# VERIFICATION / CERTIFICATION REPORT

# JIANLI KAIDI BIOMASS POWER PROJECT IN CHINA

(UNFCCC Registration Ref. No. 3044)

Monitoring Period:
12 August 2010 to 31 March 2011

REPORT NO. 2012-9064
REVISION NO. 01

DET NORSKE VERITAS

# VERIFICATION / CERTIFICATION REPORT

| | |
|---|---|
| Date of first issue:<br>4 June 2012 | Project No.:<br>PRJC-314724-2011-CCS-CHN |
| Approved by:<br>Ole A. Flagstad | Organisational unit:<br>DNV KEMA Energy & Sustainability<br>Accredited Climate Change Services |
| Client:<br>Wuhan Kaidi Holding Investment Co., Ltd | Client ref.:<br>Hao Jing |

DNV CLIMATE CHANGE SERVICES AS

Veritasveien 1,
1322 HØVIK, Norway
Tel: +47 67 57 99 00
Fax: +47 67 57 99 11
http://www.dnv.com
Org. No: NO 994 774 352 MVA

Summary:

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions reported for the "Jianli Kaidi Biomass Power Project" in China (UNFCCC Registration Ref. No. 3044 for the period 12 August 2010 to 31 March 2011.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (version 2.0) of 31 March 2012 are fairly stated.

The project is implemented in accordance with the revised Project Design Document version 06 of 3 February 2012. A notification of changes from the project activity related to utilization of different biomass residues was notified by DNV to the CDM-EB and approved on 28 February 2012.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology ACM0006 (version 6.2) and the monitoring plan contained in the revised Project Design Document version 06 of 3 February 2012.

DNV Climate Change Services AS is able to certify that the emission reductions from the "Jianli Kaidi Biomass Power Project" in China during the period 12 August 2010 to 31 March 2011 amount to 58 410 tonnes of $CO_2$ equivalent.

| | |
|---|---|
| Report No.:<br>2012-9064 | Subject Group:<br>Environment |
| Report title:<br>Jianli Kaidi Biomass Power Project in China | |
| Work carried out by:<br>Lin Wu, Hou Baojun | |
| Work verified by:<br>Sharmistha Shome, Astakala Vidyacharan | |
| Date of this revision:<br>4 June 2012 | Rev. No.:<br>01 / Number of pages:<br>33 |

**Indexing terms**

| | |
|---|---|
| Key words<br>Climate Change<br>Kyoto Protocol<br>Validation<br>Clean Development Mechanism | Service Area<br>Verification<br>Market Sector<br>Energy Industry |

☒ No distribution without permission from the client or responsible organisational unit

☐ free distribution within DNV after 3 years

☐ Strictly confidential

☐ Unrestricted distribution

© 2002 Det Norske Veritas AS
All rights reserved. This publication or parts thereof may not be reproduced or transmitted in any form or by any means, including photocopying or recording, without the prior written consent of Det Norske Veritas AS.

## *Table of Content* *Page*

## *Abbreviations*

| | |
|---|---|
| CAR | Corrective Action Request |
| CCPG | Central China Power Grid |
| CDM | Clean Development Mechanism |
| CER | Certified Emission Reduction(s) |
| $CH_4$ | Methane |
| CL | Clarification request |
| $CO_2$ | Carbon dioxide |
| $CO_2e$ | Carbon dioxide equivalent |
| DNA | Designated National Authority |
| DNV | Det Norske Veritas |
| DOE | Designated Operational Entity |
| FAR | Forward Action Request |
| GHG | Greenhouse gas(es) |
| GWP | Global Warming Potential |
| IPCC | Intergovernmental Panel on Climate Change |
| MP | Monitoring Plan |
| NCV | Net Calorific Value |
| PDD | Project Design Document |
| UNFCCC | United Nations Framework Convention on Climate Change |
| VVM | Validation and Verification Manual |

# 1 INTRODUCTION

Wuhan Kaidi Holding Investment Co., Ltd has commissioned DNV Climate Change Services AS (DNV) to carry out the verification and certification of emission reductions reported for the "Jianli Kaidi Biomass Power Project" in China (the project) in the period 12 August 2010 to 31 March 2011. This report contains the findings from the verification and a certification statement for the certified emission reductions.

## 1.1 Objective

Verification is the periodic independent review and *ex post* determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined monitoring period.

Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the "Jianli Kaidi Biomass Power Project" for the period 12 August 2010 to 31 March 2011.

## 1.2 Scope

The scope of the verification is:

- To ensure that the project activity has been implemented and operated as per the registered PDD and that all physical features of the project are in place.
- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan and the approved methodology.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.
- To evaluate the data recorded and stored as per the monitoring methodology.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

## 1.3 Description of the project activity

| | |
|---|---|
| Project Parties: | China (host Party), Switzerland and the United Kingdom of Great Britain and Northern Ireland (other Party) |
| Title of project activity: | Jianli Kaidi Biomass Power Project |
| UNFCCC registration No: | 3044 |
| Baseline and monitoring methodology | ACM0006 (version 6.2) |

| | |
|---|---|
| Project Participants: | Jianli Kaidi Green Energy Development Co., Ltd from China |
| | Camco International Limited and Camco Carbon Limited from the United Kingdom of Great Britain and Northern Ireland |
| | Camco International Limited from Switzerland |
| Location of the project activity: | Chengdong Industrial Park, Jianli County, Hubei Province, P.R.China |
| Project's crediting period: | 12 August 2010 to 11 August 2017 (Renewable) |
| Period verified in this verification: | 12 August 2010 to 31 March 2011 |

## 1.4 Methodology for determining emission reductions

The emission reductions are determined in accordance with the formulae given in the baseline and monitoring methodology ACM0006 (version 6.2) /39/ and revised approved PDD /3/ for the baseline scenario 2.

According to revised PDD, the project will not claim GHG emission reductions from displacing the heat that would otherwise be produced within Chengdong Industrial Park. Hence, the baseline emissions due to the displacement of heat ($ER_{heat,y}$) was not considered in the emission reduction calculation for the proposed project. The emission reductions ($ER_y$) by the project activity is therefore the difference between the baseline emissions through the displacement of electricity ($ER_{electricity,y}$) and baseline emissions due to natural decay or uncontrolled burning of biomass residues ($BE_{biomass,y}$), project emissions ($PE_y$) and emissions ($L_y$) due to leakage:

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

### 1.4.1 Baseline emissions

(1) Baseline emissions due to the displacement of electricity ($ER_{electricity,y}$)

$ER_{electricity,y}$ is calculated by multiplying the net quantity of increased electricity generated with biomass residues as a result of the project activity ($EG_y$) with the $CO_2$ baseline emission factor for the electricity displaced due to the project activity ($EF_{electricity,y}$):

$$ER_{electricity,y} = EG_y * EF_{electricity,y}$$

$EF_{electricity,y}$ is the emission factor of the grid, which was calculated *ex-ante* in the revised PDD and will not be updated during the first crediting period. $EG_y$ is the net quantity of increased electricity generation as a result of the project (incremental to baseline generation). Since the baseline scenario 2 was applied for the project activity in the revised PDD, $EG_y$ corresponding to the net quantity of electricity generation in the project plant ($EG_y=EG_{project\ plant,y}$).

(2) Baseline emissions due to natural decay or uncontrolled burning of biomass residues ($BE_{biomass,y}$)

The biomass residue would have been burned in an uncontrolled manner or dumped and left to decay, generating significant methane emissions. Methane emissions from dumping biomass residues, and leaving them to decay, are higher than when they are burned in an uncontrolled manner. Therefore, to be conservative, it is assumed, that all biomass residues

are burned. The emissions can be calculated from the quantity of biomass ($BF_{PJ,k,y}$) that would not be used in absence of the project activity, with the net caloric value ($NCV_k$) and the appropriate emission factor for the uncontrolled burning ($EF_{burning,CH4,k,y}$).

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

### 1.4.2 Project emissions

The project emissions include emissions from transportation of biomass residues to the project site ($PET_y$), emissions from on-site consumption of fossil fuel by the project ($PEFF_y$), emissions from consumption of electricity ($PE_{EC,y}$), and methane emissions from combustion of biomass residues ($PE_{biomass,CH4,y}$):

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

(1) Project emissions from transportation of biomass residues to the project site ($PET_y$)

The emissions from the transport of biomass residues to the project site were calculated from the number of truck trips ($N_y$), average round trip distance (from and to) between the biomass residue fuel supply sites and the project site ($AVD_y$), average transportation from collection site to power plant and the $CO_2$ emission factor from fuel used for transportation ($EF_{km,CO2,y}$).

