

**MONITORING REPORT FORM (F-CDM-MR)**
Version 02.0**MONITORING REPORT**

Title of the project activity	Wuhe Kaidi Biomass Power Project
Reference number of the project activity	3064
Version number of the monitoring report	1.0
Completion date of the monitoring report	10/07/2012
Registration date of the project activity	15/01/2011
Monitoring period number and duration of this monitoring period	The 1st monitoring period, from 15/01/2011 to 31/12/2011
Project participant(s)	United Kingdom of Great Britain and Northern Ireland , involved indirectly authorized Participants: Camco International Limited, Camco Carbon Limited Switzerland , involved indirectly authorized Participants: Camco International Limited project owner , Wuhe Kaidi Green Energy Development Co., Ltd
Host Party(ies)	China
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / non-renewable sources) Methodologies Used ACM0002 ver. 10 - Consolidated methodology for grid-connected electricity generation from renewable sources ACM0006 ver. 9 - Consolidated methodology for electricity generation from biomass residues
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	102,472 tonnes CO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	124,733 tonnes CO ₂ e



SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Wuhe Kaidi Biomass Power Project (hereafter referred to as the project) is a biomass utilization project developed by Wuhe Kaidi Green Energy Development Co., Ltd. (hereafter referred to as the Project Owner) and is located in the Wuhe Economic and Technology Development Area, Mohekou Town, Bengbu City, Anhui Province, P.R. China. The project is designed to produce 144,000 MWh of electricity per year from burning biomass residues, displacing electricity generated by East China Power Grid (ECPG), which is dominated by fossil fuel-fired power plants, and thus reducing greenhouse gas (CO₂) emissions.

The project processes and burns biomass residues, of which rice husk, maize straw, wheat straw, wood scrap and barks are the biomass fuel. 2 sets of 65t/h Circulating Fluidized Bed (CFB) boiler and 2 sets of 12MW steam turbines generator units are installed. Therefore, the total installed capacity of the project is 24MW and the project is estimated to achieve 106,559 tonnes of CO₂e emissions reduction annually.

The project began to construct in March 2008, and was put into operation since 26/08/2009. The project has been registered as a CDM project on 15/01/2011 (The version of registered PDD is version 4).

During current monitoring period (15/01/2011-31/12/2011), the project has achieved emission reductions of 124,733 tonnes CO₂e.

A.2. Location of project activity

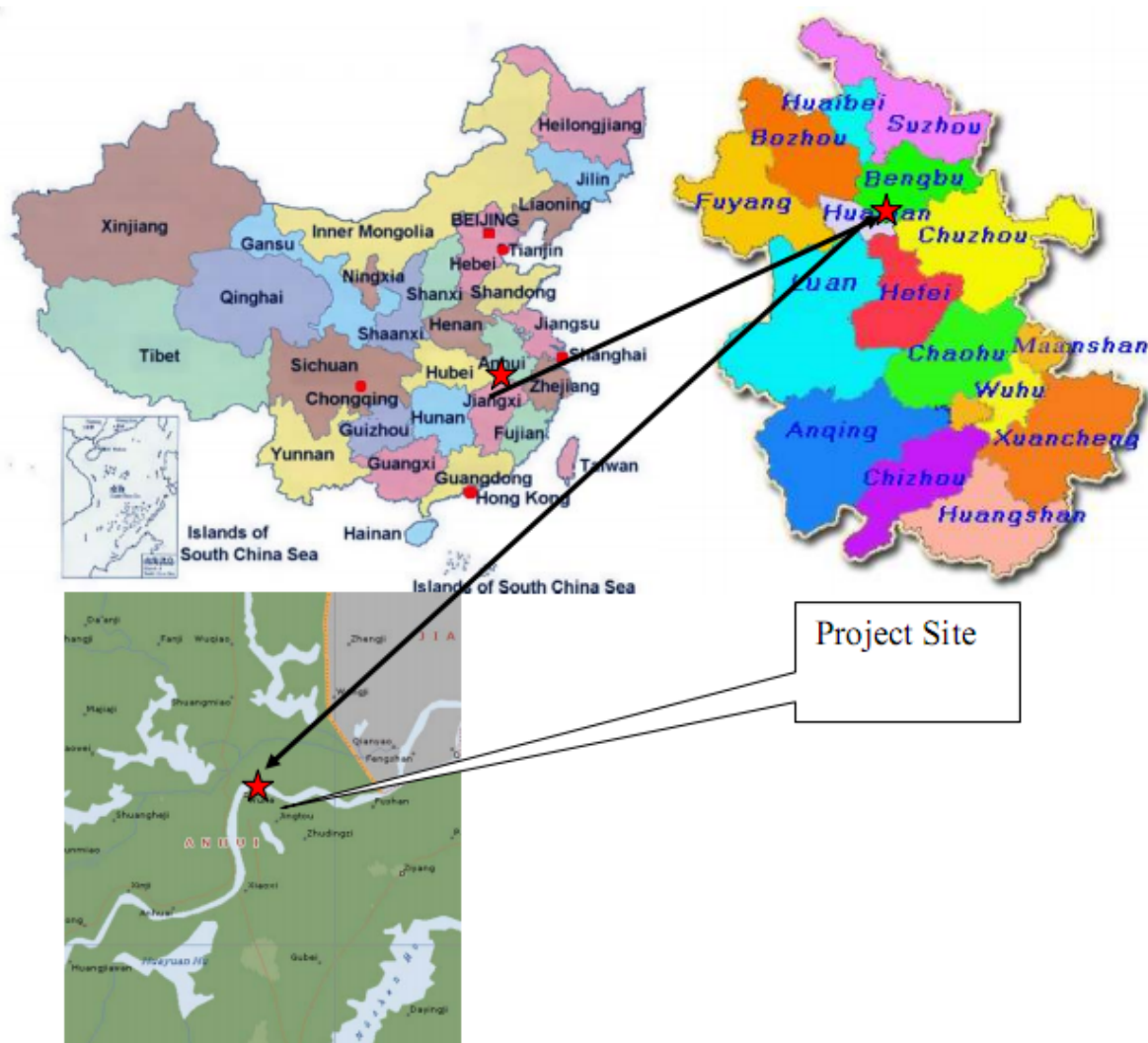
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The project activity is located in Wuhe Economic and Technology Development Area, Mohekou Town, Bengbu City, Anhui Province, P.R. China.

The center of plant has geographical coordinates of 117°29'42" east longitude 32°54'18" north latitude.

Please refer to the following drawing for the geographic location of the project activity.

