biomass residues to generate electricity. The biomass residue fired power plant has a total installed capacity of 25 MW. This is in conformity with the PDD.

2.4 Operation of the project

The project was fully operational from 15 April 2007. The project has been operating since this date. “operational” in this context includes downtime due to maintenance or technical issues.

2.5 Category of project activity

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

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

3 Project timeline

First electricity generation date	28 December 2006
Start date of commercial operation	15 April 2007
CDM registration date	25 June 2008
The 1 st Crediting period from	25 June 2008
to	24 June 2015
Start of this monitoring period	25 June 2008
End of this monitoring period	31 January 2009

4 Baseline methodology

4.1 Methodology

The project participants use 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.

4.2 Calculations Methodology

4.2.1 Electricity

The project participants used ACM0002 in the PDD to calculate the emissions factor for the net electricity displaced 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

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

Where EG_y is the net electricity supplied to the grid, $EF_{electricity,y}$ is the CO₂ emission factor of the grid and BE_y is the baseline emissions.

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 1.1208 tCO₂e/MWh. The Build Margin emission factor $EF_{BM,y}$ was calculated as 0.9397 tCO₂e/MWh.

The weighted average of Operating and Build Margin emission factors is:

$$EF_{electricity,y} = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y}$$
$$= 0.5 * 1.1208 + 0.5 * 0.9397 = 1.03025 \text{ tCO}_2/\text{MWh}$$

4.2.2 Project emissions from transport

Following ACM0006 in the PDD, the emissions from the transport were estimated 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 CO₂ emissions factor from fuel used for transportation. During operation, the truck load, transport distance, truck types are monitored so that the following formula is used to calculate the project emission from transportation:

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

$$EF_{km,CO_2,y} = DPK \times Density_d \times NCV_d \times EF_d$$

4.2.3 Project emissions from fossil fuel use

Fossil fuels are used by forklift in plant, but no fossil fuels are combusted as auxiliary fuel for boiler start up in operation. Following ACM0006 in the PDD, the project participants 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:

$$PEFF_y = (FF_{project,plant,d,y} + FF_{project,site,d,y}) \times NCV_d \times EF_d$$

4.2.4 Project emissions from electricity consumption in straw collection sites ($PE_{EC,y}$)

The electricity consumption due to straw cracker is estimated as the product of electricity consumption and an appropriate grid emission factor, as follows:

$$PE_{EC,y} = EC_{PJ,y} \times EF_{electricity,y}$$

4.2.5 Methane from biomass

Finally, the project participants, using ACM0006, 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. 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 (uncontrolled burning), as follows:

$$BE_{biomass,co_2,y} = GWP_{CH_4} \times \sum_k BF_{PJ,k,y} \times NCV_k \times EF_{burning,CH_4,k,y}$$

Accounting for the methane emissions in the baseline, methane emissions from the combustion in the project scenario also needs to be calculated. The formula used in the PDD presents project methane emissions, using the quantity of biomass used in the project activity, the net caloric value and the appropriate emissions factor (controlled burning in power plant), as follows:

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

4.2.6 Project emission

$$PE_y = PET_y + PEFF_y + PE_{Biomass,CH_4,y} \times GWP_{CH_4,k}$$

4.2.6 Leakage

Following ACM0006 in the PDD, the project participants established that the leakage from the project activity is zero, as the surplus of biomass residues is far greater than the quantity of residues used on the project plant (see section 7.3).

4.2.7 Emission reduction

The emission reduction due to project activity can be calculated as follows:

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

5 Monitoring data

Monitoring has been carried out in accordance with the monitoring plan published on the UNFCCC website. The Monitoring Parameters are as follows:

5.1 Electricity

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Annual electricity delivered to the grid by the proposed project
Source of data used:	Electricity meter
Value of data for this monitoring period	96877.28 MWh (see table 1 pls)
Description of measurement methods and procedures applied:	The net electricity displacement by the project is calculated as EG _y =A-A'-B, where A is the electricity delivered to the grid by the project, and monitored by main ammeter, located in the project site. The serial number of the meter is 36065966; A' is the electricity consumed by the project and also monitored through the same main meter; B is the electricity consumed by the project, purchased from the grid, and monitored by the another ammeter located in the project site, whose serial number is 36065969; But in this project no electricity from the grid via the main line is transmitted to the project, then A' equals to zero
QA/QC procedures applied:	Data measured by meters are cross checked against receipts from the grid company. Meters have been calibrated by an accredited agency, see table 6.
Any comment:	

Table 1 Monitored Data of EG_y

<p>The electricity delivered by the project to the grid through the main line (A)</p>
--