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

(2) Project emissions from on-site consumption of fossil fuel by the project ($PEFF_y$)

The on-site consumption of fossil fuels is from two sources: one is combusted as auxiliary fuel for boiler start up and another is from the diesel consumption for forklifts at collection sites and project site. According to the revised PDD, the emissions from fossil fuel consumed in the project plant will use the quantity of fossil fuel ($FC_{i,y}$) as well as its emission factor ($NCV_{i,y} \times EF_{CO2,i,y}$) according to the "*Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion*" /44/.

$$PEFF_y = \sum FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}$$

(3) Project emissions from consumption of electricity ($PE_{EC,y}$)

The emissions ($PE_{EC,y}$) due to on-site consumption of electricity are calculated based on the quantify of electricity consumed ($EC_{PJ,j,y}$), emission factor for electricity generation ($FE_{EL,j,y}$) and a factor to account for transmission losses ($TDL_{j,y}$) according to the "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*" /45/.

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

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

Accounting for the methane emissions in the baseline, methane emissions from the combustion in the project scenario use the quantity of biomass residues ($BF_{k,y}$) used in the project activity, the net caloric value ($NCV_k$) and the appropriate emission factor for the controlled burning in power plant ($EF_{CH4,BF}$).

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

### 1.4.3 Leakage

According to ACM0006 (version 6.2), the probable source identified for leakage is that the project diverts biomass from other users and thereby increases fossil fuel use. Approach $L_2$ was selected to demonstrate that the annual biomass requirement of the project activity is at least 25% larger than the biomass utilized in the region. In case of the leakage effects of a certain type of biomass residues used in the project activity cannot be ruled out with the mentioned above, leakage effects for the project activity shall be calculated as follow:

$$L_y = EF_{CO2,LE} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k$$

As stated in the revised PDD, the leakage from the project activity is zero, as the surplus of biomass residues is far greater than the quantity of residues used by the project activity.

## 2 METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. These include:

- The net electricity supplied to the grid by the project activity as well as on-site electricity consumption attributable to the project activity, which is multiplied by the fixed grid emission factor;
- The number of truck trips for transportation of biomass residues and average round trip distance (from and to) between the biomass residue fuel supply sites and the project site;
- The quantity and $CO_2$ emission factor of fossil fuel (diesel) consumed; and
- The amount, NCV and emission factor of biomass residues combusted by the project activity.

***Verification team***

| | | | | ***Type of involvement*** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Role*** | ***Last Name*** | ***First Name*** | ***Country*** | Desk review | Site visit | Reporting | Supervision of work | Technical review | TA 1.1 competence |
| Team leader (Verifier) | Lin | Wu | China | ✓ | ✓ | ✓ | ✓ | | |
| Expert | Hou | Baojun | China | ✓ | ✓ | ✓ | | | ✓ |
| Technical reviewer | Shome | Sharmistha | India | | | | | ✓ | |
| Technical reviewer | Astakala | Vidyacharan | India | | | | | ✓ | ✓ |

***Duration of verification***

| | |
|---|---|
| Monitoring report publication: | *7 September 2011* |
| Preparations: | *From 19 September 2011 to 24 September 2011* |
| On-site verification: | *27 September 2011* |
| Reporting, calculation checks and QA/QC: | *From 8 October 2011 to 4 June 2012* |

## 2.1 Review of documentation

The monitoring report, version 1.0 dated 8 August 2011, has been made publicly available on the CDM website /1/. In addition to the monitoring report, the verification has been performed based on the review of the following documentation:

- The registered PDD /3/, including the monitoring plan and the corresponding validation report /4/;
- The approved baseline and monitoring methodology ACM0006 (version 6.2) applied by the project /39/;
- Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board /38/-/43/; and
- Other information and references relevant to the project activity /4/-/36/;

During the desk review, DNV has applied standard auditing techniques to assess the quality of information provided. The following activities were performed:

- A review of the data and information presented to verify their completeness;
- A review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures; and
- An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

## 2.2 Site visit

On 27 September 2011, DNV visited Jianli Kaidi Green Energy Development Co., Ltd, and performed interviews with the project participants. The key personnel of the project that were interviewed or assisted the verification team /46/-/48/.

During the on-site assessment, DNV has applied standard auditing techniques to assess the quality of information provided. The following aspects of the CDM project activity have been verified:

- The implementation and operation of the CDM project activity as ;
- The information flow for generating, aggregating and reporting of the monitoring parameters; and

- The operational and data collection procedures are implemented in accordance with the monitoring plan in the PDD.

Further, the following activities were performed:

- A cross-check between information provided in the monitoring report and data from other sources /22//23//27/ /28//37/;
- A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD and the selected methodology /10/-/17/;
- A review of calculations and assumptions made in determining the GHG data and emission reductions /2/; and
- An identification that quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters /19/.

The data presented in the monitoring report were assessed by review of the detailed project documentation and production records, as well as by interviews with personnel from Jianli Kaidi Green Energy Development Co., Ltd and Camco International Limited, and observation of collection of measurements, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of reported monitoring results, to verify the correct application of the approved monitoring methodology and the determination of the emission reductions.

In addition all parameters required by the monitoring methodology ACM0006 (version 6.2) /39/, and the management system were assessed during the site visit.

## 2.3 Reporting of findings

A corrective action request (CAR) is issued, where:

i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
ii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
iii. Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

Four CARs and five CLs were raised and have been adequately addressed by the project participants in the updated documents (refer to Appendix A), and thus closed by DNV. No FAR was raised in this periodical verification.

# 3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "Jianli Kaidi Biomass Power Project" for the period 12 August 2010 to 31 March 2011.

## 3.1 Remaining issues, CARs, FARs from previous validation / verification

This monitoring period 12 August 2010 to 31 March 2011 is the first verification of the project. No remaining issues were identified from the validation /4/.

## 3.2 Project implementation

The project is a biomass cogeneration plant, located in Chengdong Industrial Park, Jianli County, Hubei Province of China. The electricity generated is delivered to the Central China Power Grid (CCPG) and the heat generated was proposed to be supplied to the plants in the Chengdong Industrial Park. The project activity started to operate from December 2009 /21/. The project activity was registered as CDM project on 12 August 2010, which is later than the estimated starting date of the crediting period of 1 November 2009 as stated in the revised PDD. Hence, 12 August 2010 was identified as the starting date of crediting period, and the selected monitoring period 12 August 2010 to 31 March 2011 is within the first crediting period 12 August 2010 to 11 August 2017.

The project started the commissioning from 7 December 2009 for 1# generator and 6 February 2010 for 2# generator, which was confirmed by the commissioning certificates for the project /5/. After the commissioning, the test and joint inspection report for the project has been accepted by Project Check and Acceptance Committee /5/, which proved that the project is constructed as planned and was able to satisfy the requirements of operation and implementation. Furthermore, the environmental protection measurement taken during project construction and operation as stipulated in the environment impact assessment has been inspected and accepted by local environmental authority /6/.

All facilities and equipment as described in the PDD /3/ have been installed. The details of the boiler, turbine and generator with respect to their number, type and model of the machines have been verified /30/-/32/ during the on-site visit.

DNV has verified that the cogeneration plant included the installation of two sets of 65 t/h circulating fluid bed (CFB) boilers with medium temperature and sub-high pressure, two sets of 12 MW condensing and extraction steam turbines, and two sets of 15 MW associated generators, and confirmed to be as per the registered PDD.

As stated in the registered PDD, the heat generated by the project activity will be supplied to the plants in Chengdong Industrial Park to meet the process and demand. As stated in the notification issued by Hubei Jianli Economic Development Management Committee on 30 October 2011 /36/, the negotiation for the heat supply plan between the industrial park and project owner has not been finalized, and hence the heat supply was not commenced. During the site visit, DNV found that the pipeline for heat extraction from the turbines has been reserved but no heat generated by the project activity was supplied, yet, to the industrial user. Therefore, DNV confirmed that there was not heat export by the project activity during this

verification period. As stated in the PDD, the generator is sized at 15 MW and not 12 MW to allow for possible peak generation and to avoid damage to the generation unit by sudden load change in abnormal situations. It also stated in the PDD that under conditions where there is no steam extraction the steam turbines can theoretically generate at 2X15 MW, and the project activity still is additional due to the financial unattractiveness because the efficiency of the plant for power only is higher than the plant operating in cogeneration mode. Since the emission reductions from the displacement of heat has not been considered in the emission reduction calculation in the PDD, DNV confirmed that the project implementation without heat supply in this monitoring period does not have negative effect on the emission reductions claimed in this monitoring period.

