# Monitoring report form
# (Version 03.2)

## Monitoring report

| | |
|---|---|
| **Title of the project activity** | Hunan Qidong Kaidi Biomass Power Project |
| **Reference number of the project activity** | 3066 |
| **Version number of the monitoring report** | 1.0 |
| **Completion date of the monitoring report** | 17/12/2013 |
| **Registration date of the project activity** | 15/01/2011 |
| **Monitoring period number and duration of this monitoring period** | The 2nd monitoring period, from 01/10/2011 to 31/12/2012 |
| **Project participant(s)** | **United Kingdom of Great Britain and Northern Ireland** , involved indirectly authorized Participants: Camco Clean Energy Plc, Camco Carbon Limited<br>**Switzerland** , involved indirectly authorized Participants: Camco Clean Energy Plc<br>project owner, Qidong Kaidi Green Energy Development Co., Ltd |
| **Host Party(ies)** | China |
| **Sectoral scope(s) and applied methodology(ies)** | Energy industries (renewable - / non-renewable sources)<br>ACM0006 (Version 09) – "Consolidated methodology electricity generation from biomass residues"<br>"Combined tool to identify the baseline scenario and demonstrate additionality". (Version 02.2)<br>ACM0002 (Version 10) – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"<br>"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02)<br>"Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 01)<br>"Tool to calculate the emission factor for an electricity system" (Version 02) |
| **Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD** | 136,586 tonnes CO2e |
| **Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period** | 61,426 tonnes CO2e |
| **Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)** | 134,399 tonnes CO2e |
| **Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).** | 0 |

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

>>

Hunan Qidong Kaidi Biomass Power Project (hereafter referred to as the proposed project) is a biomass utilization project developed by Qidong Kaidi Green Energy Development Co., Ltd.(hereafter referred to as the Project Owner) and is located in the Hongfeng Industry Area, Economic and Technology Economic and Technology Development Area, Qidong County, Hunan Province, P.R. China. The project is designed to produce 253,440 MWh of net electricity per year from burning biomass residues, displacing electricity generated by Central China Power Grid (CCPG), which is dominated by fossil fuel-fired power plants, and thus reducing greenhouse gas ($CO_2$) emissions.

The project processes and burns biomass residue, of which rice husk, rice straws, branches, stumps, barks and wood chips are the biomass fuel. The project is designed as a total installation of 48MW. The project is built into two phases, each of them is 24MW. 2 sets of 65t/h Circulating Fluidized Bed (CFB) boiler and 2 sets of 12MW steam turbines generator units are installed at the first phase. The second phase of the project hasn't been put into construction yet. Therefore, the total installed capacity of the project is 24MW and the project is estimated to achieve 108,851 tonnes of $CO_2$e emissions reduction annually.

The project began to construct in April 2009, and was put into operation since 05/10/2010. 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 (01/10/2011-31/12/2012), the project has achieved emission reductions of 61,426tonnes $CO_2$e.

### A.2. Location of project activity

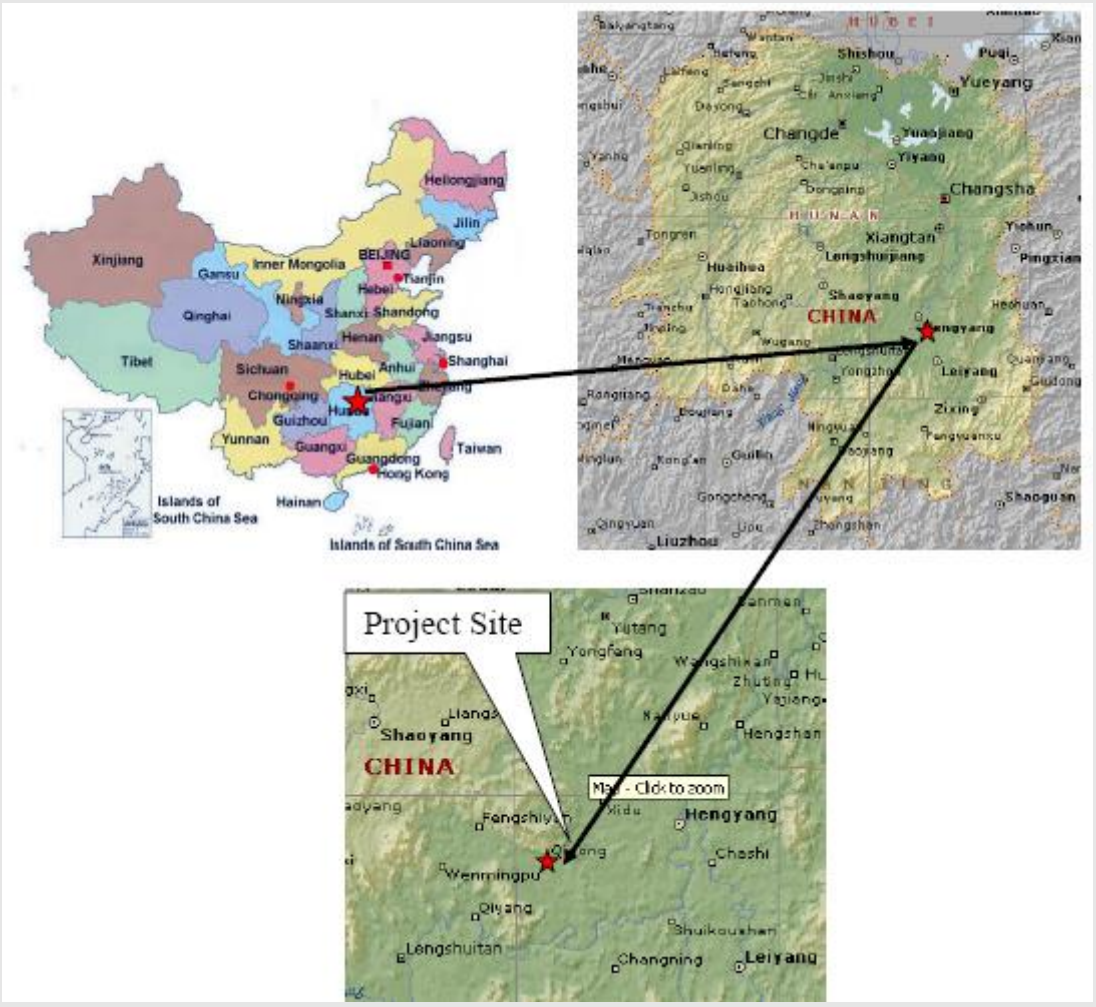
>>

The project activity is located in Hongfeng Industry Area, Economic and Technology Development Area, Qidong County, Hunan Province, P.R. China..