Period	Value (MWh)
25/06/2008~20/07/2008	11,058.30
21/07/2008~19/08/2008	13,244.55
20/08/2008~20/09/2008	12,997.60
21/09/2008~20/10/2008	17,054.40
21/10/2008~20/11/2008	16,385.33
21/11/2008~20/12/2008	18,414.00
21/12/2009~20/01/2009	15,883.18
21/01/2009~31/01/2009	6,275.22
Sub-total (25/06/2008~31/01/2009)	111,312.58
The electricity consumed by the project through the main line (A')	
Period	Value (MWh)
25/06/2008~31/01/2009	0
The electricity consumed by the project through the backup (emergency) line (B)	
Period	Value (MWh)
25/06/2008 0:00~15/07/2008 8:00	1,259.06
15/07/2008 8:00~15/08/2008 8:00	2,070.60
15/08/2008 8:00~15/09/2008 8:00	2,053.80
15/09/2008 8:00~15/10/2008 8:00	1,954.05
15/10/2008 8:00~15/11/2008 8:00	2,069.55
15/11/2008 8:00~15/12/2008 8:00	1,877.40
15/12/2008 8:00~15/01/2009 8:00	1,832.25
15/01/2009 8:00~31/01/2009 24:00	1,318.59
Subtotal (25/06/2008~31/01/2009)	14,435.30
EG_y (EG_y = A - A' - B)	
Period	Value (MWh)
25/06/2008~31/01/2009	96877.28

5.2 Transport

Data / Parameter:	AVD_y
Data unit:	km
Description:	Average round trip distance between biomass fuel supply sites and the project site
Source of data used:	Records by Power plant and the department who is responsible for the straw collection and transportation.

Value of data applied for this crediting period	58 (see table 2 pls)
Description of measurement methods and procedures to be applied:	A staff appointed by the project company is responsible for the record and monitor of recording average round trip for each trucks and the record will be reported and documented monthly.
QA/QC procedures to be applied:	Check consistency of distance records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps)
Any comment:	

Data / Parameter:	TL_v
Data unit:	Tons
Description:	Average truck load of the trucks used for transportation of biomass
Source of data used:	Measured by weight bridge in the Power plant
Value of data applied for this crediting period	8 (see table 2 pls) .
Description of measurement methods and procedures applied:	A staff is appointed by the project company to be responsible for the record of load for each truck in the power plant, using the weight bridge of No.6288, and the record is reported and documented monthly.
QA/QC procedures applied:	Check consistency of load record with straws receipts. The weight bridge have been calibrated by an accredited agency, see table 6.
Any comment:	

Data / Parameter:	DPK_v
Data unit:	L/km
Description:	The diesel consumption per km for the full-load truck in L/km
Source of data used:	The test report by the manufacture of the truck;
Value of data applied for this crediting period	0.58 (see table 2.1 pls)
Description of measurement methods and procedures applied:	The typical type of truck that transports biomass to the project is the 120 Horsepower Jiefang light truck. The assessment team has checked the records of biomass transported to the project site, and can confirm that the 120 Horsepower light truck was the mostly used truck, consisting 60%-70% of all the trucks that transporting biomass to the project site. And the power of the 120 Horsepower light truck is the largest among all the trucks transporting biomass to the project site. The transportation capacity and fuel consumption per kilometer of the 120 Horsepower light truck are the largest. It is conservative to use the DPK of the 120 Horsepower Jiefang light truck to calculate project emissions. The fuel consumption per kilometer of the 120 Horsepower Jiefang light truck was tested by the manufacturer, at the average load (about 8 tonne). The testing result was 0.29 L/km. To be conservative, PP multiplied the value with 2 and applied 0.58 L/km in the monitoring report.
QA/QC procedures applied:	The test report is held by the manufacture of the truck, and in a conservative estimation, viz.,two times of the value is used in ER calculation;
Any comment:	

Data / Parameter:	EF_{km,CO₂,y}
Data unit:	tCO ₂ /km
Description:	Average CO ₂ emission factor for the trucks during the year y.
Source of data used:	Calculated.
Value of data applied for this crediting period	0.001577 (see table 2.1 pls)
Description of measurement methods and procedures applied:	Measurement has been conducted on the fuel consumption per kilometer for the typical truck, the Jiefang 120 Horsepower light truck. And the distance travelled for all transportation tools are recorded; The CO ₂ emissions are calculated by multiplying with appropriate net calorific values and CO ₂ emission factors. For net calorific values and CO ₂ emission factors, use reliable IPCC default values. .
QA/QC procedures applied:	It is cross-checked by the IPCC default value;
Any comment:	The CO ₂ emissions factor of the fuel used for transportation is calculated as 0.001576, which is more than the IPCC default value of EF _{km,CO₂,y} , 0.001011t CO ₂ /km. Then it is conservative;

Table 2 Monitored data of AVD_y and TL_y

Period	AVD _y (km)	TL _y (t)
25/06/2008~30/06/2008	72	8.26
01/07/2008~31/07/2008	71	8.24
01/08/2008~31/08/2008	61	7.41
01/09/2008~30/09/2008	69	7.82
01/10/2008~31/10/2008	73	8.56
01/11/2008~30/11/2008	49	10.23
01/12/2008~31/12/2008	40	7.82
01/01/2009~31/01/2009	29	8.55
Average (25/06/2008~31/01/2009)	58	8

Table 2.1 Calculation EF_{km,CO₂,y}

	A	B	C	D	E=A*B*C*D
Item	DPK (L/km)	Density(t/L)	NCV _d (TJ/t)	EF _d (tCO ₂ /TJ)	EF _{km,CO₂,y}
	0.58	0.00086	0.042652	74.1	0.001577
Source	The figure 0.29 is tested by the Manufacturer. It is then doubled here to be conservative	In compliance with Meth: Chinese National Standard GB/T19147-2003	In compliance with Meth: China Energy Statistical Yearbook 2008	IPCC 2006	