All the monitoring equipment, including electricity meters, flow meter, weight scale and moisture analyzers, have been installed in line with the description in the PDD /3/. The PDD does not specify the accuracy and calibration frequency for the flow meter, weighting scale and moisture analyzers, but DNV can confirm the relevant accuracy and calibration represent good monitoring practise in China. Except for the gate meter (including main meter and backup meter both), other electricity meters have accuracy of 0.5S /11/, which is consistent with the values in the PDD. The gate meters have accuracy of 0.2S, which is more conservative than the value of 0.5S as stipulated in the registered PDD. The annual calibration for all electricity meters is in compliance with relevant industry standard. The electricity meters are locked to guarantee the integrity of the instruments.

The biomass residues consumed by the project activity are directly sourced from agriculture and forestry residues. The collected biomass residues will be transported by vehicles to biomass residue sheds at the project site before being burnt in the boiler for electricity and heat generation. In the registered PDD, regarding the biomass residue utilized, it was stated that “The biomass residues utilized in this proposed project will be mainly rice husk, wheat straw, rice straw, cotton straw and oil seed rape straw”. However, after the project was put into operation from December 2009, the project owner was compelled to seek other alternatives as the project owner realized that the seasonal production of biomass residues affected the biomass fuel supply, whereas the biomass types in Jianli County the project is located were much more diverse than predicted and various types of biomass residues supply can guarantee the continuous operation of power plant. By checking the daily operating log /21/, DNV was able to confirm that additional types of biomass were utilized since the start of operation. The main biomass residues utilized for the project are found to be rice husk, cotton straw, stump, branch, bark and wood chip (stump, branch, bark and wood chip here are defined as residues and by-product from the forestry). The changes are considered to be permanent. DNV was able to confirm that the biomass changes for the project would not impact the additionality of project activity negatively, would not change the scale of CDM project activity and would not change the applicability of ACM0006 (version 6.2). Since the quantity and nature of each biomass residue used in the calculation of emission reductions in the registered PDD are changed due to the change of biomass residue types, the annual estimated emission reductions have been updated to reflect to the actual project implementation and operation in the revised PDD. In compliance with the “Procedures for notifying and requesting approval of changes from the project activity as described in the registered project design document”, a notification for change from project activity related to use a different biomass residue is therefore requested, and the notification has been accepted by EB on 28 February 2012 /40/.

The control system at the power plant is automated and assures continuous operation, including monitoring on malfunction of equipment. By checking the daily operation and maintenance records /21/, there were 17 times and 10 times shutdowns for maintenance on 1# and 2# facility in this monitoring period, respectively; and the operating times for 1# and 2# facility are 2 765.5 hours and 3 656.4 hours, respectively. DNV confirmed that no serious malfunction has happened and the plant was under a normal operation as expected in this monitoring period.

On-site training for the CDM related procedures including monitoring, recording and reporting was verified to be in place /18/ and their implementation was confirmed by interview with the key operators and observing the operation /46/.

According to para 198 (a) of VVM version 1.2 /36/, DNV verified that the project is fully implemented according to the description in the revised PDD (version 06 of 3 February 2012). The verification team confirmed through visual inspection and document review that all physical features of the proposed CDM project activity including data collection systems and storage systems have been implemented in accordance with the revised PDD. The project is completely operational which was confirmed by means of the on-site visit.

## 3.3 Information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD

The emissions reductions in this monitoring period are 58 410 $tCO_2e$ in the period from 12 August 2010 to 31 March 2011 (i.e. 232 days), which corresponds to the emission reductions of 91 895 $tCO_2e$ in yearly basis (i.e. 365 days). The annually expected emission reductions according to the revised PDD (version 06 of 3 February 2012) is 116 650 $tCO_2e$, hence the reported emission reductions are lower than the expected.

By comparing the actual project emissions and baseline emissions assessed in section 3.6 against the expected values in the PDD as below:

| Items | Actual value (convert to the yearly basis) | Expected yearly value in registered PDD |
|---|---|---|
| **Baseline emissions (**$tCO_2e$**)** | 96 565 | 130 327 |
| Displacement of electricity ($tCO_2e$) | 89 921 | 123 362 |
| Natural decay of anthropogenic sources of biomass residue ($tCO_2e$) | 6 644 | 6 965 |
| **Project emissions** ($tCO_2e$) | 4 669 | 13 676 |

DNV can find that the main reasons for low emission reductions in this monitoring period are due to the low baseline emissions from displacement of electricity though the low project emissions are observed in this monitoring period which would result in high emission reductions. The low baseline emissions from displacement of electricity are due to the less electricity supplied in this monitoring period, i.e. low operating hours for the power sets which can be confirmed by daily operation and maintenance records /21/. The reported electricity supplied in this monitoring period is 58 711.31 MWh, which corresponds to 92 369 MWh on yearly basis and lower than the estimated yearly electricity supplied 126 720 MWh

in the PDD. Considering the inexperienced operation from the project staff and unstable facility performance (there were 17 times and 10 times shutdowns for maintenance for 1# and 2# facility in this monitoring period, respectively), DNV considers that the electricity supplied by the project activity in this monitoring period is reasonable.

Hence, DNV was able to confirm that the emission reductions claimed during this monitoring period 12 August 2010 to 31 March 2011 was reasonable.

## 3.4 Compliance of monitoring plan with monitoring methodology

As per para 203 of VVM version 1.2 /38/, DNV is able to confirm that the monitoring plan in the revised PDD (version 06 of 3 February 2012) /3/ is in accordance with the approved methodology applied by the project activity, i.e. ACM0006 (version 6.2) "Consolidated methodology electricity generation from biomass residues" /39/. Neither a revision nor a deviation to the monitoring plan has been requested to CDM Executive Board.

## 3.5 Compliance of monitoring with the monitoring plan

As per para 206 of VVM version 1.2 /38/, DNV confirms that all parameters stated in the monitoring plan contained in the revised PDD (version 06 of 3 February 2012) /3/ are monitored and reported appropriately. All parameters required to be monitored by the monitoring plan as per the monitoring methodology ACM0006 (version 6.2) /39/, and the management system were assessed during the site visit. The monitoring report lists each monitoring parameter required by the monitoring plan and the information flow (i.e. from data generation, aggregation, recording, calculation and reporting) for these parameters is provided in the monitoring report. The information flow for the each parameter in further verified in the following sections.

### 3.5.1 Factor and datum determined ex-ante

All reported factors determined *ex-ante* by the monitoring methodology ACM0006 (version 6.2) /39/ and indicated in the revised PDD (version 06 of 3 February 2012) /3/ were assessed as follows:

***a. Global warming potential for methane (GWP)***

The IPCC default value of 21 $tCO_2/tCH_4$ is applied for the first commitment period and will be updated according to any future COP/MOP decisions /3/ /34/.

***b. Average technical transmission and distribution losses for providing electricity to source j ($TDL_{j,y}$)***

The default value of 20% is applied according to "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /3/ /45/.

***c. Baseline emission factor of Central China Power Grid ($EF_y$)***

As per the revised PDD /3/, the *ex-ante* determined emission factor 0.9735 $tCO_2/MWh$ for the CCPG is applied during the first crediting period.

***d. Methane emission factor for controlled burning of the biomass residue in the project plant ($EF_{CH4,BF}$)***

In the revised PDD /3/, the IPCC default value of 30 $kgCH_4/TJ$ is estimated ex-ante and

applied during this crediting period. When the default $CH_4$ emission factor of 30 kg/TJ is used, the uncertainty is estimated to be 300%, resulting in a conservativeness factor of 1.37. Thus, in this case a $CH_4$ emission factor of 41.1 kg/TJ is used.

***e. Methane emission factor for uncontrolled burning of the biomass residue ($NCV_k$*$EF_{burning,CH4,k,y}$)***

As per the methodology ACM0006 (version 6.2) /39/, 0.0027 $tCH_4$/tone is recommended as the default value for the product of $NCV_k$ and $EF_{burning,CH4,k,y}$ when more accurate information is absent. When 0.0027 $tCH_4$/tone is used, the uncertainty is deemed greater than 100%, resulting in a conservativeness factor of 0.73. Hence, an emission factor of 0.001971 $tCH_4$/tone is used for the emission reduction calculation.