Figure 1: Map showing the location of the project site



A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Peoples' Republic of China (host)	Wuhe Kaidi Green Energy Development Co., Ltd	No
United Kingdom of Great Britain and Northern Ireland	Camco International Limited	No
United Kingdom of Great Britain and Northern Ireland	Camco Carbon Limited	No
Switzerland	Camco International Limited	No

A.4. Reference of applied methodology

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1. ACM0006 (Version 09) – “Consolidated methodology electricity generation from biomass residues”



2. “Combined tool to identify the baseline scenario and demonstrate additionality”. (Version 02.2)
3. ACM0002 (Version 10) – “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”
4. “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” (Version 02)
5. “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01)
6. “Tool to calculate the emission factor for an electricity system” (Version 02)

For more information regarding the methodology, please refer to the link:

<http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

A.5. Crediting period of project activity

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Crediting period: 15/01/2011 – 14/01/2018(Renewable)

The start date of the crediting period is 15/01/2011.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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The project consists of one site, and has been implemented as described in the registered PDD. The project began to construct in March 2008, and was put into operation since 26/08/2009. Please refer to the following table for details.

Activity	Date	
	1# Generator	2# Generator
Start of construction	10/03/2008	
Commissioning of core equipment	22/08/2009	13/01/2010
Operation of core equipment	26/08/2009	17/01/2010

During current period, the project has been operating normally as described in the registered PDD. 1# steam turbine generator and 2# steam turbine generator were respectively shutdown 23 times and 16 times from 15/01/2011 to 31/12/2011.

No events or situations, which may impact the applicability of the methodology, occurred during the current monitoring period.

The technology employed by the project is advanced domestic technology. The project installed two sets of 65t/h circulating fluid bed (CFB) boilers with medium temperature and sub-high pressure. At the same time, two 12MW steam turbines and two associated generators are applied in the project. The steam turbine employed is medium temperature and sub-high pressure extraction condensing steam turbine. The total installed capacity of the project is 24MW.

The key technical specifications of the boiler, turbine and generator are listed in the table below.

Boiler	
Manufacturer	Jiangxi Jianglian Energy and Environmental Protection Co., Ltd
Model	KG65-450/5.29-FSWZ- I
Type	Medium temperature and sub-high pressure Circulating Fluidized Bed
Maximum evaporation volume	65t/h
Rated steam pressure	5.29MPa
Rated steam temperature	450°C

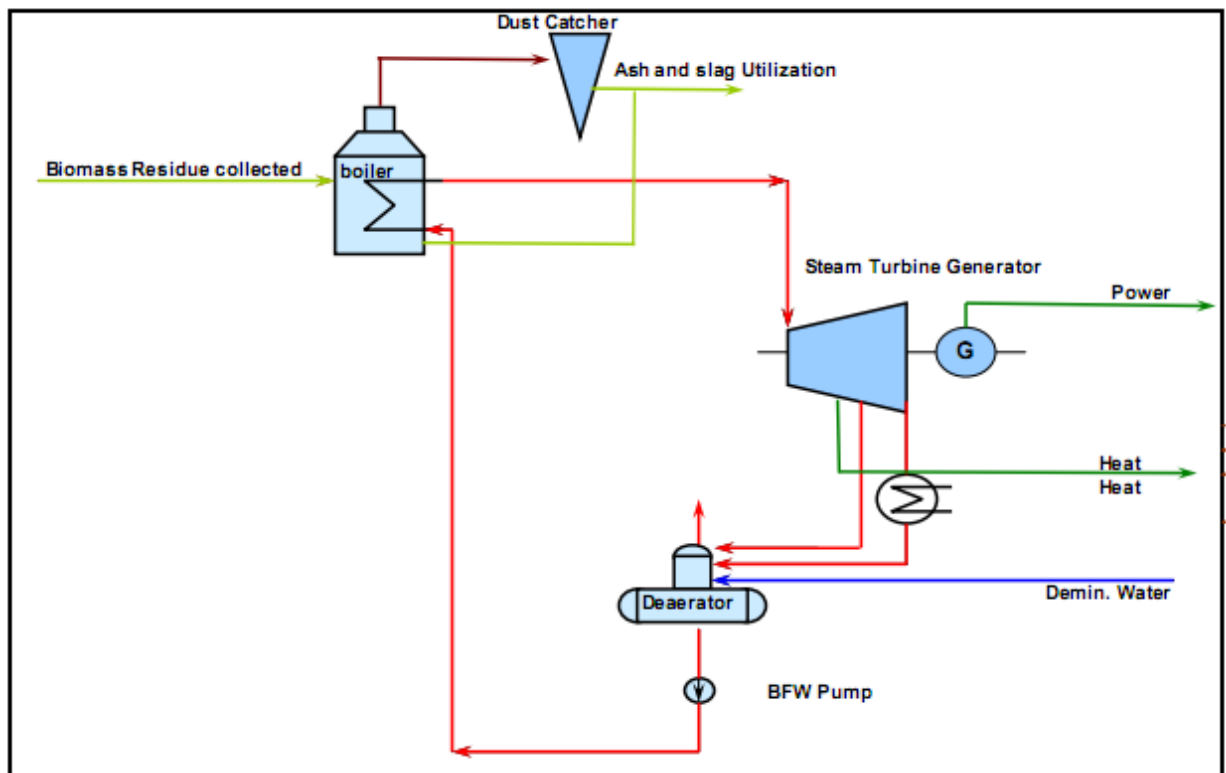


Feed water temperature	153.2°C
Feed water pressure	5.72MPa
Efficiency	≥86 %
Quantity	2
STEAM TURBINE	
Manufacturer	NanJing Steam Turbine(Group) Co., Ltd
Model	C12-4.90/0.981-12/435
Type	Medium temperature and sub-high pressure extraction condensing steam turbine
Rated power	12MW
Main steam pressure	4.9MPa
Main steam temperature	435°C
Rate extraction steam volume	15t/h
Maximum Extraction steam volume when Rate electricity capacity is 6.59MW	45t/h
Quantity	2
GENERATOR	
Manufacturer	NanJing Steam Turbine(Group) Co., Ltd
Model	QFJ-15-2
Rated power	15MW ¹
Rated voltage	10.5KV
Power factor	0.8
Efficiency	≥97%
Rated rotating speed	3000r/min
Rated frequency	50Hz
Quantity	2

The electricity generated is transmitted through a 35kV transformer at the site to Mouhekou 110kV substation and then supplied to Anhui power grid, which is a sub-grid of the East China Power Grid (ECPG). The project will therefore replace the equivalent capacity of power plants on the ECPG, which is predominantly made up of fossil fuel fired plants.

The Flow Diagram of the Plant as follows:

¹ The generator is sized at 15MW and not 12MW to allow for possible peak generation and to avoid damage to the generation unit by sudden load change in abnormal situations.