5.3 Fossil fuel use

Data / Parameter:	FF_{project,plant,d,y}
Data unit:	Tons
Description:	Quantity of diesel combusted in the straw-fired boiler start-up during the year y
Source of data used:	Measured
Value of data applied for this crediting period	0 (see table 3.1 pls)
Description of measurement methods and procedures applied:	The power plant measures diesel consumption for each boiler start-up by meter and the data are reported and documented monthly. In actual, no fossil fuel is used for start-up of the boilers;
QA/QC procedures applied:	The amount of diesel consumed are recorded monthly and crosschecked by an annual energy balance that is based on purchased quantities and stock (at power plant) changes.
Any comment:	

Data / Parameter:	FF_{project,site,d,y}
Data unit:	Tons
Description:	Quantity of diesel combusted in the straw forklift during the year y
Source of data used:	Power plant and straw brokers daily operation record
Value of data applied for this crediting period	74.88 (see table 3.2 pls)
Description of measurement methods and procedures applied:	The power plant collects diesel purchase receipt from fuel station and files these data monthly. The quantity of diesel combusted is equal to the quantity of stock (different stock from the parameter above, which is at fuel station) at the start of the month plus the purchased amount and then minus the stock at the end of the month.
QA/QC procedures applied:	The amount of diesel consumed are recorded monthly and crosschecked by an annual energy balance that is based on purchased quantities and stock changes of different straw brokers. The weight bridge have been calibrated by an accredited agency, see table 6.
Any comment:	

Table 3.1 Monitored data of FF_{project plant,d,y}

Period	FF _{project plant,d,y} (t)
25/06/2008~31/01/2009	0

Table 3.2 Monitored data of FF_{project site,d,y}

Period	Quantity at start (t)	Quantity at end (t)	Purchased (t)	FF _{project site,d,y} (t)
25/06/2008~30/06/2008	0.16	1.66	9.8	8.3
01/07/2008~31/07/2008	1.66	2.14	7.52	7.04
01/08/2008~31/08/2008	2.14	0.68	7.94	9.4
01/09/2008~30/09/2008	0.68	2.44	10.14	8.38

01/10/2008~31/10/2008	2.44	2.56	8.26	8.14
01/11/2008~30/11/2008	2.56	1.32	10.82	12.06
01/12/2008~31/12/2008	1.32	3.86	11.4	8.86
01/01/2009~31/01/2009	3.86	2.46	11.3	12.7
Total (25/06/2008~31/01/2009)			77.18	74.88

5.4 Electricity consumed in the straw collection sites

Data / Parameter:	EC_{PJ,y}																												
Data unit:	MWh																												
Description:	On-site electricity consumption attributable to the project activity during the year y.																												
Source of data used:	Calculated																												
Value of data applied for this crediting period	1239.8 (see table 4 pls)																												
Description of measurement methods and procedures applied:	<p>A Part of the biomasses are smashed at the collection sites before they are transported into the project plant. To be conservative, the electricity consumption due to the smashing of the biomasses happened out side the project plant monitored. The on-site electricity consumption attributable to the project activity are measured by electricity energy meters at the collections sites outside the project plant. The PDD provided a conservative way to estimate the electricity consumption attributable to the project activity.</p> <p>According to the PDD, the electricity factor for calculating EC_{PJ,y} can be calculated as follows:</p> <ol style="list-style-type: none"> 1) Collecting all the nameplate power (in kW) and capacity (t/h) of every straw crackers, 2) calculating the electricity factor corresponding to each cracker which equals to power/capacity (in kWh/t), 3) using the largest number as a conservative electricity factor for the calculation. <p>In the actual monitoring, 3 kinds of crackers were used during this monitoring period. The nameplate power and capacity of the cracker were collected and the electricity factor corresponding to each cracker are calculated following Step 2 as follows:</p> <table border="1"> <thead> <tr> <th>Manufacture</th><th>Type</th><th>Capacity (t/h)</th><th>Nameplate power (kW)</th><th>Electricity factor (kWh/t)</th><th>Testing report Value (kwh/h)</th></tr> </thead> <tbody> <tr> <td>Sida</td><td>93QS—3</td><td>3</td><td>18.5</td><td>6.17</td><td>3.25</td></tr> <tr> <td>Jiuxin</td><td>9ZP-8.0A</td><td>4</td><td>27.5</td><td>6.88</td><td>8.5</td></tr> <tr> <td>Longmu</td><td>9QS-62</td><td>10</td><td>25</td><td>2.50</td><td>8</td></tr> </tbody> </table> <p>The monitoring complies with the monitor plan. The project owner also asked the manufactures of the crackers to test the electricity factor. The largest value of the nameplate values and tested values are applied in the monitoring report. It is</p>					Manufacture	Type	Capacity (t/h)	Nameplate power (kW)	Electricity factor (kWh/t)	Testing report Value (kwh/h)	Sida	93QS—3	3	18.5	6.17	3.25	Jiuxin	9ZP-8.0A	4	27.5	6.88	8.5	Longmu	9QS-62	10	25	2.50	8
Manufacture	Type	Capacity (t/h)	Nameplate power (kW)	Electricity factor (kWh/t)	Testing report Value (kwh/h)																								
Sida	93QS—3	3	18.5	6.17	3.25																								
Jiuxin	9ZP-8.0A	4	27.5	6.88	8.5																								
Longmu	9QS-62	10	25	2.50	8																								

	conservative.
QA/QC procedures applied:	it is cross-checked by the consumption of electricity monitored by the meters and the purchasing invoices of electricity; the monitored consumption of electricity by the meters is only 131.95 MWh, then the value applied in this monitoring report is very conservative;