The center of plant has geographical coordinates of 112°03´57″ east longitude26°47´44″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) | Qidong Kaidi Green Energy Development Co., Ltd | No |
| United Kingdom of Great Britain and Northern Ireland | Camco Clean Energy Plc | No |
| United Kingdom of Great Britain and Northern Ireland | Camco Carbon Limited | No |
| Switzerland | Camco Clean Energy Plc | No |

## A.4. Reference of applied methodology

**>>**

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

**>>**
Crediting period: 15/01/2011 – 14/01/2018(Renewable)
The start date of the crediting period is 15/01/2011.
This monitoring period: 01/10/2011-31/12/2012

## SECTION B. Implementation of project activity

### B.1. Description of implemented registered project activity

**>>**
The project consists of one site, and has been implemented as described in the registered PDD. The project began to construct in Apr 2009, and was put into operation since 05/10/2010. Please refer to the following table for details.

| Activity | Date | |
|---|---|---|
| | 1# Generator | 2# Generator |
| Start of construction | 22/04/2009 | |
| Commissioning of core equipment | 01/10/2010 | 27/11/2010 |
| Operation of core equipment | 05/10/2010 | 01/12/2010 |

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 12 times and 8 times from 01/10/2011 to 31/12/2012.

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

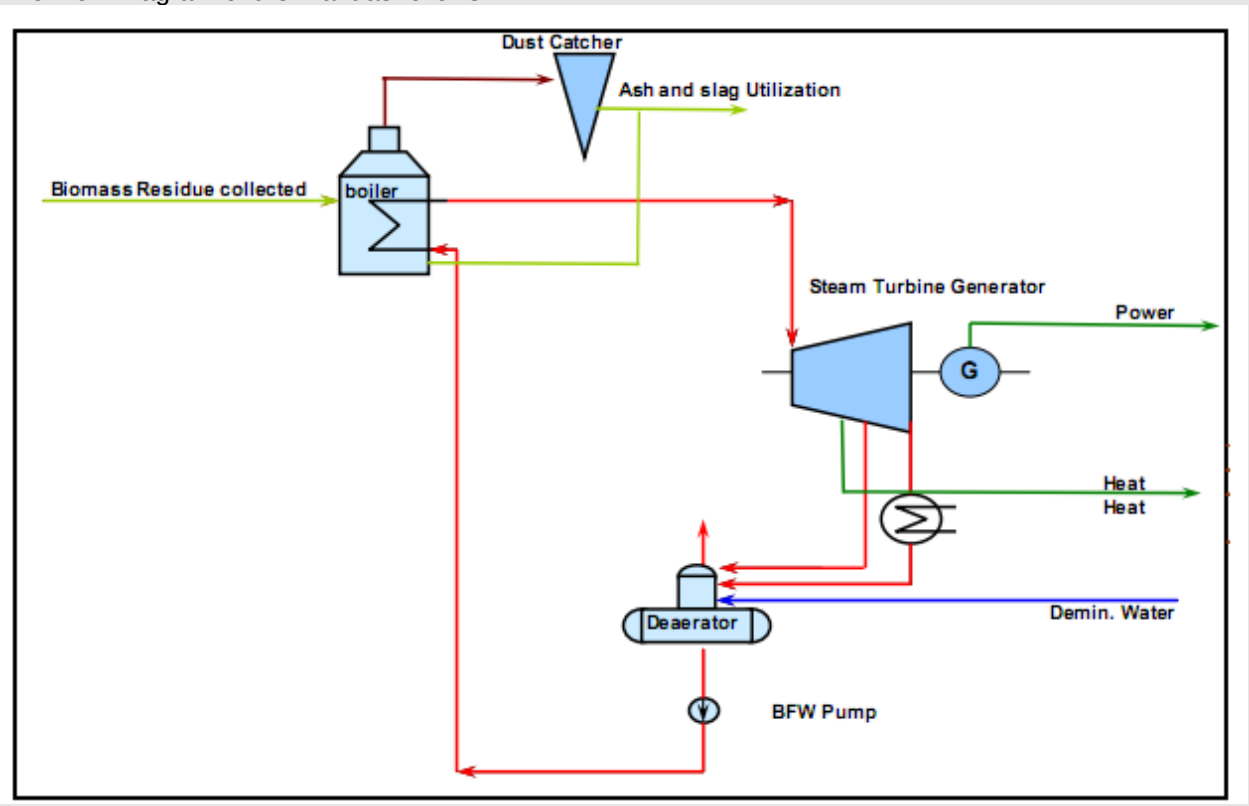
The technology employed by the project is advanced domestic technology. The project installed two sets of 65t/h circulating fluid bed (CFB) boilers with medium temperature and sub-high pressure. At the same time, two 12MW steam turbines and two associated generators are applied in the project. The steam 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℃ |
| Feed water temperature | 153.2℃ |
| Feed water pressure | 5.72MPa |
| Efficiency | ≥86 % |
| Quantity | 2 |
| STEAM TURBINE | |
| Manufacturer | China Chang Jiang Energy Corporation |
| Model | C12-4.90/0.981 |
| Type | Medium temperature and sub-high pressure extraction condensing steam turbine |
| Rated power | 12MW |
| Main steam pressure | 4.9MPa |
| Main steam temperature | 435℃ |

| | |
|---|---|
| Rate extraction steam volume | 15t/h |
| Maximum Extraction steam volume | 60t/h |
| Quantity | 2 |
| GENERATOR | |
| Manufacturer | China Chang Jiang Energy Corporation. |
| Model | QF-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 an 110kV transformer at the site to 110kV substation and then supplied to Hunan power grid, which is a sub-grid of the Central China Power Grid (CCPG). The proposed project will therefore replace the equivalent capacity of power plants on the CCPG, which is predominantly made up of fossil fuel fired plants.
The Flow Diagram of the Plant as follows:




### B.2. Post registration changes

### B.2.1. Temporary deviations from registered monitoring plan or applied methodology

**>>**
N/A

### B.2.2. Corrections

**>>**

N/A

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

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

**>>**
N/A

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

**>>**
The request for post-registration changes related to the change of biomass types of the project to the PDD was approved by EB on 21 Dec 2012.