**B.2. Post registration changes****B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

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N/A

B.2.2. Corrections

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N/A

B.2.3. Permanent changes from registered monitoring plan or applied methodology

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N/A

B.2.4. Changes to project design of registered project activity

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N/A

B.2.5. Changes to start date of crediting period

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N/A

B.2.6. Types of changes specific to afforestation or reforestation project activity

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N/A

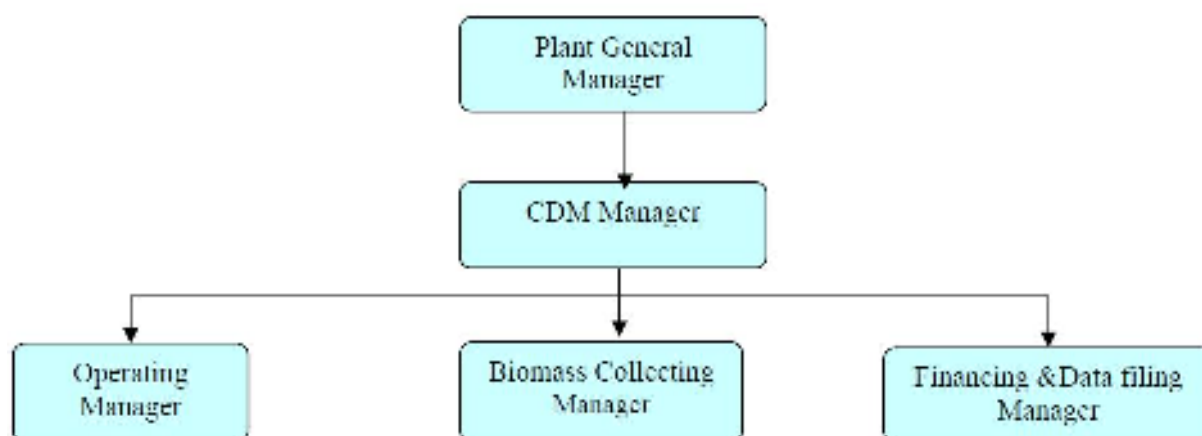
SECTION C. Description of monitoring system

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1. The organizational structure, roles and responsibilities of personnel:

In order to ensure monitoring of the project is in accordance with the monitoring plan and methodology, a specific CDM office had been established before the registration of the project. Figure 2 shows the organizational structure of the CDM office.

Figure 2 Organizational structure of the CDM office



The responsibilities of the sections are briefly described as following:

The plant manager is in charge of approving the monitoring report, appointing the CDM manager and the relevant monitoring team members and responsible for the monitoring outcome.

The CDM manager is responsible for liaising with DOE and the buyers, organizing the relevant training, reviewing all the documents related with the monitoring of the project, correcting any errors in time and acting as the quality supervisor of the monitoring process.

The Operating Manager is responsible for the monitoring associated with operation of the plant, the net electricity generation, the start-up diesel consumption and the dry biomass combusted. In addition, the Operating Manager supervises meter maintenance and manages the calibration process.

The Biomass Collecting Manager is responsible for the monitoring associated with biomass collection, the transportation emission, the mechanical biomass pre-treatment emissions and assisting the annual leakage analysis.

The Financing & Data filing Manager prepares the available original invoices or receipts associated with the whole monitoring process. Besides, the Financing & Data filing Manager collects the relevant data from the Operating Manager and the Biomass Collecting Manager, summarize the data, file the data and submit reports to the CDM manager in time.

The monitoring report is generated based on the monthly reports before each verification. The monitoring report is reviewed by the office manager before submitted to DOE.

2. Monitoring system:

2.1 Net electricity generation



There are two gate way meters and two back up meters installed on the project site monitoring the electricity supplied to the grid and purchased from the grid.

The data of electricity supplied to the grid and purchased from the grid is measured and crosschecked by the invoices and the power transaction note if available.

2.2 Biomass residues consumption and moisture of the biomass residues

The amount of biomass residues combusted in the boiler is monitored by the belt weigher. The moisture of the biomass residues combusted also is monitored by sampling continuously at fixed time period and analyzed daily. An energy balance is recorded monthly to assist verifying the biomass combusted

2.3 Fossil Fuel Consumption in the power plant

For fossil fuel used for starting up, flow meters are equipped in the supply and return pipe to monitor the quantity of diesel consumption.

If there is any fossil fuel used for the shredders, forklifts or any other machines for the mechanical biomass pre-treatment in the project site (including the biomass collection sites) is monitored by the diesel purchase and consumption log book.

The purchase receipt is used for cross-check. If there is any data missing or significant error exists, the entire quantity of fossil fuel purchased in a particular monitoring period would be considered as combusted in the power plant for conservativeness.

2.4 Transportation of Biomass residues

The project developer of the project structures a recording and monitoring system within the biomass residues supply and management system covering all the biomass collection sites established by the project. Each time each truck transporting the biomass into the project site is counted and recorded in the log book. The transportation distance to the collection sites is recorded by company staffs at the sites and the data is recorded in the log books. The data on distance of fuel supply site from the plant can be verified by cross checking data records on the distances available with information from other sources (e.g. maps).

If data is missing for a particular round trip, the following backup data apply in their order:

- The round trip distance between the farthest biomass fuel supply site and the project plant is used.
- If the farthest biomass fuel supply site could not be verified, 200km would be used for conservativeness

2.5 Electricity consumed on site

When the biomass residue is mechanically pre-treated, the project needs a certain amount of electricity from grid. This amount is metered or calculated conservatively.

If the monitoring data is missing, or it is not feasible to install a dedicated meter to monitor this indicator, it is calculated conservatively as the weight of straws smashed in tons and the electricity consumption factor (kWh/ton). The electricity factor can be calculated as follows:

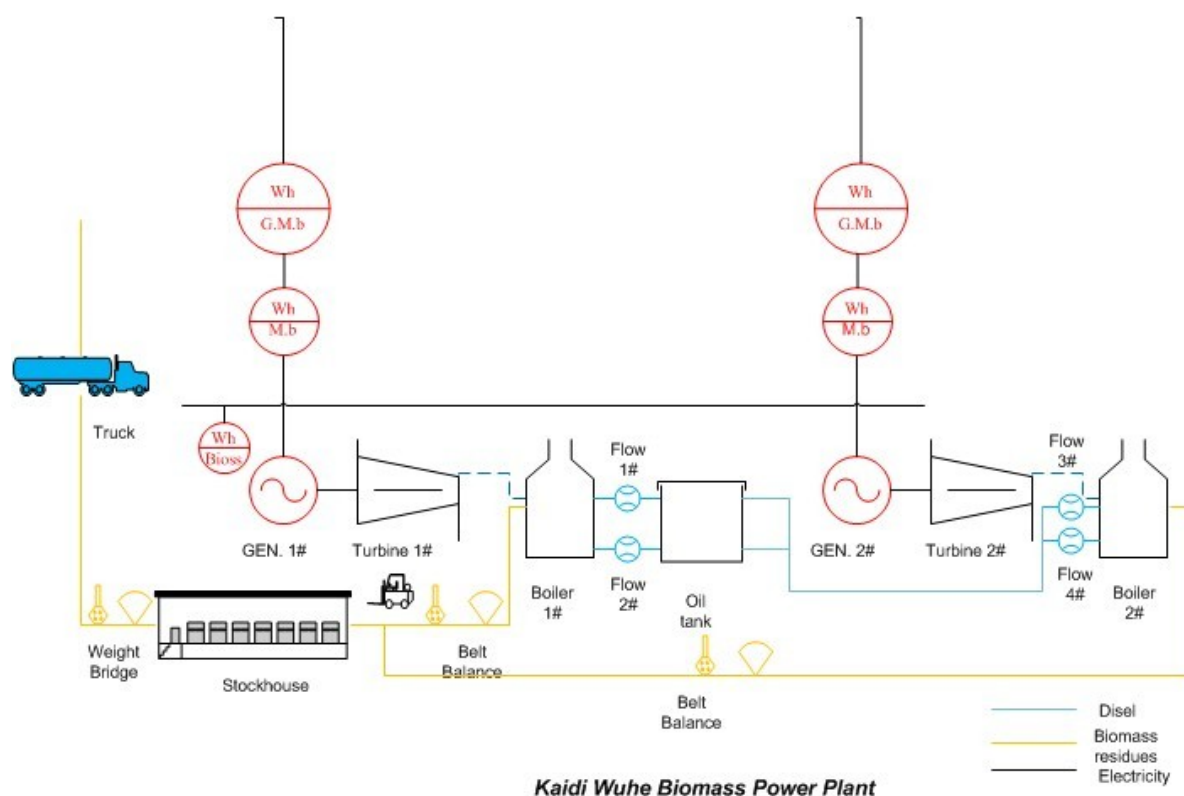
- 1) Collecting all the nameplates power (in kW) and capacity (t/h) of every straw crackers
- 2) Calculating the electricity factor corresponding to each cracker in kWh/t
- 3) Using the largest number as a conservative electricity factor for the calculation