Table 4 Calculation of $PE_{EC,y}$

Period	$\Sigma BF_{k,y,\text{fresh matter}} \text{ (t)}$	Electricity consumption factor (MWh/t)	$EC_{PJ,y} \text{ (MWh)}$
25/06/2008~31/01/2009	145857.8	0.0085	1239.8

5.5 Methane emissions

Data / Parameter:	$BF_{k,y,\text{fresh matter}}$
Data unit:	Tons
Description:	the quantity of cotton straw and maize stalk used as fuel in the project plant during the year y in tons in fresh matter;
Source of data used:	Measured
Value of data applied for this crediting period	145,857.80 (see table 5.1 pls)
Description of measurement methods and procedures applied:	The weigh bridge of No 6228 is operated by staffs appointed by the project company to be responsible for the record and monitor of straws purchased and consumed in the project plant, and build straws account rechecked by comparing with the purchase receipt and stock change record. The record will be reported and documented monthly.

QA/QC procedures applied:	Recorded each time by weigh Bridge, and crosscheck by the purchase receipt and stock change record. The weight bridge have been calibrated by an accredited agency, see table 6.
Any comment:	$BF_{k,y,dry\ matter}$ is calculated based on moisture content and $BF_{k,y,fresh\ matter}$

Data / Parameter:	NCV_k
Data unit:	TJ/t
Description:	The net calorie value of cotton straw and maize stalk consumed by the proposed project
Source of data used:	measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0121 for cotton straw and 0.0103 for maize stalk; see table 5.2 pls.
Description of measurement methods and procedures applied:	The net calorific value of straws are measured and reported by qualified test institution. For each test, three samples are measured and the maximum of NCV are used. Frequency of the NCV measurement: The analysis are made every six months.
QA/QC procedures applied:	Three samples (dry matter) are analysed at the same time by the test institution and reported. And the maximum of NCV of these samples are used in the emission reduction calculation.
Any comment:	

Data / Parameter:	Moisture content of the biomass residues
Data unit:	%
Description:	Average Moisture content of cotton straw and maize stalk
Source of data used:	On-site measurements
Value of data applied for this crediting period	15.82% for cotton straw and 18.67% for maize stalk; see table 5.3 pls.
Description of measurement methods and procedures applied:	The moisture content is measured by moisture content meter of No 1 and 2 each time of truck straw enter into the plant, and mean values is calculated annually.
QA/QC procedures applied:	Three samples are recorded at the same time and reported. And the average of moisture content of these samples should be used. Meters have been calibrated by an accredited agency, see table 6.
Any comment:	

Table 5.1 Monitored $BF_{k,y}$

Period	Fresh Matter			Dry Matter		
	Cotton Straw (t)	Maize Stalk (t)	Total (t)	Cotton Straw (t)	Maize Stalk (t)	Total (t)
25/06/2008~30/06/2008	3,459.88	0	3,459.88	2,912.53	0	2,912.53

01/07/2008~31/07/2008	12,306.75	0	12,306.75	10,359.82	0	10,359.82
01/08/2008~31/08/2008	16,827.99	0	16,827.99	14,165.80	0	14,165.80
01/09/2008~30/09/2008	16,732.44	0	16,732.44	14,085.37	0	14,085.37
01/10/2008~31/10/2008	18,807.05	0	18,807.05	15,831.77	0	15,831.77
01/11/2008~30/11/2008	36,670.51	2,229.84	38,900.35	30,869.24	1,813.53	32,682.76
01/12/2008~31/12/2008	24,143.35	577.03	24,720.38	20,323.87	469.30	20,793.17
01/01/2009~31/01/2009	13,338.44	764.52	14,102.96	11,228.30	621.78	11,850.08
Total (25/06/2008~31/01/2009)	142,286.41	3,571.39	145,857.80	119,776.70	2,904.61	122,681.31

Table 5.2 Monitored NCV_k(TJ/tonne)

Date	NCV _k (TJ/t)	
	Cotton Straw	Maize Stalk
20/06/2008	0.012	0.0103
20/12/2008	0.0121	0.00986
Average	0.01205	0.01008
Minimum	0.012	0.00986
Maximum	0.0121	0.0103

Table 5.3 Monitored data of Moisture content of the biomass residues

Period	Cotton Straw	Maize Stalk
Average (25/06/2008~31/01/2009)	15.82%	18.67%

6 Quality assurance and quality control measures

The accuracy of the monitoring results are in conformity with calibration requirements, recording frequency and quality assurance and quality control procedures stated in the monitoring plan.

6.1 Calibration of monitoring equipment

All monitoring equipment are calibrated and checked for accuracy in line with industry standards as follows:.