Please refer to the link: http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1256219572.25/view

**B.2.5. Changes to start date of crediting period**

**>>**
N/A

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

**>>**
N/A

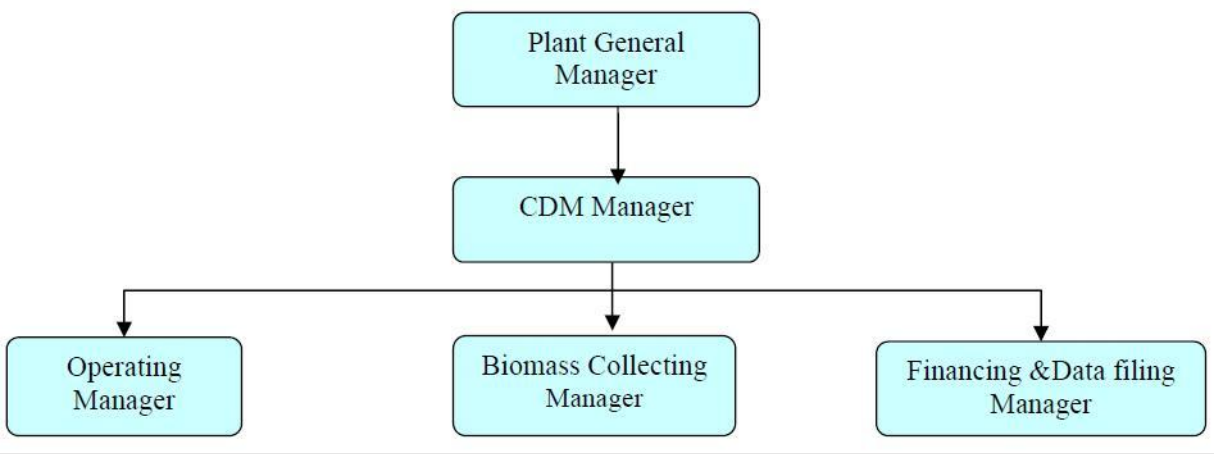
**SECTION C. Description of monitoring system**

**>>**

**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 Manger 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 Manger 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 is a gate way meter installed on the project site monitoring the electricity supplied to the grid and purchased from the grid. There is a back up meter installed at the project site monitoring the electricity supplied to the grid and purchased from the grid too.

In addition, a 10KV backup power supply is available in site in the early time of the project and the amount of electricity imported through this line is monitored and checked by the invoice if available.

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 proposed 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 proposed project needs a certain amount of

electricity from grid. This amount is metered or calculated conservatively.

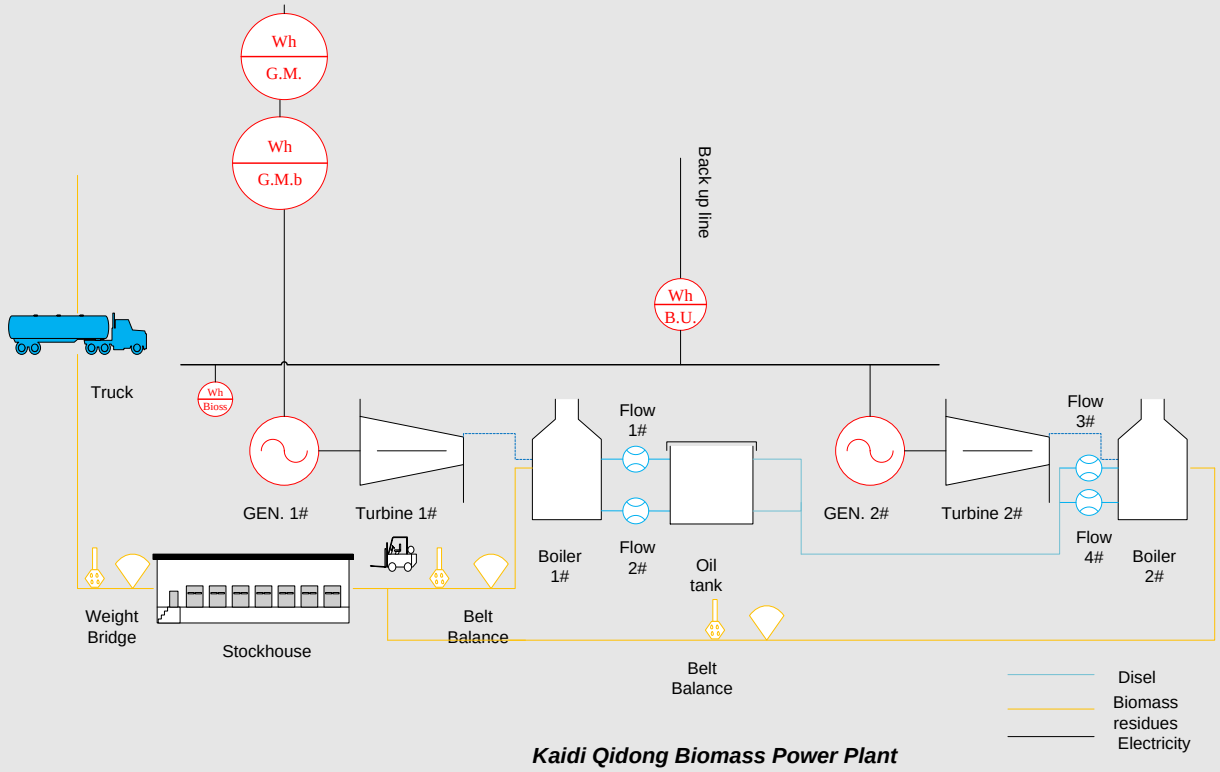
If the monitoring data is missing, or it is not feasible to install a dedicated meter to monitor this indicator, it is calculated conservatively as the weight of straws smashed in tons and the electricity consumption factor (kWh/ton). The electricity factor can be calculated as follows:

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 proposed 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**