2.6 Leakage

The project consumption and availabilities in the defined geographical area of each type of biomass

residue not only the biomass types mentioned above but also other biomass residues utilized in the project is monitored to check the leakage effect brought by the operation of the project. This is obtained from surveys or statistics from local agricultural bureau or other official public resource. If they are not available, the project owner will ask specialized institute or consulting company to do biomass availability research.

Figure 3: The monitoring system and power system connection



3. Data collection procedures

The meters or monitoring equipment installed in the monitoring system have been calibrated by a certified Party in accordance with the manufacturer's recommendations and National Regulations for ensuring reliability of the system. Calibrations shall be evidenced with certificates of calibration for the relevant meter(s) issued by a qualified body. A calibration and error log have been maintained to provide transparency and sound management.

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

4. Emergency procedures for the monitoring system

4.1 Training

Members of staff who are involved in the CDM project have been given training on the CDM and reporting requirements, prior to registration of the project. New members of staff joining the CDM



project team will also be given training in relation to their responsibilities. Full training procedures and a training plan will be detailed in the CDM Manual.

4.2 Record Keeping and Internal Reporting Procedure

The data associated with the emission reduction will be kept for at least 2 years after the end of the crediting period or the last issuance of CERs, whichever occurs later.

4.3 Error Handling Procedure

In the event that a meter has lost calibration over the allowable error limit then this shall be corrected at the earliest opportunity and re-calibrated and the data recorded from this meter since the last successful calibration shall be ignored.

The check of the CDM Project manager and then the third party verifier prior to issuance of the CERs is considered adequate for errors in the calculations. Where errors in the calculations are discovered by either of these Parties, the monitoring report shall be modified and the corrected version shall be resubmitted to the verifier.

4.4 External Reporting Procedure

After signing by the CDM Project manager, the report is sent to the third party verifier who is contracted to verify the emissions reductions during the crediting period of the project.

4.5 Procedure for corrective actions arising

The CDM manager is responsible for identifying corrective actions arising from the above procedures and for liaising with the purchaser, the third party verifiers and other stakeholders to take necessary steps to implement the corrective actions.

4.6 Emergency procedures

In the unlikely event of an emergency, set procedures will be followed. Details of the procedures to be followed are described in the relevant Operation Manuals. The key points include:

- The Distributed Control System (DCS) will automatically shut off the boilers upon detecting an emergency.
- The operators can also remotely shut off the boilers if they find an emergency situation has occurred.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/Parameter	EF _y
Unit	t CO ₂ e/MWh
Description	Baseline emission factor of East China Power Grid
Source of data	The registered PDD Version 4
Value(s) applied	0.8888
Purpose of data	Baseline emission calculation
Additional comment	--



Data/Parameter	GWP_{CH_4}
Unit	t CO ₂ e/t CH ₄
Description	Global warming potential for CH ₄
Source of data	The registered PDD Version 4
Value(s) applied	21
Purpose of data	Baseline emission calculation
Additional comment	--

Data/Parameter	$TDL_{j,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source j in year y.
Source of data	The registered PDD Version 4
Value(s) applied	20
Purpose of data	Project emission calculation
Additional comment	--

Data/Parameter	$EF_{CH_4,BF}$
Unit	t CH ₄ /GJ
Description	CH ₄ emission factor for controlled burning of the biomass residue in the project plant
Source of data	The registered PDD Version 4
Value(s) applied	41.1
Purpose of data	Project emission calculation
Additional comment	--

Data/Parameter	$NCV_k * EF_{burning,CH_4,k,y}$
Unit	t CH ₄ /tonne
Description	CH ₄ emission factor for uncontrolled burning of the biomass residue
Source of data	The registered PDD Version 4
Value(s) applied	0.001971
Purpose of data	Baseline emission calculation
Additional comment	--

**D.2. Data and parameters monitored**

Data/Parameter	BF _{k, y}		
Unit	Tons of dry matter		
Description	Quantity of each biomass residue type k combusted in the project plant in year, y.		
Measured/Calculated /Default	Measured		
Source of data	On-site measurements		
Value(s) of monitored parameter	Type	Units	Data
	Rice husk	tonne	51,605.89
	Maize straw	tonne	15,017.74
	Wheat straw	tonne	704.61
	Wood scrap	tonne	16,699.02
	Barks	tonne	112,171.52
	total	tonne	196,198.78
Monitoring equipment	Meter name	Belt Balance 1#	Belt Balance 2#
	Type/Model	ICS-1000	ICS-1000
	Accuracy	0.5%	0.5%
	SN	0811115	0811116
	Last calibration date	07/01/2011	07/01/2011
	valid Period	06/01/2012	06/01/2012
	Calibration frequency	once per year	once pre year
Measuring/Reading/ Recording frequency	Daily measurement and recording		
Calculation method (if applicable)	Use weigh meters, adjust for the moisture content in order to determine the quantity of dry biomass		
QA/QC procedures	The meter undergoes calibration/maintenance subject to appropriate industrial standards. Direct measurements at the plant site could be crosschecked with an annual energy balance that is based on purchased quantities and stock changes.		
Purpose of data	Baseline and project emissions		
Additional comment	-		