### 3.5.2 Factor and datum monitored or calculated ex-post

The following data reported in the monitoring report has been assessed in detail:

***a. Net calorific value of each biomass residue of type k ($NCV_k$)***

The project participant committed the reputed laboratory Luoyang City Coal Quality Testing Centre /7/ to analyze the net calorific value of biomass residues, and the measurement took three samples and bases on dry biomass residues every six months /8/. The following are the reported NCVs of each biomass residue /2/, and verified by DNV against the testing reports /8/.

| Biomass type | NCV tested in July and October 2010 (MJ/kg) | NCV tested in January 2011 (MJ/kg) |
|---|---|---|
| Rice husk | 12.13 | 13.56 |
| Cotton straw | 13.36 | 13.47 |
| Branch | 13.38 | 12.66 |
| Bark | 13.94 | 13.98 |
| Stump | 10.88 | 10.90 |
| Wood chip | 11.53 | 11.49 |

***b. Average round trip distance (from and to) between the biomass fuel supply sites and the project plant ($AVD_y$)***

This amount is reported on daily log sheets /21/ and aggregated into monthly reports /22/. All the biomass residues are from the biomass residue collection stations. The verification team has assessed all daily log sheets and monthly reports and found the monthly total distance in the ER spreadsheet /2/ to be correct. During the site visit, DNV double checked the transportation distance with the local map for the biomass collection stations, and confirmed that the round trip distance recorded in the daily log sheets reflected to the practice. Hence, DNV confirmed that the reported $AVD_y$ (86.2 km) in this monitoring period is reasonable.

***c. Numbers of truck trips for the transportation of biomass ($N_y$)***

The numbers of trucks into the plant are recorded on daily log sheets /21/ and aggregated into monthly reports /22/. The verification team has assessed all daily log sheets and monthly reports and found the monthly number for transportation in the ER spreadsheet /2/ to be correct.

***d. Average $CO_2$ emission factor for transportation of biomass with trucks ($EF_{km,CO2}$)***

The IPCC default value of 0.001097 $tCO_2$/km was applied for the average $CO_2$ emission

factor of the diesel trucks in the revised PDD /3/ /34/. DNV has checked the updated IPCC 2006 /34/ and was able to confirm no change for this value.

***e. Net calorific value of the fossil fuel ($NCV_i$)***

According to the monitoring plan in the PDD /3/ and the methodology /39/, the NCV of the diesel from China Energy Statistical Yearbook 2007 was applied in the emission reduction calculations. DNV checked the updated China Energy Statistical Yearbook 2008, 2009 and 2010 /33/ and was able to confirm no change for this value. Hence, the reported value 0.042652 TJ/tonne used in the emission reduction calculation is reasonable.

***f. $CO_2$ emission factor for fossil fuel ($EF_{CO2,y}$)***

In the PDD, the IPCC default value 74 100 $kgCO_2e/TJ$ was applied for the $CO_2$ emission factor of the diesel sourced from IPCC 2006 in the estimated calculation of project emissions for fossil fuel consumption, and the $CO_2$ emission factor of fossil fuel (diesel) used in the project will be reviewed annually on its appropriateness /3/. According to the methodology, the emissions from fossil fuel consumed in the project plant will use the quantity of fossil fuel ($FC_{i,y}$) as well as its emission factor ($NCV_{i,y} \times EF_{CO2,i,y}$) according to the "*Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion*" /44/, in which it stated that IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in IPCC 2006 was applied for the $CO_2$ emission factor of fossil fuel. Hence, IPCC default values at the upper limit of the uncertainty at a 95% confidence interval 74 800 $kgCO_2e/TJ$ /34/ was applied for the $CO_2$ emission factor of the diesel in the calculation of project emissions for fossil fuel consumption. Since IPCC 2006 is the latest version till now, DNV considers that 74 800 $kgCO_2e/TJ$ /34/ applied for the $CO_2$ emission factor of the diesel is reasonable.

***g. The quantity of biomass residues of type k that are utilized in the defined geographical region***

The data is provided from the investigation report of local biomass resource by the accredited third party /35/, which has been listed in the table below.

***h. The quantity of biomass residues of type k in the defined geographical region***

DNV was able to verify the data provided regarding the total production, availability and utilization of the biomass residues in the region from the investigation report /35/ for the biomass supply and demand in Jianli County where the project located. DNV confirmed that the quantity of available biomass residue in the region is at least 25% larger than the quantity of biomass that is utilized, including the project plant. Hence, the leakage for the project activity is considered as zero. The detail data is indicated as follows:

**Biomass resources in 60 km radius from the plant**

| Biomass Type | Rice husk ($10^3$ tonnes) | Cotton straw ($10^3$ tonnes) | Stump ($10^3$ tonnes) | Wood residues* ($10^3$ tonnes) |
|---|---|---|---|---|
| Total biomass generation in the region | 236.3 | 102.1 | 150.0 | 410.0 |
| Biomass loss | 23.6 | 15.3 | 15.0 | 41.0 |
| Available biomass in the region | 212.7 | 86.8 | 135.0 | 369.0 |
| Biomass utilized out of the project | 42.5 | 13.0 | 27.0 | 73.8 |
| Biomass utilized by the project** | 94.622 | 14.031 | 0.341 | 13.063 |
| Total biomass utilized, including the project | 137.156 | 27.049 | 27.341 | 86.863 |
| Available biomass/Total biomass utilized | 155% | 321% | 494% | 425% |

* Wood residues include branch, bark and wood chip

The following tables are for the parameters which are measured following the monitoring plan / methodology.

| | Assessment/ Observation |
|---|---|
| Data / Parameter:<br>(as in monitoring plan of PDD): | Net quantity of electricity generated in the project plant ($EG_{project\ plant,y}$) |
| Measuring frequency: | Continuously |
| Reporting frequency: | Monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | The measuring frequency (continuously) is accordance with the monitoring plan and monitoring methodology. Since there is not specific requirement for reporting frequency in the monitoring plan and monitoring methodology, the reporting frequency (monthly) for this parameter did reflect to the monitoring practise. |
| Type of monitoring equipment: | Electricity meters |
| Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise? | Gate meter (main meter) /11/<br>Type/Model: MK6E<br>SN:206652850<br>Accuracy: 0.2s<br>Calibration frequency: annual<br>Calibration entity: Hubei Electric Power Testing & Research Institute<br>Calibration date: 22 July 2010<br>Calibration validity: 21 July 2011<br><br>Gate meter (backup meter) /11/<br>Type/Model: MK6E<br>SN:206652837<br>Accuracy: 0.2s<br>Calibration frequency: annual<br>Calibration entity: Hubei Electric Power Testing & Research Institute<br>Calibration date: 22 July 2010<br>Calibration validity: 21 July 2011 |

| | |
|---|---|
| | Backup line meter /11/<br>Type/Model: DSSD5<br>SN:53648<br>Accuracy: 0.5s<br>Calibration frequency: annual<br>Calibration entity: Hubei Electric Power Testing & Research Institute<br>Calibration date: 23 July 2010<br>Calibration validity: 22 July 2011<br><br>In the revised PDD /3/, it stated the meters have accuracy level 0.5. The accuracy of backup line meter 0.5s is consistent with that. The gate meters (main and backup) have higher accuracy level (0.2s) than the value stipulated in the revised PDD, and also present good monitoring practice. |
| Calibration frequency /interval: | Annual |
| Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise? | The PDD did not specify the calibration interval of the electricity meters, but mentioned that the monitoring equipment will be calibrated by a certified party in accordance with the manufacture's recommendations and National Regulations for ensuring reliability of the system. The calibration frequency of the electricity meters is annual, which meets the relevant industry standard JJG596-1999 /11/ and represents good monitoring practice in China. |
| Company performing the calibration: | Hubei Electric Power Testing & Research Institute /7/ |
| Did calibration confirm proper functioning of monitoring equipment? (Yes / No): | Yes |
| Is (are) calibration(s) valid for the whole reporting period? | Yes. The calibrations for these three meters can cover the whole monitoring period 12 August 2010 to 31 March 2011. |
| If applicable, has the reported data been cross-checked with other available data? | Yes. The monthly electricity generation /23/ was cross-checked with the monthly electricity sales receipt /27/ /28/. |
| How were the values in the monitoring report verified? | The net electricity generation supplied to the grid is determined by the electricity supplied to the grid minus the electricity imported from the grid and electricity imported from the 10 kV backup power line /9/. The amount of net electricity generated is determined by monitoring meter on the hourly basis when the power plant is operating, and these hourly readings are aggregated into monthly reports /22/. The net electricity generated was cross-checked with the electricity sales invoices /27/ /28/. |
| Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | All necessary documentations are collected, referenced and aggregated, which is easily accessible in hard-copy or electronic format. The quality assurance and quality control procedures have been addressed in the CDM Management and Monitoring Manual /19/, including the organization structure with the responsibilities, |

| | |
|---|---|
| | personnel competencies, monitoring procedures and monitoring management. All monitoring devices have been calibrated and maintained periodically to ensure the accuracy of measurement. By interviewing with the staff and checking records during on-site visit, it can be confirmed that the monitoring management system is in place. |
| In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved? | Not applicable. |