***Kaidi Qidong Biomass Power Plant***

**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 will be 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**

*(Copy this table for each piece of data and parameter.)*

| **Data / Parameter:** | $EF_y$ |
|---|---|
| Unit: | t $CO_2e$/MWh |
| Description: | Baseline emission factor of Central China Power Grid |
| Source of data: | The registered PDD Version 4 |
| Value(s) applied): | 0.9735 |
| Purpose of data: | Baseline emission calculation |
| Additional comment: | -- |

| **Data / Parameter:** | $GWP_{CH4}$ |
|---|---|
| Unit: | t $CO_2e$/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:** | $EF_{CH4,BF}$ |
|---|---|
| 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:** | $NCV_k*EF_{burning,CH4,k,y}$ |
|---|---|
| Unit: | t $CH_4$/tonne |
| Description: | CH4 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**

*(Copy this table for each piece of data and parameter.)*

| **Data / Parameter:** | $\boldsymbol{BF_{k,y}}$ |
|---|---|
| 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 husks | tonne | 10,784.27 |
| Rice straws | tonne | 4,878.47 |
| Wood chips | tonne | 17,757.07 |
| Stumps | tonne | 1,368.11 |
| Branches | tonne | 8,765.12 |
| Barks | tonne | 67,194.65 |
| total | tonne | 110,747.68 |

| | |
|---|---|
| Monitoring equipment: | |

| Meter name | Belt Balance 1# | Belt Balance 2# |
|---|---|---|
| Type/Model | ICS-ST4 | ICS-ST4 |
| Accuracy | 1.0 | 1.0 |
| SN | 807837 | 811358 |
| 1st calibration date | 25/11/2010 | 25/11/2010 |
| 2nd calibration date | 25/11/2011 | 25/11/2011 |
| Last calibration date | 15/11/2012 | 15/11/2012 |
| valid Period | 14/11/2013 | 14/11/2013 |
| Calibration frequency | once per year | once per year |

| | |
|---|---|
| Measuring/ Reading/ Recording frequency: | Continuously measurement and monthly recording; 100% of data is monitored and electronically archived. |
| 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 | ES-4100H |
| Accuracy | I level | Ⅲ level |
| SN | 2770 | 0927620 |
| 1st calibration date | 25/11/2010 | 25/11/2010 |
| 2nd calibration date | 25/11/2011 | 25/11/2011 |
| Last calibration date | | 15/11/2012 |
| valid Period | 24/11/2012 | 14/11/2013 |
| Calibration frequency | once per year | once per year |

| Meter name | Balance 3# |
|---|---|
| Type/Model | AL204 |
| Accuracy | I level |
| SN | 1231060551 |
| 1st calibration date | 15/11/2012 |
| valid Period | 14/11/2013 |
| Calibration frequency | once per year |

| Meter name | Dry cabinet 1# | Dry cabinet 2# |
|---|---|---|
| Type/Model | 101 | 202-2A |
| Accuracy | 1℃ | 1℃ |
| SN | 081214 | 32712 |
| 1st calibration date | 25/10/2010 | 25/10/2010 |
| 2nd calibration date | 26/11/2011 | 26/11/2011 |
| Last calibration date | 15/11/2012 | 15/11/2012 |
| valid Period | 14/11/2013 | 14/11/2013 |
| Calibration frequency | once per year | once per year |

| | |
|---|---|
| Measuring/ Reading/ Recording frequency: | Daily measurement and monthly recording; 100% of data is monitored and electronically archived. |
| 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: | The balance manufacturer advised to replace the equipment every 3 years, and in order to avoid the potential risk of equipment failures the balance 1# with Type FA214 (SN: 2770) was replaced by new one with type of AL204 (SN: 1231060551) on15 November 2012. |

| **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: | |
| 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: | -- |

| Type | 27/06/2011 | 25/08/2011 | 30/09/2011 | 05/01/2012 | 23/07/2012 |
|---|---|---|---|---|---|
| | GJ/ton | GJ/ton | GJ/ton | GJ/ton | GJ/ton |
| Rice husks | 13.07 | -- | | 12.97 | 13.31 |
| Rice straws | -- | 10.63 | | | |
| Wood chips | 11.76 | -- | | 11.32 | 11.17 |
| Stumps | -- | -- | 11.22 | | |
| Branches | 11.27 | -- | | 11.49 | |
| Barks | | -- | 11.33 | 11.56 | 11.24 |

| **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.<br>Monitoring frequency: Continuously |

| | |
|---|---|
| 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).<br>If data is missing for a particular round trip, the following backup data apply in their order:<br>➢ The round trip distance between the farthest biomass fuel supply site and the project plant will be used.<br>➢ 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: | 14,346 |
| 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.<br>Monitoring frequency: Continuously |
| 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:** | $EF_{km,CO2}$ |
|---|---|
| Unit: | $tCO_2e/km$ |
| 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<br>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.<br>The appropriateness of the data is reviewed annually |
| Calculation method (if applicable): | -- |
| QA/QC procedures: | -- |
| Purpose of data: | Project emission |
| Additional comment: | -- |

| **Data / Parameter:** | $EF_{CO2,I,y}$ |
|---|---|
| Unit: | kg $CO_2$e/TJ |
| Description: | $CO_2$ emission factor for fossil fuel type i (diesel) |
| Measured/ Calculated / Default: | Default |
| Source of data: | As local or national data are not available, the source is IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories |
| Value(s) of monitored parameter: | 74,800<br>The upper limit of IPCC 2006 default value , 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:** | ***NCVi*** |
|---|---|
| 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<br>China Energy Statistical Yearbook 2010,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*(diesel) combusted in the project plant during year y |
| Measured/ Calculated / Default: | Measured |
| Source of data: | Flow meters |
| Value(s) of monitored parameter: | 14.08 |

| | |
|---|---|
| Monitoring equipment: | |

| Meter name | Flow meter 1# | Flow meter 2# |
|---|---|---|
| Type/Model | LWY-10C | LWY-10C |
| Accuracy | 1.0 | 1.0 |
| SN | 08074 | 08021 |
| 1st calibration date | 19/11/2010 | 19/11/2010 |
| valid Period | 18/11/2011 | 18/11/2011 |
| Calibration frequency | once per year | once per year |