Data/Parameter	Moisture content of the biomass residues		
Unit	% water content		
Description	Moisture content of the biomass residues		
Measured/Calculated /Default	Measured		
Source of data	Measured by balance and dry cabinet		
Value(s) of monitored parameter	Please refer to the spread sheet		
Monitoring equipment			
	Meter name	Balance 1#	Balance 2#
	Type/Model	FA214	T500
	Accuracy	I level	III level
	SN	107	120510095103
	Last calibration date	06/01/2011	06/01/2011
	valid Period	05/01/2012	05/01/2012
	Calibration frequency	once per year	once per year
	Meter name	Dry cabinet 1#	Dry cabinet 2#
	Type/Model	101-1B	101-1B
	Accuracy	1℃	1℃
	SN	1003333	081226
	Last calibration date	06/01/2011	06/01/2011
	valid Period	05/01/2012	05/01/2012
	Calibration frequency	once per year	once per year
Measuring/Reading/ Recording frequency	Daily measurement and recording		
Calculation method (if applicable)	--		
QA/QC procedures	The monitoring procedures in the laboratory of the plant is done according to authoritative guidance		
Purpose of data	Baseline and project emissions		
Additional comment	--		



Data/Parameter	NCV _k				
Unit	GJ/ton of dry matter				
Description	Net calorific value of each biomass residue of type k				
Measured/Calculated /Default	Measured				
Source of data	Report from a reputed laboratory and according to relevant international standards.				
Value(s) of monitored parameter					
	Type	08/01/2011	03/06/2011	07/07/2011	01/09/2011
		GJ/ton	GJ/ton	GJ/ton	GJ/ton
	Rice husk	13.30		13.88	
	Maize straw	12.42			12.28
	Wheat straw		12.23		
	Wood scrap	12.32		12.12	
	Barks	10.20		10.02	
Monitoring equipment	N/A				
Measuring/Reading/ Recording frequency	Six months, taking three samples for each measurement.				
Calculation method (if applicable)	--				
QA/QC procedures	The consistency of the measurements is checked by comparing the measurement results with measurements from previous years, relevant data sources. If the measurement results differ significantly from previous measurements or other relevant data sources, Additional measurements are conducted.				
Purpose of data	Baseline emissions & project emission				
Additional comment	--				



Data/Parameter	AVD_y
Unit	km
Description	Average round trip distance (from and to) between the biomass fuel supply sites and the project plant during the year y
Measured/Calculated /Default	Measured
Source of data	On site records maintained in the log books
Value(s) of monitored parameter	200
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	Each time every truck which transports biomass residue to the plant is counted and recorded in the log books. Monitoring frequency: Every trip
Calculation method (if applicable)	Aggregated monthly and taken the average
QA/QC procedures	The data on distance of fuel supply site from the plant can be verified by cross checking data records on the distances available with information from other sources (e.g. maps). If data is missing for a particular round trip, the following backup data apply in their order: <ul style="list-style-type: none"> ➤ The round trip distance between the farthest biomass fuel supply site and the project plant will be used. ➤ If the farthest biomass fuel supply site could not be verified, 200km would be used for conservativeness.
Purpose of data	Project emission
Additional comment	--

Data/Parameter	N_y
Unit	--
Description	Number of truck trips for the transportation of biomass
Measured/Calculated /Default	Measured
Source of data	On site records maintained in the log books
Value(s) of monitored parameter	22,285
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	Each time every truck which transports biomass residue to the plant is counted and recorded in the log books. Monitoring frequency: Every trip
Calculation method (if applicable)	--
QA/QC procedures	The consistency of the number of truck trips could be checked with the quantity of biomass combusted by the relation with previous years
Purpose of data	Project emissions
Additional comment	--



Data/Parameter	EF_{km,CO_2}
Unit	tCO ₂ e/km
Description	Average CO ₂ Emission Factor for transportation of biomass with trucks during year y
Measured/Calculated /Default	Default
Source of data	IPCC default value
Value(s) of monitored parameter	0.001097 Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-32 on Page 1.75) of the Reference Manual (Estimated Emission Factors for US Heavy Duty Diesel Vehicles)
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	Choose emission factors applicable for the truck types used from the literature in a conservative manner. The appropriateness of the data is reviewed annually
Calculation method (if applicable)	--
QA/QC procedures	--
Purpose of data	Project emission
Additional comment	--

Data/Parameter	$EF_{CO_2,i,y}$
Unit	kg CO ₂ e/TJ
Description	CO ₂ emission factor for fossil fuel type i (diesel)
Measured/Calculated /Default	Default
Source of data	IPCC default value
Value(s) of monitored parameter	74,100 IPCC 2006 default value (Volume2.Chapter2.P16) , diesel emission factor
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	The appropriateness of the data i reviewed annually
Calculation method (if applicable)	--
QA/QC procedures	The plant is designed to use diesel at this stage. Should any other fossil fuel be used during operation, the same monitoring procedures apply.
Purpose of data	Project emission
Additional comment	--



Data/Parameter	<i>NCV_i</i>
Unit	TJ/tonne
Description	Net Calorific Value(NCV _i) of fossil fuel type i(diesel)
Measured/Calculated /Default	Default
Source of data	Reliable National Data
Value(s) of monitored parameter	0.042652 China Energy Statistical Yearbook 2011, Diesel NCV
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	The appropriateness of the data is reviewed annually
Calculation method (if applicable)	--
QA/QC procedures	The plant is designed to use diesel at this stage. Should any other fossil fuel be used during operation, the same monitoring procedures apply.
Purpose of data	Project emission
Additional comment	--



Data/Parameter	FF _{project plant i, y}		
Unit	tonne		
Description	Quantity of fossil fuel type <i>i</i> (diesel) combusted in the project plant during year <i>y</i>		
Measured/Calculated /Default	Measured		
Source of data	Flow meters		
Value(s) of monitored parameter	14.41		
Monitoring equipment			
	Meter name	Flow meter 1#	Flow meter 2#
	Type/Model	ZYLWGY-10C	ZYLWGY-10C
	Accuracy	1.0%	1.0%
	SN	L1012033	L1012034
	Last calibration date	08/01/2011	08/01/2011
	valid Period	07/01/2012	07/01/2012
	Calibration frequency	once per year	once per year
	Meter name	Flow meter 1#	Flow meter 2#
	Type/Model	ZYLWGY-10C	ZYLWGY-10C
	Accuracy	1.0%	1.0%
	SN	L1012032	L1012031
	Last calibration date	08/01/2011	08/01/2011
	valid Period	07/01/2012	07/01/2012
	Calibration frequency	once per year	once per year
	Measuring/Reading/ Recording frequency	Read the fuel consumption data after boiler start-up every time and record accordingly. Monitoring frequency: continuously	
Calculation method (if applicable)	--		
QA/QC procedures	The meters undergo calibration/maintenance subject to appropriate industrial standards. The measurements could be cross-checked by the purchased quantities and stock changes if available.		
Purpose of data	Project emission		
Additional comment	--		