Table 6 Calibration information on monitoring equipments:

Equipments involved for monitoring :							
Item	Data Measured	Serial Number	Accuracy	Calibration Date	Valid Date	Calibrator	accreditation certificate No.of the calibrator
main meter for electricity	electricity supplied to the grid	36065966	0.2S	11/12/2006 10/12/2007	1 year	Hebei Electric Power	(Ji) Faji (2007) D030

supplied to the grid				11/25/2008		Research Institute	(Ji) Faji (2006) D030
Emergency line meter for electricity imported from the grid	electricity imported from the grid	3606596 9	0.2S	11/12/2006 10/12/2007 25/11/2008	1 year	Hebei Electric Power Research Institute	(Ji) Faji (2007) D030 (Ji) Faji (2006) D030
weigh bridge	amount of biomass purchased and fossil fuel	6288	III	10/12/2006 29/03/2007 28/09/2007 12/03/2008 29/07/2008 29/01/2009	0.5 year	Quality and Technology Supervision and Inspection Institution of Wei County	(Ji) Faji (2004) F00917
moisture content meter	moisture content of the biomass	1	0.20%	10/12/2006 09/12/2007 08/12/2008	1 year	Metrological and Testing Institution of Handan City	(Ji) Faji (2003) F001 (Ji) Faji (2008) F001
moisture content meter	moisture content of the biomass	2	0.20%	10/12/2006 09/12/2007 08/12/2008	1 year	Metrological and Testing Institution of Handan City	(Ji) Faji (2003) F001 (Ji) Faji (2008) F001

Table 6.1 Calibrator information:

Calibrator	accreditation certificate No.of the calibrator	authorizing entity for calibrator	Valid Date
Hebei Electric Power Research Institute	(Ji) Faji (2007) D030	Quality and Technology Supervision Bureau of Hebei Province	30/11/2007-29/11/2010
	(Ji) Faji (2006) D030	Quality and Technology Supervision Bureau of Hebei Province	29/12/2006-28/12/2007
Hebei Electric Power Research Institute	(Ji) Faji (2007) D030	Quality and Technology Supervision Bureau of Hebei Province	30/11/2007-29/11/2010
	(Ji) Faji (2006) D030	Quality and Technology Supervision Bureau of Hebei Province	29/12/2006-28/12/2007

Quality and Technology Supervision and Inspection Institution of Wei County	(Ji) Faji (2004) F00917	Quality and Technology Supervision Bureau of Hebei Province	01/11/2004-31/10/2009
Metrological and Testing Institution of Handan City	(Ji) Faji (2003) F001	Quality and Technology Supervision Bureau of Hebei Province	01/01/2003-31/12/2007
	(Ji) Faji (2008) F001	Quality and Technology Supervision Bureau of Hebei Province	27/05/2008-26/05/2013
Metrological and Testing Institution of Handan City	(Ji) Faji (2003) F001	Quality and Technology Supervision Bureau of Hebei Province	01/01/2003-31/12/2007
	(Ji) Faji (2008) F001	Quality and Technology Supervision Bureau of Hebei Province	27/05/2008-26/05/2013

6.2 Monitoring frequency

The parameters to be monitored were read or done with the frequency indicated in section 5 of this document. This corresponds with the requirements from methodology ACM0006 ver.04 and the validated monitoring plan.

6.3 Monitoring system

Monitoring organisation

A monitoring organization has been set up. This involved setting up an organization and the development of procedures for

- CDM staff training
- CDM data and record keeping arrangements
- Data collection
- CDM data quality control and quality assurance
- Equipment maintenance
- Equipment calibration
- Equipment failure

CDM staff training has taken place and this can be proven by training records which are available on site. Procedures for data collection, archiving and data quality assurance and quality control were described in a monitoring manual. The monitoring manual has been signed off by the project developer and is available on site. Procedures for equipment maintenance, failure and calibration have been included in this monitoring manual.

Monitoring equipment and installation

The meters and bridge were installed by qualified technicians and the proper functioning thereof has been proven during calibration [see section 6.1 above].

During the monitoring period no failure of meters occurred. Failure is proven when zero readings occur when project activities take place or when cross checks show deviations from expected

values. Meter and bridge failures and replacements are registered in the log book and the procedure for this has been described in the monitoring manual.

Data records and management

Data records are filed electronically each month and kept for 2 years until the end of the crediting period. The procedures for data management are described in the monitoring manual.

Internal audits

The implementation of the monitoring manual is checked regularly by NBE Beijing office during field visits and/or the consistency and plausibility of the data which are processed each month.

7 Emission reduction calculations

Calculation of emission reductions took place on the basis of a complete set of cross checked data, applying the approved methodology. IPCC default data or other reference values were required for this calculation is described as in section 5. Calculations are summarized as below.

7.1 Data completeness

All data were monitored according to the frequency indicated in the validated monitoring plan. A complete set of data was used in the calculation of emission reductions. There was therefore no reason to apply a conservative scenario in view of partial data availability.

7.2. Cross checks of monitoring data

The monitoring data are cross checked with invoices etc, as describe in section 5. Events like meter failure or shut down of the project activity are registered in the log book. All procedures are documented in the monitoring manual referred to in section 5.

Implementation of the monitoring manual is regularly checked by NBE Beijing office. Cross checks applied during this period showed that the data used in the calculation of emission reductions are reliable.