| | Assessment/ Observation |
|---|---|
| Data / Parameter:<br>(as in monitoring plan of PDD): | 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 ($EC_{PJ,y}$) |
| Measuring frequency: | Continuously |
| Reporting frequency: | Monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | This on-site electricity consumption was referred to the electricity consumed for the biomass residues mechanical treatment by the project plant, which was stipulated in the PDD and methodology. The electricity consumed by the project operation itself has been included as the self-consumption in the net quantity of electricity generated in the project plant. Since the biomass residues were transported to the project site and were treated on the project site, the biomass residues collection sites were used to collect and storage the biomass residues, not mechanical treatment.<br>The measuring frequency (continuously) is accordance with the monitoring plan and monitoring methodology. Since there is not specific requirement for reporting frequency in the monitoring plan and monitoring methodology, the reporting frequency (monthly) for this parameter did reflect to the monitoring practise. |
| Type of monitoring equipment: | Electricity meters |
| Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise? | Meter for biomass /11/<br>Type/Model: DSSD1008<br>SN:30100516<br>Accuracy: 0.5s<br>Calibration frequency: annual<br>Calibration entity: Hubei Electric Power Testing & Research Institute |

| | |
|---|---|
| | Calibration date: 11 October 2010<br>Calibration validity: 10 October 2011<br><br>There is not specific requirement for the accuracy level of this meter in the revised PDD /3/. The accuracy of the meter for biomass 0.5s meets requirement of the monitoring methodology, and also present good monitoring practice in China. |
| Calibration frequency /interval: | Annual |
| Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise? | The PDD did not specify the calibration interval of the electricity meters, but mentioned that the monitoring equipment will be calibrated by a certified party in accordance with the manufacture's recommendations and National Regulations for ensuring reliability of the system. The calibration frequency of the electricity meters is annual, which meets the relevant industry standard JJG596-1999 /11/ and represents good monitoring practice in China. |
| Company performing the calibration: | Hubei Electric Power Testing & Research Institute /7/ |
| Did calibration confirm proper functioning of monitoring equipment? (Yes / No): | Yes |
| Is (are) calibration(s) valid for the whole reporting period? | DNV can confirm during site visit that the electricity used for mechanical treatment on cotton straw, stump, branch, bark and wood chip only started from 11 October 2010, at the time when the meter for biomass was installed, which can be confirmed by the daily operation and maintenance record /21/. Hence, for the period from 12 August 2010 to 10 October 2010, the electricity meter for biomass mechanical treatment was not installed and worked. As mentioned above, prior to 11 October 2010, since the biomass residues used by the project activity was rice husk, which did not need the mechanical treatment before being burnt in the boiler, no electricity consumption happened on site for biomass residues mechanical treatment. Therefore, the $EC_{PJ,y}$ value prior to 11 October 2010 was zero. The calibration confirmed proper functioning of the monitoring equipment (meter for biomass) and is valid for the remaining part of the monitoring period. |
| If applicable, has the reported data been cross-checked with other available data? | Since the invoices for purchased on-site electricity consumption is not available, the cross-check between the measurement results from the meter for biomass and its invoice is not able to be conducted. As stated in the PDD, the data source of on-site electricity consumption can use the calculated conservatively as the weight of straws smashed in tonnes and the electricity consumption factor (kWh/tonne). During the site visit, DNV found there were two chippers, one was for cotton straw and another was for residues from the forestry (including stump, branch, bark and wood chip). By checking the nameplate and technical |

| | |
|---|---|
| | specification of these two chippers /37/, DNV can confirm that the chipper for cotton straw has the power rate 18.5 kW and production efficiency 3 tonne/h, and the chipper for residues from the forestry has the power rate 224.546 kW and production efficiency 33 tonne/h. Hence, the electricity consumption factors for these two chippers are 6.16 kWh/tonne and 6.80 kWh/tonne, respectively. Considering the consumption quantity of cotton straw (14 030.62 tonne) and residue from the forestry (13 402.64 tonne) during this monitoring period /22/, the on-site electricity consumption was calculated as 177.72 MWh. Since the measurement results from the meter was 159 MWh /23/, as the conservative principle, the higher on-site electricity consumption 177.72 MWh by calculation based on the electricity consumption factor was used in the calculation of project emissions due to the on-site electricity consumption. |
| How were the values in the monitoring report verified? | The amount of on-site electricity consumption is determined by monitoring meter on the daily measurement and monthly record /22/ /23/. |
| Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | All necessary documentations are collected, referenced and aggregated, which is easily accessible in hard-copy or electronic format. The quality assurance and quality control procedures have been addressed in the CDM Management and Monitoring Manual /19/, including the organization structure with the responsibilities, personnel competencies, monitoring procedures and monitoring management. All monitoring devices have been calibrated and maintained periodically to ensure the accuracy of measurement. By interviewing with the staff and checking records during on-site visit, it can be confirmed that the monitoring management system is in place. |
| In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved? | Not applicable. |

| | Assessment/ Observation |
|---|---|
| Data / Parameter:<br>(as in monitoring plan of PDD): | Quantity of each biomass residue type k combusted in the project plan ($BF_{k,y}$) |
| Measuring frequency: | Continuously |
| Reporting frequency: | Monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | The measuring frequency (continuously) is accordance with the monitoring plan and monitoring methodology. Since there is not specific |

| | |
|---|---|
| | requirement for reporting frequency in the monitoring plan and monitoring methodology, the reporting frequency (monthly) for this parameter did reflect to the monitoring practise. |
| Type of monitoring equipment: | Belt weigher |
| Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise? | Belt weigher 1# /13/<br>Type/Model: ICS-ST4-1000<br>SN: 811110<br>Accuracy: 0.5<br>Calibration frequency: annual<br>Calibration entity: Hubei Institute of Measurement and Testing Technology<br>Calibration date: 26 June 2010<br>Calibration validity: 25 June 2011<br><br>Belt weigher 2# /13/<br>Type/Model: ICS-ST4-1000<br>SN: 811109<br>Accuracy: 0.5<br>Calibration frequency: annual<br>Calibration entity: Hubei Institute of Measurement and Testing Technology<br>Calibration date: 26 June 2010<br>Calibration validity: 25 June 2011<br><br>There is not specific requirement for the accuracy level of the belt weighers in the revised PDD /3/. The accuracy of the belt weighers meet requirement of the monitoring methodology, and also present good monitoring practice in China. |
| Calibration frequency /interval: | Annual |
| Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise? | The PDD did not specify the calibration interval of the belt weigher, but mentioned that the monitoring equipment will be calibrated by a certified party in accordance with the manufacture's recommendations and National Regulations for ensuring reliability of the system. The calibration frequency of the belt weigher is annual, which meets the relevant industry standard JJG195-2002 /13/ and represents good monitoring practice in China. |
| Company performing the calibration: | Hubei Institute of Measurement and Testing Technology /12/ |
| Did calibration confirm proper functioning of monitoring equipment? (Yes / No): | Yes. |
| Is (are) calibration(s) valid for the whole reporting period? | Yes. The calibrations for these two belt weighers can cover the whole monitoring period 12 August 2010 to 31 March 2011. |
| If applicable, has the reported data been cross-checked with other available data? | Yes, the value is cross checked with an annual energy balance. |
| How were the values in the monitoring report | The amount is reported on daily log sheets and |

| | |
|---|---|
| verified? | aggregated into monthly reports. The verification team has assessed all daily log sheets /24/ and the monthly reports /22/ and found them to be correct. The project has reported these data based on the records of belt weighers at the entrance of the boilers, and the types of biomass residues are recorded at the same time /24/. |
| Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | All necessary documentations are collected, referenced and aggregated, which is easily accessible in hard-copy or electronic format. The quality assurance and quality control procedures have been addressed in the CDM Management and Monitoring Manual /19/, including the organization structure with the responsibilities, personnel competencies, monitoring procedures and monitoring management. All monitoring devices have been calibrated and maintained periodically to ensure the accuracy of measurement. By interviewing with the staff and checking records during on-site visit, it can be confirmed that the monitoring management system is in place. |
| In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved? | Not applicable. |

| | Assessment/ Observation |
|---|---|
| Data / Parameter:<br>(as in monitoring plan of PDD): | Moisture content of the biomass residues |
| Measuring frequency: | Daily |
| Reporting frequency: | Monthly (mean value was reported annually) |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes |
| Type of monitoring equipment: | Balance and dry cabinet |
| Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise? | Balance /14/<br>Type/Model: YB2001<br>SN: 196<br>Accuracy: 0.1g<br>Calibration frequency: annual<br>Calibration entity: Hubei Institute of Measurement and Testing Technology<br>Calibration date: 26 June 2010<br>Calibration validity: 25 June 2011<br><br>Dry cabinet 1# /14/ |