Data/Parameter	<i>FF_{project site, i, y}</i>
Unit	tonne
Description	Quantity of fossil fuel type <i>i</i> combusted in the project site(including the collection sites) for other purposes that are attributable to the project activity during year <i>y</i>
Measured/Calculated /Default	Measured
Source of data	On site consumption records maintained in the log books
Value(s) of monitored parameter	96.05
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	Each time consumption of fossil fuel in the project is recorded on the log books. Monitoring frequency: continuously.
Calculation method (if applicable)	The consumption of diesel is monitored using diesel purchase and consumption log book.
QA/QC procedures	The data is cross checked by the purchase receipts.
Purpose of data	Project emission
Additional comment	--



Data/Parameter	EC _{PJ, y}																													
Unit	MWh																													
Description	On-site electricity consumption(including the electricity consumption for the mechanical treatment of the biomass in the biomass collection sites and the project site) attributable to the project activity during the year y																													
Measured/Calculated /Default	Measured																													
Source of data	On-site measurements by meter or calculated conservatively as the weight of straws smashed in tons and the electricity consumption factor (kWh/ton)																													
Value(s) of monitored parameter	125.783																													
Monitoring equipment	<table><tr><td>Meter name</td><td>Meter 1#</td><td>Meter 2#</td></tr><tr><td>Type/Model</td><td>DT862-4</td><td>DT862-4</td></tr><tr><td>Accuracy</td><td>0.5%</td><td>0.5%</td></tr><tr><td>SN</td><td>2011-82111891</td><td>2009-08-10545482</td></tr><tr><td>First calibration date</td><td>--</td><td>19/08/2010</td></tr><tr><td>Valid Period</td><td>--</td><td>18/08/2011</td></tr><tr><td>Second calibration date</td><td>21/01/2011</td><td>18/08/2011</td></tr><tr><td>Valid Period</td><td>20/01/2012</td><td>17/08/2012</td></tr><tr><td>Calibration Frequency</td><td colspan="2">once per year</td></tr></table>			Meter name	Meter 1#	Meter 2#	Type/Model	DT862-4	DT862-4	Accuracy	0.5%	0.5%	SN	2011-82111891	2009-08-10545482	First calibration date	--	19/08/2010	Valid Period	--	18/08/2011	Second calibration date	21/01/2011	18/08/2011	Valid Period	20/01/2012	17/08/2012	Calibration Frequency	once per year	
Meter name	Meter 1#	Meter 2#																												
Type/Model	DT862-4	DT862-4																												
Accuracy	0.5%	0.5%																												
SN	2011-82111891	2009-08-10545482																												
First calibration date	--	19/08/2010																												
Valid Period	--	18/08/2011																												
Second calibration date	21/01/2011	18/08/2011																												
Valid Period	20/01/2012	17/08/2012																												
Calibration Frequency	once per year																													
Measuring/Reading/ Recording frequency	Daily measured and recorded accordingly. Monitoring frequency: continuously.																													
Calculation method (if applicable)	<p>When the biomass residue is mechanically pretreated, the project needs a certain amount of electricity from grid. This amount could be metered or calculated conservatively.</p> <p>If the monitoring data is missing, or it is not feasible to install a dedicated meter to monitor this indicator, it will be calculated conservatively as the weight of straws smashed in tons and the electricity consumption factor (kWh/ton). The electricity factor can be calculated as follows:</p> <ol style="list-style-type: none">1) Collecting all the nameplates power (in kW) and capacity(t/h) of every straw crackers2) Calculating the electricity factor corresponding to each cracker in kWh/t3) Using the largest number as a conservative electricity factor for the calculation <p>Monitoring frequency: Continuously, aggregated at least monthly.</p>																													
QA/QC procedures	Cross-check measurement results with invoices for purchased electricity if available																													
Purpose of data	Project emission																													



Additional comment	--		
Data/Parameter	$EG_{project\ plant,y}$		
Unit	MWh		
Description	Net quantity of increased electricity generated in the project plant during the year y		
Measured/Calculated /Default	Measured		
Source of data	On-site measurements		
Value(s) of monitored parameter	140,759.85		
Monitoring equipment	Meter name	#1 Gate meter	#1 Backup Meter
	Type/Model	AINRTAL	AINRTAL
	Accuracy	0.2%	0.2%
	SN	02081996	02081997
	First calibration date	15/04/2010	15/04/2010
	Valid Period	14/04/2011	14/04/2011
	Second calibration date	10/04/2011	10/04/2011
	Valid Period	09/04/2012	09/04/2012
	Calibration Frequency	Once per year	Once per year
	Meter name	#2 Gate meter	#2 Backup Meter
	Type/Model	AINRTAL	AINRTAL
	Accuracy	0.2%	0.2%
	SN	02081998	02081999
	First calibration date	15/04/2010	15/04/2010
	Valid Period	14/04/2011	14/04/2011
	Second calibration date	10/04/2011	10/04/2011
	Valid Period	09/04/2012	09/04/2012
	Calibration Frequency	Once per year	Once per year
Measuring/Reading/ Recording frequency	Daily measured and recorded accordingly. Monitoring frequency: continuously.		
Calculation method (if applicable)	The net electricity equals to electricity supplied to the grid minus electricity purchased from the grid.		
QA/QC procedures	The consistency of the data is cross-checked with receipts from electricity sales and purchase invoices, if available; and the quantity of fuels fired to see whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency.		
Purpose of data	Baseline emission		
Additional comment	--		



Data/Parameter	--
Unit	Tonnes
Description	Quantity of each biomass residues type k that are utilized in the defined geographical region
Measured/Calculated /Default	Measured
Source of data	Surveys or Statistics
Value(s) of monitored parameter	Please refer to Section E.3
Monitoring equipment	N/A
Measuring/Reading/Recording frequency	Annually
Calculation method (if applicable)	N/A
QA/QC procedures	This parameter is reviewed annually according to the project data and official data.
Purpose of data	Leakage
Additional comment	--

Data/Parameter	--
Unit	Tonnes
Description	Quantity of each biomass residues type k that are available in the region
Measured/Calculated /Default	Measured
Source of data	Surveys or Statistics
Value(s) of monitored parameter	Please refer to Section E.3
Monitoring equipment	N/A
Measuring/Reading/Recording frequency	Annually
Calculation method (if applicable)	N/A
QA/QC procedures	This parameter is reviewed annually according to the project data and official data.
Purpose of data	Leakage
Additional comment	--

The monitored parameters are given in the following table 1.