7.3 Calculation of emission reductions

Emission reductions have been calculated on the basis of the formulas provided by the validated PDD and the approved methodology. The calculations are shown in as below. And the Excel spreadsheet of calculation is provided as annex.

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

$$EF_{km,CO_2,y} = DPK \times Density_d \times NCV_d \times EF_d$$

$EF_{km,CO_2,y}$ is calculated as 0.001577, which is more than the IPCC default value 0.001011 kg/km.

$$PEFF_y = (FF_{project,plant,d,y} + FF_{project,site,d,y}) \times COEF_{co_2,i}$$

$$= (FF_{project,plant,d,y} + FF_{project,site,d,y}) \times NCV_d \times EF_d$$

$COEF_{co_2,i}$ calculated from net caloric value of diesel and Emission Factor of diesel, all estimated and adopted in the PDD: $COEF_{co_2,i} = NCV_d \times EF_d = 0.042652 \text{ TJ/tonne} \times 74.1 \text{ tCO}_2/\text{TJ} = 3.16 \text{ tCO}_2\text{e/t}$.

$$PE_{Biomass,CH_4,y} = EF_{CH_4,BF} \times \sum_k BF_{k,y} \times NCV_k \text{ With the } GWP_{CH_4} = 21, \text{ and the methane}$$

emissions factor for burning biomass in a controlled manner $EF_{CH_4,BF} = 30 \text{ kgCH}_4/\text{TJ}$ with a conservativeness factor of 1.37.

Using the data presented in section 5, total project emissions can now be calculated as the aggregate of the above.

Table 7 Calculation of PE_y

Period	PET_y (tCO ₂ e)	$PEFF_y$ (tCO ₂ e)	$PE_{EC,y}$ (tCO ₂ e)	$PE_{\text{biomass,CH}_4,y}$ (tCO ₂ e)	GWP_{CH_4} (tCO ₂ e/tCH ₄)	PE_y (tCO ₂ e)
	A	B	C	D	E	F=A+B+C+D*E
25/06/2008 ~31/01/2009	1,668	237	1278	61	21	4,464

Table 7.1 Calculation of PET_y

Period	$\Sigma BF_{k,y,\text{fresh matter}}$ (t)	AVD_y (km)	TL_y (t)	$EF_{\text{km,CO}_2,y}$ (tCO ₂ e/km)	PET_y (tCO ₂ e)
25/06/2008~31/01/2009	145857.8	58	8	0.001577	1,668

Table 7.2 Calculation of $PEFF_y$

Period	$FF_{\text{project plant,d,y}}$ (t)	$FF_{\text{project site,d,y}}$ (t)	NCV_d (TJ/t)	EF_d (tCO ₂ e/TJ)	$PEFF_y$ (tCO ₂ e)
25/06/2008~31/01/2009	0	74.88	0.042652	74.1	237

Table 7.3 Calculation of $PE_{EC,y}$

Period	$\Sigma BF_{k,y,\text{fresh matter}}$ (t)	Electricity consumption factor (MWh/t)	$EC_{PJ,y}$ (MWh)	$EF_{\text{grid,y}}$ (tCO ₂ e/MWh)	$PE_{EC,y}$ (tCO ₂ e)
25/06/2008~31/01/2009	145857.8	0.0085	1239.8	1.03025	1278

Table 7.4 Calculation of $PE_{\text{biomass CH}_4,y}$

Period	$EF_{CH_4,BF}$ (tCH ₄ /TJ)	Cotton Straw		Maize Stalk		$PE_{\text{biomass,CH}_4,y}$ (tCO ₂ e)
		$BF_{k,y,\text{dry matter}}$ (t)	NCV_k (TJ/t)	$BF_{k,y,\text{dry matter}}$ (t)	NCV_k (TJ/t)	
	A	B	C	D	E	F=A*(B*C+D*E)
25/06/2008 ~31/01/2009	0.0411	119776.6999	0.0121	2904.611487	0.0103	61

7.31 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:

$ER_{electricity,y} = EG_y \times EF_{electricity,y}$ With $EF_{electricity,y}$ calculated and fixed in the PDD as 1.03025 tCO₂e/MWh

$BE_{biomass,y} = GWP_{CH_4} \times \sum_k BF_{PJ,k,y} \times NCV_k \times EF_{burning,CH_4,k,y}$ With the $GWP_{CH_4} = 21$, and the methane emissions factor for burning biomass in an uncontrolled manner $EF_{burning,CH_4,k,y} = 300$ kgCH₄/TJ with a conservativeness factor of 0.73.

Using the data presented in section 5, total baseline emissions can now be calculated as the aggregate of the above.

Table 7.5 Baseline emissions calculation (tCO₂e)

Monitoring period	$ER_{electricity,y}$	$BE_{biomass,co_2,y}$	baseline emission
	A	B	C=A+B
25/06/2008~31/01/2009	tCO ₂ e	tCO ₂ e	tCO ₂ e
total	99807	5077	104,884

Table 7.6 Calculation of $ER_{electricity,y}$

Period	EG _y (MWh)	EF _{electricity,y} (tCO ₂ e/MWh)	ER _{electricity,y} (tCO ₂ e)
25/06/2008~31/01/2009	96,877.28	1.03025	99,807

Table 7.7 Baseline biomass emissions ($BE_{biomass,co_2,y}$) calculation (tCO₂e)

Period	GWP _{CH₄} (tCO ₂ e/tCH ₄)	ΣBF _{k,y,dry} matter (t)	NCV _k *EF _{burning,CH₄,k,y} (tCH ₄ /t)	BE _{biomass,y} (tCO ₂ e)
25/06/2008~31/01/2009	21	122,681.31	0.001971	5,077

7.32 Leakage emissions

In line with the approved methodology ACM0006 (version 4), the PDD determined that no leakage would occur due to diversion of biomass from other uses to the project plant. In the PDD, option L2 was used to demonstrate that there is an abundant surplus of biomass in the region of the project activity which is not utilised.