| Meter name | Flow meter3# | Flow meter 4# |
|---|---|---|
| Type/Model | LWY-10C | LWY-10C |
| Accuracy | 1.0 | 1.0 |
| SN | 11743 | 11749 |
| 1st calibration date | 19/11/2010 | 19/11/2010 |
| 2nd calibration date | 03/05/2012 | 03/05/2012 |
| valid Period | 02/05/2013 | 02/05/2013 |
| Calibration frequency | once per year | once per year |

| Meter name | Flow meter5# | Flow meter 6# |
|---|---|---|
| Type/Model | LWY-10C | LWY-10C |
| Accuracy | 1.0 | 1.0 |
| SN | L1023015 | L1022044 |
| 1st calibration date | 03/05/2012 | 03/05/2012 |
| valid Period | 02/05/2013 | 02/05/2013 |
| Calibration frequency | once per year | once per year |

| | |
|---|---|
| Measuring/ Reading/ Recording frequency: | Continuously measuring, read the data of fuel consumption after boiler start-up every time and record accordingly. |
| 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:** | $FF_{project\ site,,i,\ y}$ |
|---|---|
| Unit: | tonne |
| Description: | Quantity of fossil fuel type *i* combusted in the project site(including the collection sites) for other purposes that are attributable to the project activity during year *y* |
| Measured/ Calculated / Default: | Measured |
| Source of data: | On site consumption records maintained in the log books |

| | |
|---|---|
| Value(s) of monitored parameter: | 115.82 |
| Monitoring equipment: | N/A |
| Measuring/ Reading/ Recording frequency: | Each time consumption of fossil fuel in the project is recorded on the log books.<br>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 biomass smashed in tons and the electricity consumption factor (kWh/ton) |
| Value(s) of monitored parameter: | 463.42 |
| Monitoring equipment: | <table><tr><td>Meter name</td><td>Meter 1#</td><td>Meter 2#</td></tr><tr><td>Type/Model</td><td>DTS426</td><td>DTS426</td></tr><tr><td>Accuracy</td><td>0.5</td><td>0.5</td></tr><tr><td>SN</td><td>0955804</td><td>0955801</td></tr><tr><td>1st calibration date</td><td>22/12/2010</td><td>18/12/2010</td></tr><tr><td>2nd calibration date</td><td>22/12/2011</td><td>18/12/2011</td></tr><tr><td>Last calibration date</td><td>22/12/2012</td><td>22/12/2012</td></tr><tr><td>Valid Period</td><td>21/12/2013</td><td>21/12/2013</td></tr><tr><td>Calibration Frequency</td><td colspan="2">once per year</td></tr></table> |
| Measuring/ Reading/ Recording frequency: | Continuously measuring and monthly recoding; 100% of data is monitored and electronically archived. |

| | |
|---|---|
| Calculation method (if applicable): | When the biomass residue is mechanically pretreated, the proposed project needs a certain amount of electricity from grid. This amount could be metered or calculated conservatively.<br><br>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:<br>1) Collecting all the nameplates power (in kW) and capacity(t/h) of every straw crackers<br>2) Calculating the electricity factor corresponding to each cracker in kWh/t<br>3) Using the largest number as a conservative electricity factor for the calculation |
| 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: | 63,581.32 |

| | |
|---|---|
| Monitoring equipment: | |

| Meter name | Gate meter | Backup Meter | 10KV Meter |
|---|---|---|---|
| Type/Model | Mk6E | Mk6E | DSSD876-TF4 |
| Accuracy | 0.2S | 0.2S | 0.5 |
| SN | 209475048 | 209475047 | 4340901000156194 |
| 1st calibration date | 30/11/2010 | 30/11/2010 | 09/12/2010 |
| 2nd calibration date | 30/11/2011 | 30/11/2011 | 09/12/2011 |
| Last calibration date | 28/11/2012 | 28/11/2012 | 12/09/2012 |
| Valid Period | 27/11/2013 | 27/11/2013 | 11/09/2013 |
| Calibration Frequency | Once per year | | |

| | |
|---|---|
| Measuring/ Reading/ Recording frequency: | Continuously measuring and monthly recoding; 100% of data is monitored and electronically archived. |
| Calculation method (if applicable): | The net electricity equals to electricity supplied to the grid minus electricity purchased from the grid minus electricity purchased from the 10kv backup power. |
| 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

| | | Rice husk | | | Rice straws | | |
|---|---|---|---|---|---|---|---|
| | | $BF_{k,y}$ | Moisture | NCV | $BF_{k,y}$ | Moisture | NCV |
| from | to | tonne | % | GJ/ton | Tonne | % | GJ/ton |
| | | A | B | C | D | E | F |
| 01/10/2011 | 31/10/2011 | 4,142 | 14.08 | 13.07 | | | |
| 01/11/2011 | 30/11/2011 | 1,180 | 14.15 | 13.07 | 1,087 | 30.43 | 10.63 |
| 01/12/2011 | 31/12/2011 | 1,408 | 13.95 | 13.07 | 2,157 | 31.12 | 10.63 |
| 01/01/2012 | 31/01/2012 | 1,428 | 13.80 | 12.97 | 3,778 | 30.22 | 10.63 |
| 01/02/2012 | 29/02/2012 | | 14.30 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 648 | | 12.97 | | | |
| 01/03/2012 | 31/03/2012 | - | | | - | | |
| 01/04/2012 | 30/04/2012 | 701 | 13.71 | 12.97 | - | | |
| 01/05/2012 | 31/05/2012 | | | | - | | |
| 01/06/2012 | 30/06/2012 | - | | | - | | |
| 01/07/2012 | 31/07/2012 | | | | - | | |
| 01/08/2012 | 31/08/2012 | 26 | 13.90 | 13.31 | - | | |
| 01/09/2012 | 30/09/2012 | 1,716 | 13.87 | 13.31 | - | | |
| 01/10/2012 | 31/10/2012 | 507 | 13.56 | 13.31 | - | | |
| 01/11/2012 | 30/11/2012 | 781 | 14.09 | 13.31 | - | | |
| 01/12/2012 | 31/12/2012 | | | | - | | |
| Total | | 12,537 | - | - | 7,022 | - | - |