Table 1: Monitored Parameters



Parameter			Rice husk			Maize straw		
			BFk,y	Moistur e	NCV	BFk,y	Moistur e	NCV
Mont h	from	to	tonne	%	GJ/ton	tonne	%	GJ/ton
			A	B	C	D	E	F
Jan	15/01/2011	31/01/2011	3993.00	13.10	13.30	1258.00	27.20	12.42
Feb	01/02/2011	28/02/2011	10282.00	13.00	13.30	1012.00	26.50	12.42
Mar	01/03/2011	31/03/2011	11458.00	13.10	13.30	1017.00	28.10	12.42
Apr	01/04/2011	30/04/2011	9463.00	12.90	13.30	1588.00	27.30	12.42
May	01/05/2011	31/05/2011	8964.00	12.80	13.30			
Jun	01/06/2011	30/06/2011	7573.00	12.80	13.30			
Jul	01/07/2011	31/07/2011	5282.00	12.90	13.88			
Aug	01/08/2011	31/08/2011	2278.00	13.50	13.88			
Sep	01/09/2011	30/09/2011				2201.00	29.70	12.28
Oct	01/10/2011	31/10/2011				6229.00	28.50	12.28
Nov	01/11/2011	30/11/2011				2682.00	27.50	12.28
Dec	01/12/2011	31/12/2011				4858.00	27.40	12.28
Total			59293.00	-	-	20845.00	-	-

Parameter			Wheat straw			Wood scrap		
			BFk,y	Moistur e	NCV	BFk,y	Moistur e	NCV
Mont h	from	to	tonne	%	GJ/ton	tonne	%	GJ/ton
			G	H	I	J	K	L
Jan	15/01/2011	31/01/2011				1056.00	33.20	12.32
Feb	01/02/2011	28/02/2011				2046.00	34.30	12.32
Mar	01/03/2011	31/03/2011						12.32
Apr	01/04/2011	30/04/2011				145.00	35.10	12.32
May	01/05/2011	31/05/2011				10997.00	32.10	12.32
Jun	01/06/2011	30/06/2011	271.00	26.70	12.23	5677.00	31.80	12.32
Jul	01/07/2011	31/07/2011	526.00	27.80	12.23	629.00	32.30	12.12
Aug	01/08/2011	31/08/2011	176.00	28.30	12.23	4347.00	35.80	12.12
Sep	01/09/2011	30/09/2011						12.12
Oct	01/10/2011	31/10/2011						12.12
Nov	01/11/2011	30/11/2011						12.12
Dec	01/12/2011	31/12/2011						12.12
Total			973.00	-	-	24897.00	-	-



Parameter			Barks			AVD _y	N _y	FF _{project} plant,i,y
			BF _{k,y}	Moistur e	NCV			
Mont h	from	to	Tonne	%	GJ/ton	km	-	Tonnes
			M	N	O	P	Q	R
Jan	15/01/2011	31/01/2011	3757.00	44.50	10.20	200.00	1,595.00	2.50
Feb	01/02/2011	28/02/2011	13811.00	43.20	10.20	200.00	826.00	0.00
Mar	01/03/2011	31/03/2011	10688.00	43.30	10.20	200.00	2,876.00	0.00
Apr	01/04/2011	30/04/2011	12990.00	42.80	10.20	200.00	1,983	0.80
May	01/05/2011	31/05/2011	6138.00	42.70	10.20	200.00	1,598	2.13
Jun	01/06/2011	30/06/2011	8888.00	41.20	10.20	200.00	886	1.30
Jul	01/07/2011	31/07/2011	22681.00	41.30	10.02	200.00	1,225	1.35
Aug	01/08/2011	31/08/2011	22823.00	43.80	10.02	200.00	1,042	0.55
Sep	01/09/2011	30/09/2011	21767.00	45.30	10.02	200.00	3,116	1.64
Oct	01/10/2011	31/10/2011	21957.00	44.10	10.02	200.00	3,622	1.83
Nov	01/11/2011	30/11/2011	27472.00	42.70	10.02	200.00	1,729	1.61
Dec	01/12/2011	31/12/2011	24296.00	42.60	10.02	200.00	1,787	0.70
Total			197268.00	-	-		22,285	14.41

Parameter			FF _{project} site,i,y	EG _{project} supply,y	EG _{project} import,y	EG _{project} net,y	EC _{PJ,y}
			Tonnes	MWh	MWh	MWh	MWh
Mont h	from	to	S	T	U	V	W
Jan	15/01/2011	31/01/2011	7.63	5,782.25	17.08	5,765.17	31.84
Feb	01/02/2011	28/02/2011	6.92	15,274.63	0.00	15,274.63	87.93
Mar	01/03/2011	31/03/2011	6.36	12,698.07	2.63	12,695.45	58.02
Apr	01/04/2011	30/04/2011	6.05	12,718.13	8.05	12,710.08	73.11
May	01/05/2011	31/05/2011	7.43	15,182.58	2.70	15,179.89	107.67
Jun	01/06/2011	30/06/2011	8.81	13,434.75	1.47	13,433.28	85.13
Jul	01/07/2011	31/07/2011	9.72	13,014.30	13.97	13,000.33	119.65
Aug	01/08/2011	31/08/2011	9.23	10,673.71	5.88	10,667.83	145.16
Sep	01/09/2011	30/09/2011	7.98	8,300.11	5.04	8,295.07	118.74
Oct	01/10/2011	31/10/2011	8.02	10,529.40	0.74	10,528.67	137.82
Nov	01/11/2011	30/11/2011	8.12	11,893.60	17.92	11,875.68	149.43
Dec	01/12/2011	31/12/2011	9.78	11,335.38	1.58	11,333.81	143.34
Total			96.05	140,836.89	77.04	140,759.85	1,257.83

D.3. Implementation of sampling plan

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N/A

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

Baseline emissions are calculated as:

a) Emission reduction due to displacement of electricity

$$ER_{electricity,y} = EG_y \times EF_{electricity,y} \quad (1)$$

Where:

$ER_{electricity,y}$	Emission reductions due to displacement of electricity during the year y (tCO ₂ /yr)
EG_y	Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y (MWh)
$EF_{electricity,y}$	CO ₂ emission factor for the electricity displaced due to the project activity during the year y (tCO ₂ /MWh), which is 0.8888 tCO ₂ e/MWh (See registered PDD Version 4 available online at http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1256212563.8/view)

During the current monitoring period, the net electricity supplied to the grid is:

$$EG_y = 140,759,85 \text{ MWh}$$

Therefore,

$$ER_{electricity,y} = 140,759.85 \text{ MWh} \times 0.8888 \text{ tCO}_2\text{e} / \text{MWh} = 125,107.35 \text{ tCO}_2\text{e}$$

b) Emission reductions or increases due to displacement of heat

Since the project does not claim emission reductions for heating, so the $ER_{heat,y} = 0$

c) Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass residues

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

Where:

$BE_{biomass,y}$	Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year y (tCO ₂ e/yr)
GWP_{CH_4}	Global Warming Potential of methane valid for the commitment period (tCO ₂ e/tCH ₄)
$BF_{PJ,k,y}$	Incremental quantity of biomass residue type k used as a result of the project activity in the project plant during the year y (tons of dry matter)
NCV_k	Net calorific value of the biomass residue type k (GJ/ton of dry matter)
$EF_{burning,CH_4,k,y}$	CH ₄ emission factor for uncontrolled burning of the biomass residue type k during the year y (tCH ₄ /GJ)
k	Types of biomass residues for which the identified baseline scenario is B1 or B3 and for which leakage effects could be ruled out with one of the approaches L1, L2 or L3 described in the leakage section

$$BE_{biomass,y} = 2 \text{ tCO}_2\text{e} / \text{CH}_4 \times 196,198.78 \text{ t} \times 0.001971 \text{ tCH}_4 / \text{t} = 8,120.86 \text{ tCO}_2\text{e}$$