During this monitoring period, the utilization of the types of biomass used by this project have been monitored by the project participants, and the total available biomass and other utilizations in the area (not including this project) was from the official statistics.

Project participants use the biomass resource investigation report to demonstrate that the biomass used in this project activity did not lead to leakage emissions by increasing fossil fuel consumption elsewhere. The data shows that the project does not influence the biomass utilization structure in Wei county, and that the two types of biomass were all in abundant surplus during this monitoring period.

Table 7.8 below demonstrates that the quantity of available biomass in the region is ‘at least 25% larger than the quantity of biomass utilised (e.g. for energy generation or as feedstock), including the project plant.’

Table 7.8 Demonstration of abundant surplus of biomass availability

Biomass type	Cotton Straw	Maize Stalk
Total biomass generation in the region (10 ⁴ t)	38.2833	2.5
Available biomss (10 ⁴ t)	32.5408	2.125
Biomass used excluding project (10 ⁴ t)	4.5	0.05
Biomass demand of the project in one year (10 ⁴ t)	18.3789	0.4334
Total used biomass including project (10 ⁴ t)	22.8789	0.4834
Available biomass/total used biomass	167.33%	517.17%
Abundant surplus?(more than 25%?)	yes	yes

Sources: “Report of Resource Investigation in Wei county” 2008

Thus, the leakage from this project is neglected and considered as zero: $L_y = 0$.

Table 7.9 Leakage

Period	L_y (tCO ₂ e)
25/06/2008~31/01/2009	0

7.33 Summary of emission reductions during the monitoring period

Table 7.10 Emission reductions calculation (tCO₂e)

Period	ER _{electricity,y} (tCO ₂ e)	BE _{biomass,y} (tCO ₂ e)	PE _y (tCO ₂ e)	L _y (tCO ₂ e)	ER _y (tCO ₂ e)
	A	B	C	D	E =A+B-C-D
25/06/2008~31/01/2009	99,807	5077	4464	0	100,420

7.4 Assumptions in emission calculations

No assumptions were required when calculating the emission reductions over the monitoring period.

7.5 Application of emission factors, IPCC default values and other reference values

The emission factor used in the calculation of the emission reductions is the combined margin grid emission factor. This has been calculated in the PDD and validated. The value is shown in this report and it is valid throughout the crediting period. IPCC default values or other reference values were required in the calculation of emission reductions of this project as follows:..

Data / Parameter:	EF_{OM,y}
Data unit:	tCO ₂ /MWh
Description:	Operation Margin Emission Factor of NCPG
Source of data used:	Chinese DNA
Value applied:	1.1208
Justification of the choice of data or description of measurement methods and procedures actually applied :	This operation margin emission factor is calculated and recommended by Chinese DNA, see also http://cdm.ccchina.gov.cn/ .
Any comment:	

Data / Parameter:	EF_{BM,y}
Data unit:	tCO ₂ /MWh
Description:	Build Margin Emission Factor of NCPG
Source of data used:	Chinese DNA
Value applied:	0.9397
Justification of the choice of data or description of measurement methods and procedures actually applied :	This build margin emission factor is calculated and recommended by Chinese DNA, see also http://cdm.ccchina.gov.cn/ .
Any comment:	

Data / Parameter:	EF_d
Data unit:	tCO ₂ /TJ
Description:	Emission factor of diesel used for straws transportation and on-site fuel use
Source of data used:	IPCC default value
Value applied:	74.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value, 2006 IPCC Guidelines for National Greenhouse Gas Inventories” Volume 2 Energy,
Any comment:	

Data / Parameter:	GWP_{CH4}
Data unit:	tCO ₂ e/tCH ₄
Description:	Global warming potential for CH ₄

Source of data used:	IPCC
Value applied:	21 for the first commitment period and will be updated according to any future COP/MOP decisions.
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value, 2006 IPCC Guidelines for National Greenhouse Gas Inventories” Volume 2 Energy,
Any comment:	

Data / Parameter:	Density_d
Data unit:	t/L
Description:	Density of diesel used for straws transportation
Source of data used:	National standard value: GB/T19147-2003
Value applied:	0.00086
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the national standard GB/T19147-2003, the density of diesel should be 0.82-0.86 kg/L. The upper limit used here will lead to an overestimation of project emission, thus a conservative estimation.
Any comment:	

Data / Parameter:	EF_{burning,CH4,k,v}*NCV_k
Data unit:	tCH ₄ /t
Description:	CH ₄ emission factor for uncontrolled burning of the straw.
Source of data used:	Version 04 of ACM0006
Value applied:	0.001971
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the IPCC default value provided in table 5 of ACM0006, the CH ₄ emission factor of combustion of biomass in power plant is 0.0027 tCH ₄ /t. Considering a conservativeness factor of 0.73, the CH ₄ emission factor in this PDD is taken as 0.001971 tCH ₄ /TJ.
Any comment:	