| | |
|---|---|
| | Type/Model: 101-1B<br>SN: 81213<br>Accuracy: 0.1℃<br>Calibration frequency: annual<br>Calibration entity: Hubei Institute of Measurement and Testing Technology<br>Calibration date: 27 June 2010<br>Calibration validity: 26 June 2011<br><br>Dry cabinet 2# /14/<br>Type/Model: 101-1A<br>SN: 171<br>Accuracy: 0.1℃<br>Calibration frequency: annual<br>Calibration entity: Hubei Institute of Measurement and Testing Technology<br>Calibration date: 27 June 2010<br>Calibration validity: 26 June 2011<br><br>There is not specific requirement for the accuracy level of the balance and dry cabinets in the revised PDD /3/. The accuracy of the balance and dry cabinets meets requirement of the monitoring methodology, and also present good monitoring practice in China. |
| Calibration frequency /interval: | Annual |
| Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise? | The PDD did not specify the calibration interval of the electricity meters, but mentioned that the monitoring equipment will be calibrated by a certified party in accordance with the manufacture's recommendations and National Regulations for ensuring reliability of the system. The calibration frequency of the electricity meters is annual, which meets the relevant industry standard JJG1036-2008 /14/ and represents good monitoring practice in China. |
| Company performing the calibration: | Hubei Institute of Measurement and Testing Technology /12/ |
| Did calibration confirm proper functioning of monitoring equipment? (Yes / No): | Yes. |
| Is (are) calibration(s) valid for the whole reporting period? | Yes. The calibrations for the balance and dry cabinets can cover the whole monitoring period 12 August 2010 to 31 March 2011. |
| If applicable, has the reported data been cross-checked with other available data? | Not applicable. |
| How were the values in the monitoring report verified? | Moisture for all types of biomass residues is sampled and analyzed daily by the balance and dry cabinet in the laboratory of the plant, and mean value is calculated at least annually. The value is reported on daily log sheets /24/ and aggregated into monthly reports /24/. |

| | |
|---|---|
| Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | All necessary documentations are collected, referenced and aggregated, which is easily accessible in hard-copy or electronic format. The quality assurance and quality control procedures have been addressed in the CDM Management and Monitoring Manual /19/, including the organization structure with the responsibilities, personnel competencies, monitoring procedures and monitoring management. All monitoring devices have been calibrated and maintained periodically to ensure the accuracy of measurement. By interviewing with the staff and checking records during on-site visit, it can be confirmed that the monitoring management system is in place. |
| In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved? | Not applicable. |

| | Assessment/ Observation |
|---|---|
| Data / Parameter:<br>(as in monitoring plan of PDD): | Quantity of fossil fuel (diesel) combusted in the project plant ($FF_{project\ plant,y}$) |
| Measuring frequency: | Continuously |
| Reporting frequency: | Monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | The measuring frequency (continuously) is accordance with the monitoring plan and monitoring methodology. Since there is not specific requirement for reporting frequency in the monitoring plan and monitoring methodology, the reporting frequency (monthly) for this parameter did reflect to the monitoring practise. |
| Type of monitoring equipment: | Volume flow meters |
| Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise? | Flow meter 1# (main meter) /15/<br>Type/Model: LWY-10C<br>SN: 8059<br>Accuracy: 1.0<br>Calibration frequency: annual<br>Calibration entity: Hubei Institute of Measurement and Testing Technology<br>Calibration date: 26 June 2010<br>Calibration validity: 25 June 2011<br><br>Flow meter 1# (backup meter) /15/<br>Type/Model: LWY-10C<br>SN: 8084<br>Accuracy: 1.0 |

| | |
|---|---|
| | Calibration frequency: annual<br>Calibration entity: Hubei Institute of Measurement and Testing Technology<br>Calibration date: 26 June 2010<br>Calibration validity: 25 June 2011<br><br>Flow meter 2# (main meter) /15/<br>Type/Model: LWY-10C<br>SN: 8085<br>Accuracy: 1.0<br>Calibration frequency: annual<br>Calibration entity: Hubei Institute of Measurement and Testing Technology<br>Calibration date: 26 June 2010<br>Calibration validity: 25 June 2011<br><br>Flow meter 2# (backup meter) /17/<br>Type/Model: LWY-10C<br>SN: 10620<br>Accuracy: 1.0<br>Calibration frequency: annual<br>Calibration entity: Beijing Changcheng Institute of Metrology & Measurement<br>Calibration date: 30 June 2010<br>Calibration validity: 29 June 2011<br><br>There is not specific requirement for the accuracy level of the volume flow meters in the revised PDD /3/. The accuracy of the volume flow meters meets requirement of the monitoring methodology, and also present good monitoring practice in China. |
| Calibration frequency /interval: | Annual |
| Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise? | The PDD did not specify the calibration interval of the electricity meters, but mentioned that the monitoring equipment will be calibrated by a certified party in accordance with the manufacture's recommendations and National Regulations for ensuring reliability of the system. The calibration frequency of the electricity meters is annual, which meets the relevant industry standard JJG1037-2008 /15/ and represents good monitoring practice in China. |
| Company performing the calibration: | Hubei Institute of Measurement and Testing Technology /12/<br>Beijing Changcheng Institute of Metrology & Measurement /17/ |
| Did calibration confirm proper functioning of monitoring equipment? (Yes / No): | Yes |
| Is (are) calibration(s) valid for the whole reporting period? | Yes. The calibrations for the volume flow meters can cover the whole monitoring period 12 August 2010 to 31 March 2011. |

| | |
|---|---|
| If applicable, has the reported data been cross-checked with other available data? | The quantity of diesel was cross-checked by the purchase receipt /29/ provided by the accounting department and the amount of stored fuel on site in the beginning and end of the monitoring period. |
| How were the values in the monitoring report verified? | The diesel was used for start-up of boiler, which is monitored continuously by the volume flow meter and recorded monthly. The value is reported on daily log sheets /25/ and aggregated into monthly reports /22/ /25/. |
| Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | All necessary documentations are collected, referenced and aggregated, which is easily accessible in hard-copy or electronic format. The quality assurance and quality control procedures have been addressed in the CDM Management and Monitoring Manual /19/, including the organization structure with the responsibilities, personnel competencies, monitoring procedures and monitoring management. All monitoring devices have been calibrated and maintained periodically to ensure the accuracy of measurement. By interviewing with the staff and checking records during on-site visit, it can be confirmed that the monitoring management system is in place. |
| In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved? | Not applicable. |

| | Assessment/ Observation |
|---|---|
| Data / Parameter:<br>(as in monitoring plan of PDD): | Quantity of fossil fuel combusted in the project site (including the collection sites) for other purposes that are attributable to the project activity ($FF_{project\ site,y}$) |
| Measuring frequency: | Continuously |
| Reporting frequency: | Monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | The measuring frequency (continuously) is accordance with the monitoring plan and monitoring methodology. Since there is not specific requirement for reporting frequency in the monitoring plan and monitoring methodology, the reporting frequency (monthly) for this parameter did reflect to the monitoring practise |
| Type of monitoring equipment: | Not applicable |
| Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good | The consumption of diesel was monitored by using diesel purchase and consumption log book. |

| | |
|---|---|
| monitoring practise? | |
| Calibration frequency /interval: | Not applicable |
| Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise? | Not applicable |
| Company performing the calibration: | Not applicable |
| Did calibration confirm proper functioning of monitoring equipment? (Yes / No): | Not applicable |
| Is (are) calibration(s) valid for the whole reporting period? | Not applicable |
| If applicable, has the reported data been cross-checked with other available data? | The quantity is cross checked with diesel purchase receipt /29/ and stock change as the basis of energy balance. |
| How were the values in the monitoring report verified? | The consumption of diesel (including consumption as auxiliary fuel for boiler start up and consumption for forklifts at collection sites and project site) was monitored by using diesel purchase and consumption log book /25/ /26/. |
| Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | All necessary documentations are collected, referenced and aggregated, which is easily accessible in hard-copy or electronic format. The quality assurance and quality control procedures have been addressed in the CDM Management and Monitoring Manual /19/, including the organization structure with the responsibilities, personnel competencies, monitoring procedures and monitoring management. By interviewing with the staff and checking records during on-site visit, it can be confirmed that the monitoring management system is in place. |
| In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved? | Not applicable. |

### 3.5.3 Energy balance

According to the methodology ACM0006 (version 6.2), the energy balance for the power plant is required to cross check the biomass and auxiliary fuels consumption. DNV has checked the energy balance calculation spread sheet and confirmed the integrated electricity generation efficiency to be 16.33% /2/. Based on the relevant design information from the suppliers and equipment purchase agreement of boiler, generator and turbine /30/-/32/, the design efficiencies for these three equipment are 86%, 97 % and 32% (this is under pure condensing condition for steam turbine), respectively, which leads to an overall efficiency of 27% in theory for the set of boiler-turbine-generator. Considering the inexperienced operation

from the project staff and unstable facility performance (there were 17 times and 10 times shutdowns for maintenance for 1# and 2# facility in this monitoring period, respectively), DNV considers that the efficiency observed in this monitoring period for the project activity is reasonable.