So, the baseline emission reduction is:

$$BE_y = ER_{electricity,y} + ER_{heat,y} + BE_{biomass,y} = 125,107.35 + 0 + 8,120.86 = 133,228.22 \text{ tCO}_2\text{e}$$

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

According to methodology ACM0006 version9, the emissions of the project within the project boundary include:

- CO₂ emissions from transportation of biomass residues to the project site (PET_y),
- CO₂ emissions from on-site consumption of fossil fuels due to the project activity (PEFF_y),
- CO₂ emissions from consumption of electricity (PE_{EC,y}),
- Where this emission source is included in the project boundary and relevant: CH₄ emissions from the combustion of biomass residues (PE_{Biomass,CH₄,y}),
- Where waste water from the treatment of biomass residues degrades under anaerobic conditions: CH₄ emissions from waste water.

Project emissions are calculated as follows:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH_4} \cdot PE_{biomass,CH_4,y}$$

Where:

PET _y	CO ₂ emissions during the year y due to transport of the biomass residues to the project plant (tCO ₂ /yr)
PEFF _y	CO ₂ emissions during the year y due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity (tCO ₂ /yr)
PE _{EC,y}	CO ₂ emissions during the year y due to electricity consumption at the project site that is attributable to the project activity (tCO ₂ /yr)
GWP _{CH₄}	Global Warming Potential for methane valid for the relevant commitment period
PE _{Biomass,CH₄,y}	CH ₄ emissions from the combustion of biomass residues during the year y (tCH ₄ /yr)

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

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

Where:

PET _y	CO ₂ emissions during the year y due to transport of the biomass residues to the project plant (tCO ₂ /yr)
N _y	Number of truck trips during the year y
AVD _y	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}	Average CO ₂ emission factor for the trucks measured during the year y (tCO ₂ /km)

Therefore,

$$PET_y = 22,285 \times 200 \times 0.001097 tCO_2e / km = 4,889.33 tCO_2$$

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

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

Where:

$PE_{FC,j,y}$	Are the CO ₂ emissions from fossil fuel combustion in process j during the year y (tCO ₂ /yr);
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);
$COEF_{i,y}$	Is the CO ₂ emission coefficient of fuel type i in year y (tCO ₂ /mass or volume unit)
i	Are the fuel types combusted in process j during the year y

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

$COEF_{i,y}$	Is the CO ₂ emission coefficient of fuel type i in year y (tCO ₂ /mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO ₂ emission factor of fuel type i in year y (tCO ₂ /GJ)
i	Are the fuel types combusted in process j during the year y

Therefore,

$$PEFF_y = \sum_i FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,y}$$
$$= (14.41t + 96.05t) \times 0.042652TJ / t \times 74,100kgCO_2e / TJ / 1 \times 10^3 = 349.11tCO_2e$$

c) CO₂ emissions from electricity consumption ($PE_{EC,y}$)

$$PE_{EC,y} = \sum_i EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$

Where:

$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO ₂ /MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

Therefore,

$$PE_{EC,y} = 1,257,83MWh \times 0.8888tCO_2e / MWh \times (1 + 20\%) = 1341.55tCO_2e$$

d) Methane emissions from combustion of biomass residues ($PE_{Biomass,CH4,y}$)

$$PE_{biomass,CH4,y} = EF_{CH4,BF} \cdot \sum_k BF_{k,y} \cdot NCV_k$$

Where:

$BF_{k,y}$	Quantity of biomass residue type k combusted in the project plant during the year y (tons of dry matter)
NCV_k	Net calorific value of the biomass residue type k (GJ/ton of dry matter)
$EF_{CH4,BF}$	CH ₄ emission factor for the combustion of biomass residues in the project plant (tCH ₄ /GJ), according to ACM0006, Version 9, the $EF_{CH4,BF} = 41.1 \text{ kg CH}_4/TJ$

Therefore,

$$PE_{biomass,CH4,y} = 91.18tCH_4$$

According the data calculated above,

$$PE_y = 4,889.33tCO_2e + 349.11tCO_2e + 1,341.55tCO_2e + 21tCO_2e / tCH_4 \times 91.18tCH_4$$

$$= 8,494.81tCO_2e$$

E.3. Calculation of leakage

>>

According to methodology ACM0006 version 9, the main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion or other sources due to diversion of biomass residues from other uses to the project plant as a result of the project activity. Changes in carbon stocks in the LULUCF sector are expected to be insignificant since this methodology is limited to biomass residues.

A statistic is issued by a reputed institute on the biomass availability, and the data are as followed:

Demonstration of abundant surplus of biomass availability (tonne)					
	Rice husk	Maize straw	Wheat straw	Wood scrap	Barks
Total biomass generation in the region (10,000t)	35.00	10.00	34.00	45.00	
Biomass loss (10,000t)	3.50	1.00	3.40	4.50	
Available Biomass (10,000t)	31.50	9.00	30.60	40.50	
Biomass consumption other the project (10,000t)	5.25	1.50	5.10	6.75	
Biomass consumption in the project (10,000t)	6.17	2.17	0.10	2.59	20.51
Total biomass consumption (10,000t)	11.42	3.67	5.20	29.85	
Available Biomass/Total biomass utilised -100%	175.93%	145.37%	488.35%	35.66%	
Leakage or not? (if it is more than 25%; if not, yes)	Yes	Yes	Yes	Yes	
The limit volume of each biomass residue type that the project owner is allowed to use to avoid leakage (10,000t)	20.49	5.85	19.88	26.3	
Biomass utilised by the project (full year)=Biomass utilised by the project (15/01/2011~31/12/2011) *365/351					

From the data in the above table, that the leakage of the project within the project boundary is zero, i.e. $LE_y = 0 tCO_2e$.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e)	Project emissions or actual net GHG removals by sinks (tCO ₂ e)	Leakage (tCO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO ₂ e)
Total	133,228	8,495	0	124,733 (Rounded down)



E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO ₂ e)	102,472 ²	124,733

E.6. Remarks on difference from estimated value in registered PDD

>>

From the data shown in the above table, the actual emission reduction achieved during current monitoring period is 21.72% higher than the ex-ante estimation in registered CDM-PDD, the main reasons are below:

- The electricity generation was 16% higher than the ex-ante estimation in registered CDM PDD (Version 4) due to higher operation hours. As the project was just fully commissioned, the new facilities ensured the stable operation of the project activity.
- Project emissions were less than the ex-ante estimation in registered CDM PDD (Version 4).

The higher electricity generation has no impact on the additionality of the project activity as the sensitivity analysis of the project activity shows that the IRR will not exceeds benchmark until a 24% increase in operation hours.

History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance		

² $102,472tCO_2e = \frac{106,559tCO_2e}{365days} \times 351days$