| | | Wood chips | | | Stumps | | |
|---|---|---|---|---|---|---|---|
| | | $BF_{k,y}$ | Moisture | NCV | $BF_{k,y}$ | Moisture | NCV |
| from | to | tonne | % | GJ/ton | Tonne | % | GJ/ton |
| | | G | H | I | J | K | L |
| 01/10/2011 | 31/10/2011 | 4,374 | 40.77 | 11.76 | | | |
| 01/11/2011 | 30/11/2011 | 4,175 | 41.14 | 11.76 | 1,936 | 29.33 | 11.22 |
| 01/12/2011 | 31/12/2011 | 10,485 | 40.28 | 11.76 | - | | |
| 01/01/2012 | 31/01/2012 | - | | | - | | |
| 01/02/2012 | 29/02/2012 | | | | | | |
| 01/03/2012 | 31/03/2012 | 4,318 | 40.65 | 11.32 | - | | |
| 01/04/2012 | 30/04/2012 | - | | | - | | |
| 01/05/2012 | 31/05/2012 | 1,741 | 41.19 | 11.32 | - | | |
| 01/06/2012 | 30/06/2012 | 1,342 | 41.49 | 11.32 | | | |
| 01/07/2012 | 31/07/2012 | | | | | | |
| 01/08/2012 | 31/08/2012 | - | | | - | | |
| 01/09/2012 | 30/09/2012 | - | | | - | | |
| 01/10/2012 | 31/10/2012 | 2,294 | 40.92 | 11.17 | - | | |
| 01/11/2012 | 30/11/2012 | 998 | 39.45 | 11.17 | - | | |
| 01/12/2012 | 31/12/2012 | 198 | 41.02 | 11.17 | - | | |
| Total | | 29,923 | - | - | 1,935.91 | - | - |

| Parameter | | Branches | | | Barks | | |
|---|---|---|---|---|---|---|---|
| | | $BF_{k,y}$ | Moisture | NCV | $BF_{k,y}$ | Moisture | NCV |
| from | to | tonne | % | GJ/ton | Tonne | % | GJ/ton |
| | | M | N | O | P | Q | R |
| 01/10/2011 | 31/10/2011 | 3,710 | 29.79 | 11.27 | 10,042 | 41.73 | 11.33 |
| 01/11/2011 | 30/11/2011 | 2,454 | 32.98 | 11.27 | 14,035 | 40.17 | 11.33 |
| 01/12/2011 | 31/12/2011 | 3,074 | 32.51 | 11.27 | 18,950 | 41.56 | 11.33 |
| 01/01/2012 | 31/01/2012 | 2,556 | 30.51 | 11.49 | 9,452 | 40.50 | 11.56 |
| 01/02/2012 | 29/02/2012 | | | | 3,513 | 41.03 | 11.56 |
| 01/03/2012 | 31/03/2012 | 941 | 29.38 | 11.49 | 5,011 | 40.37 | 11.56 |
| 01/04/2012 | 30/04/2012 | - | | | 5,189 | 41.03 | 11.56 |
| 01/05/2012 | 31/05/2012 | - | | | 10,607 | 41.24 | 11.56 |
| 01/06/2012 | 30/06/2012 | | | | 3,509 | 41.58 | 11.56 |
| 01/07/2012 | 31/07/2012 | | | | | | |
| 01/08/2012 | 31/08/2012 | - | | | 260 | 41.33 | 11.24 |
| 01/09/2012 | 30/09/2012 | - | | | 3,596 | 41.57 | 11.24 |
| 01/10/2012 | 31/10/2012 | - | | | 12,230 | 41.55 | 11.24 |
| 01/11/2012 | 30/11/2012 | - | | | 9,769 | 41.22 | 11.24 |
| 01/12/2012 | 31/12/2012 | - | | | 7,975 | 41.03 | 11.24 |
| Total | | 12,735 | - | - | 114,137 | - | - |

| Parameter | | | $VD_y$ | $N_y$ | $FF_{project\ plant,i,y}$ | $FF_{project\ site,i,y}$ |
|---|---|---|---|---|---|---|
| Month | from | to | km | - | Tonnes | Tonnes |
| | | | S | T | U | V |
| Oct | 01/10/2011 | 31/10/2011 | 319,800 | 1,599 | 0 | 8.02 |
| Nov | 01/11/2011 | 30/11/2011 | 372,000 | 1,860 | 2.42 | 9.03 |
| Dec | 01/12/2011 | 31/12/2011 | 434,200 | 2,171 | 0 | 14.85 |
| Jan | 01/01/2012 | 31/01/2012 | 171,400 | 857 | 2.67 | 8.22 |
| Feb | 01/02/2012 | 29/02/2012 | 143,000 | 715 | 1.31 | 4.59 |
| Mar | 01/03/2012 | 31/03/2012 | 148,600 | 743 | 1.38 | 10.35 |
| Apr | 01/04/2012 | 30/04/2012 | 150,600 | 753 | 0 | 7.84 |
| May | 01/05/2012 | 31/05/2012 | 137,000 | 685 | 1.16 | 6.58 |
| Jun | 01/06/2012 | 30/06/2012 | 32,600 | 163 | 1.08 | 5.94 |
| Jul | 01/07/2012 | 31/07/2012 | 9,400 | 47 | 0 | 1.53 |
| Aug | 01/08/2012 | 31/08/2012 | 65,400 | 327 | 0.73 | 3.17 |
| Sep | 01/09/2012 | 30/09/2012 | 178,000 | 890 | 0.85 | 5.14 |
| Oct | 01/10/2012 | 31/10/2012 | 277,800 | 1,389 | 0.71 | 11.85 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Nov | 01/11/2012 | 30/11/2012 | 223,400 | 1,117 | 0.97 | 11.09 |
| Dec | 01/12/2012 | 31/12/2012 | 206,000 | 1,030 | 0.8 | 7.62 |
| Total | | | 989,142.00 | 14,507.00 | 2,869,200 | 14,346 |