Therefore, it is concluded that the monitoring system is appropriate and complete.

## 3.6 Assessment of data and calculation of emission reductions

According to para 209 (c) of VVM version 1.2, DNV confirms that appropriate methods and formulae for calculating baseline emissions, project emissions and leakage have been applied for this project activity.

### 3.6.1 Baseline emissions

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

The emission reductions ($ER_{electricity,y}$) due to displacement of electricity is the product of the ex-ante calculated grid emission factor ($EF_{electricity,y}$, in $tCO_2/MWh$) times the net electricity generation as a result of the project activity ($EG_y$ in MWh), which will otherwise be supplied by the Central China Power Grid without the project activity:

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

The emission factor of the Central China Power Grid is determined *ex-ante* as 0.9735 $tCO_2/MWh$ for the first crediting period. The net electricity delivered to the grid is 58 711.3 MWh/22/, which results in the baseline emission reductions 57 155.46 $tCO_2e$ in this monitoring period.

**(2) Emission reductions ($BE_{biomass,y}$) due to natural decay of anthropogenic sources of biomass residue**

The emission reductions ($BR_{biomass,y}$) due to natural decay of anthropogenic sources of biomass residue during the year y is calculated as the product of the amount of biomass residues (dry basis) used ($BE_{biomass,CH4,y}$) multiplies the biomass net calorific value, methane emission factor and the global warning potential of methane:

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

According to the revised PDD and the methodology, the quantity of biomass residue is adjusted for the moisture content in order to determine the quantity of dry biomass. Hence, $BF_{PJ,k,y} = BF_{k,y}$, namely the quantity of biomass residues of type k combusted in the project plant during the year y (tonnes of dry matter). According to the revised PDD, 0.001971 $tCH_4/t$ is used as the product of $NCV_k$ and $EF_{burning,CH4,k,y}$. The incremental quantity of biomass residues used as a result of the project activity is 102 024.40 tonnes (dry matter), which results in the baseline emission reductions 4 222.89 $tCO_2e$ in this monitoring period.

**(3) Baseline emissions due to the displacement of heat ($ER_{heat,y}$)**

According to revised PDD, the project will not claim GHG emission reductions from displacing heat. Hence, $ER_{heat,y} = 0$.

Therefore, the total baseline emissions occurred in this monitoring period are 61 378.35 $tCO_2e$.

### 3.6.2 Project emissions

The project emissions include emissions from transportation of biomass residues to the project site ($PET_y$), emissions from on-site consumption of fossil fuel by the project ($PEFF_y$), emissions from consumption of electricity ($PE_{EC,y}$), and methane emissions from combustion of biomass residues ($PE_{biomass,CH4,y}$):

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

**(1) Project emissions from transportation of biomass residues ($PET_y$)**

The emissions from the transport of biomass residues to the project site were calculated from the number of truck trips ($N_y$), average round trip distance (from and to) between the biomass residue fuel supply sites and the project site ($AVD_y$), average transportation from collection site to power plant and the $CO_2$ emission factor from fuel used for transportation ($EF_{km,CO2,y}$).

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

The IPCC default value of 0.001097 $tCO_2$/km was applied for the average $CO_2$ emission factor ($EF_{km,CO2,y}$) of the diesel trucks /34/. The average round trip distance (from and to) between biomass residue supply sites and the project site are calculated and verified as 86.2 km based on the numbers of truck trips for the transportation of biomass residues accounted as 13 505 and total round trip distance (from and to) between biomass residue supply sites and the project site as 1 163 854 km in this monitoring period. Hence, the project emissions were calculated as 1 276.75 $tCO_2e$.

**(2) Project emissions from on-site consumption of diesel by the project ($PEFF_y$)**

The emission from on-site consumption of fossil fuels is calculated using the "*Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion*" /44/:

$$PEFF_y = \sum FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}$$

The diesel combusted in the project plant (46.74 tonnes), and diesel combusted at the collection sites and project site for other purposes that are attributable to the project activity (64.06 tonnes) /25/ /26/ are both considered in the calculation. As stated in section 3.5.2 above, the IPCC default values at the upper limit of the uncertainty at a 95% confidence interval 74 800 $kgCO_2e$/TJ was applied for the $CO_2$ emission factor of the diesel in the calculation of project emissions for fossil fuel consumption /34/, and the net calorific value of diesel refers to latest reliable national data of China Energy Statistical Yearbook as 0.042652 TJ/t /33/. Hence, the project emissions were calculated as 353.49 $tCO_2e$.

**(3) Project emissions from consumption of electricity ($PE_{EC,y}$)**

The emissions ($PE_{EC,y}$) due to on-site consumption of electricity are calculated based on the quantify of electricity consumed, emission factor for electricity generation and a factor to account for transmission losses according to the "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*" /45/:

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

Since the electricity consumption is purchased from the grid only, the Scenario A mentioned is applicable to the proposed project /3/. The power grid emission factor 0.9735 $tCO_2$/MWh is applied, and 20% was chosen as the default value of *TDL* in line with the "*Tool to calculate*

*baseline, project and/or leakage emissions from electricity consumption*". The quantity of electricity consumption was conservatively accounted as 177.72 MWh as stated in CL 4 of Appendix A, which resulted in the project emissions as 207.61 $tCO_2e$.

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

The methane emissions from combustion of biomass residues in the project ($PE_{biomass,CH4,y}$) is determined as below:

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

According to the methodology ACM0006 (version 6.2) /39/, when the IPCC default methane emission factor of 30 $kgCH_4/TJ$ for combustion of biomass residues is applied, the uncertainty of the methane emission factor is estimated to be 300%, resulting in a conservativeness factor of 1.37. Thus, the methane emission factor of 41.1 $kgCH_4/TJ$ ($EF_{CH4,BF}$) is used in the emission reduction calculation. The quantity /22/ and NCV for each type of biomass residues /15/ used in the project were applied. The project emissions due to methane emissions from combustion of biomass residues were calculated to be 1 129.86 $tCO_2e$.

Therefore, the total project emissions occurred in this monitoring period are calculated and verified as 2 967.72 $tCO_2e$ /2/.

### 3.6.3 Leakage

As stated in section 3.5.2, DNV confirms that the quantity of available biomass residue in the region is at least 25% larger than the quantity of biomass that is utilized, including the project plant. Hence, the leakage for the project activity is considered as zero.

### 3.6.4 Emission reductions

As stated in Section 1.4 above, the emission reductions ($ER_y$) by the project activity is the difference between the baseline emissions through the displacement of electricity ($ER_{electricity,y}$) and baseline emissions due to natural decay or uncontrolled burning of biomass residues ($BE_{biomass,y}$), project emissions ($PE_y$) and emissions ($L_y$) due to leakage:

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

From Section 3.6.1 to 3.6.3, the following information has been achieved:

$ER_{electricity,y}$ = 57 155.46 $tCO_2e$

$BE_{biomass,y}$ = 4 222.89 $tCO_2e$

$PE_y$ = 2 967.72 $tCO_2e$

$L_y$ = 0 $tCO_2e$

Hence, the emission reductions ($ER_y$) by the project activity during this monitoring period are calculated to be 58 410 $tCO_2e$.

The emission reduction calculations have been based on actual monitored data of the plant, from 12 August 2010 to 31 March 2011 which have been verified by DNV. Emission reduction calculations were presented in a worksheet /2/ and DNV has assessed the calculations to be accurate.

The reported emission reductions of 58 410 $tCO_2e$ (corresponds to 91 895 $tCO_2e$ on yearly

basis, 91 895 = 58 410 $tCO_2e$ / 365 days × 232 days) during chosen monitoring period 12 August 2010 to 31 March 2011 (232 days) are less than the *ex-ante* yearly emission reductions estimated 116 650 $tCO_2e$ in the revised PDD /3/. The detail assessment on the low emission reductions in this monitoring period has been addressed in section 3.3. DNV was able to confirm that the emission reductions claimed during this monitoring period 12 August 2010 to 31 March 2011 was reasonable.

## 3.7 Quality of evidence to determine emission reductions

All necessary documentations are collected, referenced and aggregated, which is easily accessible in hard-copy or electronic format. Measurements are performed by calibrated equipment, and the key data can also be cross-checked via other sources, such as records, receipts and inventory data. No assumptions are used that have any material influence on reported emission reductions.