Data / Parameter:	EF_{CH4,BF}
Data unit:	tCH ₄ /TJ
Description:	CH ₄ emission factor for controlled burning of the straw.
Source of data used:	Version 04 of ACM0006
Value applied:	0.0411
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the IPCC default value provided in table 3 of ACM0006, the CH ₄ emission factor of combustion of biomass in agriculture is 0.03 tCH ₄ /TJ. Considering a conservativeness factor of 1.37, the CH ₄ emission factor in this PDD is taken as 0.0411 tCH ₄ /TJ. This value will be fixed in the entire crediting period
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ/t
Description:	Net calorie value of fossil fuel type i.
Source of data used:	National default value
Value applied:	i=d for diesel and NCV _d =0.042652
Justification of the choice of data or description of measurement methods and procedures actually applied :	The net calorific value of diesel is collected from the latest China Energy Statistical Yearbook.
Any comment:	As a national specific value, the uncertainty is low.

7.6 Comparison of Emission Reductions with the Estimates in the PDD

The emission reductions from 25/06/2008 to 31/01/2009 is 100,420 tCO₂e, and the corresponding annualized emission reductions is 165,852 tCO₂e, while the annual emission reductions in registered PDD is 130,638 tCO₂e; then annual emission reduction is increased by 26.96%;

The reasons that the project plant generated more emission reductions than estimated in registered PDD are as follows:

- 1) the cotton straw are produced and collected mainly from October to January per year, then enough biomass residue makes the generation in these months higher than other months;
- 2) it was extreme dry weather in 2008, and the rainfall from Nov 2008-Jan 2009 is only one third of the value in the history; the dry weather made the collecting and storing of cotton straw easier, which provided enough biomass residue in this period;
- 3) The project owner has more and more experience in operation; the designed operating hours in FSR and PDD is 5500, as no biomass to generation project operated in China before December 2006, while the FSR was finished in March 2006. Thus in FSR the operating hours was assumed at a low value considering lack of operation experience in China. At the same time, the average operating hours of all the 42 biomass to generation projects applying for CDM before June 25 2008(the registration date of this project) was 5551 as contained in Appendix 1, which is quite similar to 5500. It implies that most of project owners lack experience and confidence in operation of the biomass generation projects in China;
- 4) But at the same time the NCV of the cotton straw (the main biomass residue) was assumed at a high valued, 0.01744 TJ/t in FSR and PDD, as lacking experience, while in operation the maximum NCV is only 0.0121TJ/t, which increases the consumer of biomass fuel and the operation cost significantly;

The 1st reason is considered to be reasonable, and will not impact the additionality of the project;

The 2nd reason will not last in the future, and will not impact the additionality either;

The 3rd and 4th reason are out of expectation of FSR, and will last in the future, which might impact the additionality, then the financial analysis is used to identify the impact.

The changed key parameters between the registered PDD and actual operational parameters relevant to determine the emission reduction are listed below:

Item	Actual	Estimates based on actual	PDD	Difference
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	A	B	C	D = B/C-1
Days (d)	221	365	365	
EG_y (MWh)	96877.28	160000.9	126,500	26.483%
BF_{k,y} (t)	122,681.31	202618.5	119,792	69.14%
ER_y (tCO₂e)	100,420	165852	130,638	26.96%

To assess the impact of the increased electricity generation and biomass consumption on the additionality of the project, we recalculated the IRR of the project using the registered IRR spreadsheet. In the revised IRR calculation spreadsheet, the operation hours was increased by 26.483%, which also led to the increase of net electricity supply by 26.483%. The biomass consumption was increased by 69.14% to 202618.5 t per year. Other parameters were not changed, except those depending on the operation hours (electricity generation) and biomass consumption, as other parameters and the calculation formulas had been validation during validation. The recalculated IRR of the project activity without CDM revenue was 2.24%, which was still below the applied benchmark of 8%.

In conclusion, even the operating hours keeps higher in the future, considering the related biomass will also be increased, the additionality will not be affected.

8. Summary

The CDM project activity Straw generation project in Wei county Hebei province, P.R. China, CDM reference 1546 has reduced 100,420 tCO₂e in the period 25/06/2008 00:00 to 31/01/2009 24:00. The emission reduction has been calculated as set out in the validated PDD and the approved methodology. The project activity is implemented as set out in the validated PDD. The validated monitoring plan is in accordance with the approved methodology. Monitoring has been carried out as per validated monitoring plan.

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 27.21%.

The energy input and output in the project activity in this period

8. Energy Balance

8.1 The energy input in the project activity in this monitoring period

	Quantity (t)	NCV (TJ/t)	Energy Input (TJ)
Cotton Straw	119,776.70	0.0121	1,449.30
Maize Stalk	2,904.61	0.0103	29.92
Startup Oil	0	0.0427	0
Total			1,479.22

8.2 The energy output in the project activity in this monitoring period

	Value (MWh)	Energy Output (TJ)
Electricity generation	111312.58	400.725288

6.3 The energy output /output

Output/Input	27%
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