| | | $EG_{expored,y}$ | $EG_{impored,110KV,y}$ | $EG_{impored,10KV,y}$ | $EG_{project\ plant,y}$ | $EC_{PJ,y}$ |
|---|---|---|---|---|---|---|
| from | MWh | MWh | MWh | MWh | MWh | MWh |
| | | W | X | Y | Z | AA |
| 01/10/2011 | 31/10/2011 | 9220.13 | 48.774 | 0.00 | 9171.36 | 36.49 |
| 01/11/2011 | 30/11/2011 | 8382.86 | 18.810 | 0.00 | 8364.05 | 44.48 |
| 01/12/2011 | 31/12/2011 | 12657.09 | 0.000 | 0.00 | 12657.09 | 41.41 |
| 01/01/2012 | 31/01/2012 | 5663.526 | 21.384 | 0.00 | 5642.14 | 224.08 |
| 01/02/2012 | 29/02/2012 | 1635.348 | 105.402 | 7.51 | 1522.44 | 14.09 |
| 01/03/2012 | 31/03/2012 | 2945.646 | 38.412 | 1.14 | 2906.09 | 21.76 |
| 01/04/2012 | 30/04/2012 | 2277.462 | 43.956 | 13.66 | 2219.85 | 6.15 |
| 01/05/2012 | 31/05/2012 | 3763.254 | 57.156 | 17.12 | 3688.97 | 7.38 |
| 01/06/2012 | 30/06/2012 | 1496.484 | 70.356 | 19.10 | 1407.02 | 4.65 |
| 01/07/2012 | 31/07/2012 | 0.000 | 61.314 | 21.83 | -83.15 | 5.65 |
| 01/08/2012 | 31/08/2012 | 116.820 | 102.168 | 7.13 | 7.52 | 8.88 |
| 01/09/2012 | 30/09/2012 | 2627.130 | 51.876 | 0.00 | 2575.25 | 4.75 |
| 01/10/2012 | 31/10/2012 | 6694.380 | 23.100 | 7.36 | 6663.92 | 11.68 |
| 01/11/2012 | 30/11/2012 | 4191.792 | 49.434 | 21.67 | 4120.69 | 13.00 |
| 01/12/2012 | 31/12/2012 | 2806.452 | 58.212 | 30.17 | 2718.07 | 18.98 |
| Total | | 64,478.37 | 750.35 | 146.70 | 63,581.32 | 463.42 |

**D.3. Implementation of sampling plan**

>>

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) |
| EGy | 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 0.9735 $tCO_2e$/MWh (See registered PDD Version 4 available online at http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1256219572.25/view) |

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

$EG_v$ = 74,261.41MWh

Therefore,

$$ER_{electricity,y} = 64{,}478.37MWh \times 0.9735tCO_2e/MWh = 61{,}861.41tCO_2e$$

b) Emission reductions or increases due to displacement of heat

Since there is no steam is supplied to user, so the $ER_{heat,v}$ =0

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

$$BE_{biomass,y} = GWP_{CH4} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k \cdot EF_{burningCH4,k,y}$$

Where:

| | |
|---|---|
| $BE_{biomass,v}$ | Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year y ($tCO_2e$/yr) |
| $GWP_{CH4}$ | Global Warming Potential of methane valid for the commitment period ($tCO_2e/tCH_4$) |
| $BF_{PJ,k,v}$ | 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) |
| $EF_{burning,CH4,k,v}$ | $CH_4$ 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 |

$$BE_{biomass,y} = 21tCO_2e/CH_4 \times 110{,}747.68t \times 0.001971tCH_4/t = 4{,}583.96tCO_2e$$

So, the baseline emission reduction is:
$BEy=ER_{elctricity,v} + ER_{heat,v} + BE_{biomass,v}$ = 61,896.41+0+ 4,583.96=66,480.37tCO2e

**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:

- $CO_2$ emissions from transportation of biomass residues to the project site ($PET_v$),
- $CO_2$ emissions from on-site consumption of fossil fuels due to the project activity ($PEFF_v$),
- $CO_2$ 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 ($PE_{Biomass,CH4,v}$),
- Where waste water from the treatment of biomass residues degrades under anaerobic conditions: $CH_4$ emissions from waste water.

Project emissions are calculated as follows:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH4} \cdot PE_{biomass,Ch4,y}$$

Where:

| | |
|---|---|
| $PET_v$ | $CO_2$ emissions during the year y due to transport of the biomass residues to the project plant ($tCO_2$/yr) |
| $PEFF_v$ | $CO_2$ 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) |
| $PE_{EC,v}$ | $CO_2$ 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 ($PET_v$)

$$PET_y = N_y \cdot AVD_y \cdot EF_{km,CO2,y}$$

Where:

| | |
|---|---|
| $PET_v$ | $CO_2$ emissions during the year y due to transport of the biomass residues to the project plant ($tCO_2$/yr) |
| $N_v$ | Number of truck trips during the year y |
| $AVD_v$ | 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) |
| $EF_{km.CO2.v}$ | Average $CO_2$ emission factor for the trucks measured during the year y ($tCO_2$/km) |

Therefore,

$$PET_y = 14{,}346 \times \frac{2{,}869{,}200km}{14{,}346} \times 0.001097tCO_2e/km = 3{,}147.51tCO_2$$

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

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

Where:

| | |
|---|---|
| $PE_{FC.i.v}$ | Are the $CO_2$ emissions from fossil fuel combustion in process j during the year y ($tCO_2$/yr); |
| $FC_{i.i.v}$ | Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr); |
| $COEF_{i.v}$ | 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) |
| $NCV_{i,v}$ | Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit) |
| $EF_{CO2.i.v}$ | 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,

$$PEFF_y = \sum_i FC_{i.j.y} \times NCV_{i,y} \times EF_{CO2,i,y}$$

$$= (14.08t + 115.82t) \times 0.042652TJ/t \times 74{,}800kgCO_2e/TJ/1\times10^3 = 414.43tCO_2e$$

c) $CO_2$ 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:

| | |
|---|---|
| $EC_{PJ.i.v}$ | Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr) |
| $EF_{EL,i,y}$ | Emission factor for electricity generation for source j in year y ($tCO_2$/MWh) |
| $TDL_{i.v}$ | Average technical transmission and distribution losses for providing electricity to source j in year y |

Therefore,

$$PE_{EC,y} = 463.42MWh \times 0.9735tCO_2e/MWh \times (1 + 20\%) = 541.37tCO_2e$$

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:

| | |
|---|---|
| $BF_{k,v}$ | 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 (tCH4/GJ), according to ACM0006,Version 9, the $EF_{CH4,BF}$=41.1 kg $CH_4$/TJ |

Therefore,

$$PE_{biomass,CH4,y} = 41.1 kgCH_4/TJ \cdot 1{,}100{,}770 \text{GJ}/1\times10^6 = 45.24 tCH_4$$

According the data calculated above,

$$PE_y = 3{,}147.51 tCO_2e + 414.43 tCO_2e + 541.37 tCO_2e + 21 tCO_2e/tCH_4 \times 45.24 tCH_4$$

$$= 5053.39 tCO_2e$$

**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 in 2011**

| | Rice husks (t) | Rice straws(t) | Wood chips (t) | Stumps (t) | Branches (t) | Barks(t) |
|---|---|---|---|---|---|---|
| Total biomass generation in the region(10,000t) | 30.38 | 125.53 | 60.00 | | | |
| Biomass loss(10,000t) | 3.04 | 18.83 | 6.00 | | | |
| Available Biomass in the region (10,000t) | 27.34 | 106.70 | 54.00 | | | |
| Biomass comsumption other than the project (10,000t) | 5.47 | 21.34 | 8.10 | | | |
| Biomass comsumption in the project(10,000t)[2] (From 15/01/2011 to 31/12/2011) | 5.15 | 0.43 | 4.34 | 0.99 | 2.20 | 8.94 |
| Biomass comsumption in the project(10,000t) (For the whole year) | 5.35 | 0.44 | 4.52 | 1.03 | 2.29 | 9.30 |
| Total biomass comsumption (10,000t) | 10.82 | 21.78 | 25.24 | | | |
| Available Biomass/Total biomass comsumption | 252.72% | 489.86% | 213.98% | | | |
| Available Biomass/Total biomass comsumption -100% | 152.72% | 389.86% | 113.98% | | | |
| Leakage or not? (if it is more than 25%, no leakage; if not, yes) | No | No | No | | | |

Biomass utilised by the project (full year)=Biomass utilised by the project （15/01/2011~31/12/2011）

[2] According to the MR for the 1st monitoring period, the biomass consumptions from 15/01/2011 to30/09/2011 for rice husk, rice straws, wood chips,stumps,branches and barks are 44723.22t,1006.57t,24412.29t,7982.43t,12769.68t and 46390.88t respectively.

*365/351

| Demonstration of abundant surplus of biomass availability in 2012 | | | | | | |
|---|---|---|---|---|---|---|
| | Rice husks (t) | Rice straws(t) | Wood chips (t) | Stumps (t) | Branches (t) | Barks(t) |
| Total biomass generation in the region(10,000t) | 30.09 | 124.34 | 60 | | | |
| Biomass loss(10,000t) | 3.01 | 18.65 | 6 | | | |
| Available Biomass in the region (10,000t) | 27.08 | 105.69 | 54 | | | |
| Biomass comsumption other than the project (10,000t) | 5.42 | 21.14 | 8.1 | | | |
| Biomass comsumption in the project(10,000t) | 0.58 | 0.38 | 1.09 | 0.00 | 0.35 | 7.11 |
| Total biomass comsumption (10,000t) | 6.00 | 21.52 | 16.65 | | | |
| Available Biomass/Total biomass comsumption | 451.59% | 491.22% | 324.33% | | | |
| Available Biomass/Total biomass comsumption -100% | 351.59% | 391.22% | 224.33% | | | |
| Leakage or not? (if it is more than 25%, no leakage; if not, yes) | No | No | No | | | |

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

| Item | Baseline emissions or baseline net GHG removals by sinks (t $CO_2e$) | Project emissions or actual net GHG removals by sinks (t $CO_2e$) | Leakage (t $CO_2e$) | Emission reductions or net anthropogenic GHG removals by sinks (t $CO_2e$) |
|---|---|---|---|---|
| **Total** | 61,896.41 | 5,053.39 | 0 | 61,426(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 (t $CO_2e$)** | 136,586[3] | 61,426 |

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

>>

[3] $136{,}586 tCO_2e = \frac{108{,}851 tCO_2e}{365 days} \times 458 days$

From the data shown in the above table, the actual emission reduction achieved during current monitoring period is 55.03% lower than the ex-ante estimation in registered CDM-PDD (version 05).

**E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards**

| Item | Actual values achieved up to 31 December 2012 | Actual values achieved from 1 January 2013 onwards |
|---|---|---|
| **Emission reductions or GHG removals by sinks (t $CO_2e$)** | 134,399[4] | 0 |

## Annex 1: The Energy Balance for Qidong Kaidi Biomass Project

The total inputs of biomass residues combusted and useful output of electricity from the project are
shown below. From this data the conversion efficiency of the project in this monitoring period is calculated as 18.17%

**Table4. The Energy Balance for Qidong Kaidi Biomass Project (01/10/2011 to 31/12/2012)**

| | $BF_{k,y}$（ton） (dry base) | $NCV_k$(TJ/t)[5] | Energy(TJ) |
|---|---|---|---|
| Rice husk | 10,784.27 | 13.14 | 141,662.16 |
| Rice straws | 4,878.47 | 10.63 | 51,858.10 |
| Wood chips | 17,757.07 | 11.42 | 202,726.52 |
| Stumps | 1,368.11 | 11.25 | 15,350.17 |
| Branches | 8,765.12 | 11.36 | 99,554.26 |
| Barks | 67,194.65 | 11.40 | 765,778.98 |
| Fossil Fuel[6] | 14.08 | 42.652 | 600.54 |
| Total | | | 1,277,530.74 |

[4] 134,3990 t $CO_2e$ = 72,973 t $CO_2e$(form 15/01/2011 to 30/09/2011)+ 61,426 t $CO_2e$(form 01/10/2011 to 31/12/2012)
[5] The average NCV is used
[6] Only contain fossil fuel for start-up

| | |
|---|---|
| Electricity Exported（TJ） | 232,122.14 |
| Efficiency | 18.17% |

Energy Balance：

$E_{total}=E_{biomasss}+E_{fossil\ fuel}$ =1,277,530.74 GJ
Electricity exported= 232,122.14 GJ
Efficiency= Electricity exported/ $E_{total}$ =18.17%

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**Document information**

| *Version* | *Date* | *Description* |
|---|---|---|
| 03.2 | 5 November 2013 | Editorial revision to correct table in page 1. |
| 03.1 | 2 January 2013 | Editorial revision to correct table in section E.5. |
| 03.0 | 3 December 2012 | Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11). |
| 02.0 | 13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20). |
| 01 | 28 May 2010 | EB 54, Annex 34. Initial adoption. |

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