DNV concludes that during this monitoring period, the evidences for determination of emission reductions are sufficient and reasonable, and the calculation of emission reductions is reliable.

## 3.8 Management system and quality assurance

Jianli Kaidi Green Energy Development Co., Ltd is responsible for operation and routine maintenance of power plant under the CDM activity. The quality assurance and quality control procedures have been addressed in the CDM Management and Monitoring Manual /19/, including the organization structure with the responsibilities, personnel competencies, monitoring procedures and monitoring management. By interview with the staff and check records during on-site visit, it can be confirmed that the monitoring management system is implemented following the CDM Management and Monitoring Manual /19/.

All monitoring devices have been calibrated and maintained periodically to ensure the accuracy of measurement. Calibration records of instruments used in measurements were made available during the verification visit and found to be valid for the entire period of the verification. Competence and training records of in-plant personnel engaged /18/ in measurement of plant parameters were presented during verification and found to be in order. All data have been archived electronically and/or in hard copy, and will be kept for two years after the crediting period.

# 4 CERTIFICATION STATEMENT

*DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions that have been reported for the "Jianli Kaidi Biomass Power Project" in China (UNFCCC Registration Reference No. 3044) for the period 12 August 2010 to 31 March 2011.*

*The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project.*

*It is DNV's responsibility to express an independent verification statement on the reported GHG emission reductions from the project. DNV does not express any opinion on the selected baseline scenario or on the validated and registered PDD.*

*DNV conducted the verification on the basis of the monitoring methodology ACM0006 (version 6.2), the monitoring plan contained in the revised Project Design Document of 3 February 2012 and the monitoring report (version 2.0) dated 31 March 2012. The verification included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.*

*DNV's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.*

*In our opinion the GHG emissions reductions of the "Jianli Kaidi Biomass Power Project" (UNFCCC Registration Ref. No. 3044) for the period 12 August 2010 to 31 March 2011 are fairly stated in the monitoring report (version 2.0) dated 31 March 2012.*

*The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology ACM0006 (version 6.2) and the monitoring plan contained in the revised PDD of 3 February 2012.*

*DNV Climate Change Services AS is able to certify that the emission reductions from the "Jianli Kaidi Biomass Power Project" during the period 12 August 2010 to 31 March 2011 amount to 58 410 tonnes of $CO_2$ equivalent.*

Beijing and Oslo, 4 June 2012

Lin Wu
*CDM Verifier*
DNV Beijing, China

Ole A. Flagstad
*Approver,*
DNV Climate Change Services AS

# 5 REFERENCES

*Documents provided by the Project Participants that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the periodic verification conclusions, and are usually further checked through interviews with key personnel.*

/1/ Jianli Kaidi Green Energy Development Co., Ltd and Camco International Limited: Monitoring Report of Jianli Kaidi Biomass Power Project for the period 12 August 2010 to 31 March 2011, version 1.0 of 8 August 2011 and version 2.0 of 31 March 2012.

/2/ Jianli Kaidi Green Energy Development Co., Ltd and Camco International Limited: ER calculation spreadsheet, version 1.0 of 8 August 2011and version 2.0 of 6 March 2012.

/3/ Camco International Limited: Revised Project Design Document of Jianli Kaidi Biomass Power Project, version 06 of 3 February 2012.

/4/ TUV Rheinland Group: Validation Report, version 04 of 22 April 2010.

/5/ Project Check and Acceptance Committee (comprising of project owner, project construction company, project supervision company and third party testing entity):

- Project test and joint inspection report for 1# turbine-generator, dated 20 December 2009;
- Project test and joint inspection report for 2# turbine-generator, dated 10 February 2010.

/6/ Hubei Province Environmental Protection Bureau: Notification of check and acceptance on project environmental protection during project completion, dated 1 December 2011.

/7/ Henan Quality and Technical Supervision Bureau: Metrology accreditation certificate on Luoyang City Coal Quality Testing Centre, dated 11 August 2008 and valid up to 10 August 2011.

/8/ Luoyang City Coal Quality Testing Centre: Testing reports for NCV of biomass residues

- Testing reports for wood chip, dated 20 October 2010 and 21 January 2011;
- Testing reports for wood branch, dated 20 October 2010 and 21 January 2011;
- Testing reports for wood bark, dated 20 October 2010 and 21 January 2011;
- Testing reports for stump, dated 20 October 2010 and 21 January 2011;
- Testing reports for rice husk, dated 22 July 2010 and 21 January 2011;
- Testing reports for cotton straw, dated 30 July 2010 and 21 January 2011.

/9/ Jianli Kaidi Green Energy Development Co., Ltd: Main power line connection diagram.

/10/ China National Accreditation Service for Conformity Assessment: Laboratory accreditation certificate for Hubei Electric Power Testing & Research Institute, dated 29 March 2007 and 15 January 2011.

/11/ Hubei Electric Power Testing & Research Institute: Calibration report of electricity meters

- Gate meter (SN: 206652850), issued on 22 July 2010 and valid up to 21 July 2011;

- Gate meter (backup, SN: 206652837), issued on 22 July 2010 and valid up to 21 July 2011;
- Backup line meter (SN: 53648), issued on 23 July 2010 and valid up to 22 July 2011;
- Meter for biomass (SN: 30100516), issued on 11 October 2010 and valid up to 10 October 2011.

/12/ China National Accreditation Service for Conformity Assessment: Laboratory accreditation certificate on Hubei Institute of Measurement and Testing Technology, dated 25 March 2010 and valid up to 24 March 2013.

/13/ Hubei Institute of Measurement and Testing Technology: Calibration reports of belt weighers

- Belt weigher 1# (SN: 811110), issued on 26 June 2010 and valid up to 25 June 2011;
- Belt weigher 2# (SN: 811109), issued on 26 June 2010 and valid up to 25 June 2011.

/14/ Hubei Institute of Measurement and Testing Technology: Calibration reports of balance and dry cabinets

- Balance (SN: 196), issued on 26 June 2010 and valid up to 25 June 2011;
- Dry cabinet 1# (SN: 81213), issued on 27 June 2010 and valid up to 26 June 2011;
- Dry cabinet 2# (SN: 171), issued on 27 June 2010 and valid up to 26 June 2011.

/15/ Hubei Institute of Measurement and Testing Technology: Calibration reports of volume flow meters

- Flow meter 1# (main meter, SN: 8059), issued on 26 June 2010 and valid up to 25 June 2011;
- Flow meter 1# (backup meter, SN: 8084), issued on 26 June 2010 and valid up to 25 June 2011;
- Flow meter 2# (main meter, SN: 8085), issued on 26 June 2010 and valid up to 25 June 2011.

/16/ China National Accreditation Service for Conformity Assessment: Laboratory accreditation certificate on Beijing Changcheng Institute of Metrology & Measurement, dated 6 November 2009 and valid up to 7 June 2011.

/17/ Beijing Changcheng Institute of Metrology & Measurement: Calibration report of flow meter 2# (backup meter, SN: 10620), issued on 30 June 2010 and valid up to 29 June 2011.

/18/ Jianli Kaidi Green Energy Development Co., Ltd: Training record related to CDM activity, dated 21 January 2010, 18 March 2010, 12 May 2010, 9 July 2010, 14 October 2010, 21 December 2010 and 2 March 2011.

/19/ Wuhan Kaidi Holding Investment Co., Ltd: CDM monitoring and operating manual, July 2010.

/20/ Jianli Kaidi Green Energy Development Co., Ltd and Hubei Province Power Company: Power Purchase Agreement, dated 8 December 2009 and 15 June 2011.

/21/ Jianli Kaidi Green Energy Development Co., Ltd: Daily operational and maintenance

records for the period December 2009 to March 2011.

/22/ Jianli Kaidi Green Energy Development Co., Ltd: Monthly reports of biomass residues consumption, electricity exported and imported, electricity consumption on site, diesel consumption for the period August 2010 to March 2011.

/23/ Jianli Kaidi Green Energy Development Co., Ltd: Original data record of electricity imported and exported for the period August 2010 to March 2011.

/24/ Jianli Kaidi Green Energy Development Co., Ltd: Daily and monthly report of quantity and moisture of biomass residues for the period August 2010 to March 2011.

/25/ Jianli Kaidi Green Energy Development Co., Ltd: Daily and monthly report of diesel consumption for boiler start-up for the period August 2010 to March 2011.

/26/ Jianli Kaidi Green Energy Development Co., Ltd: Daily and monthly report of diesel consumption on-site for the period August 2010 to March 2011.

/27/ Hubei Province Power Company and Jianli Kaidi Green Energy Development Co., Ltd: Monthly electricity transaction note of electricity exported and imported for the period August 2010 to March 2011.

/28/ Hubei Province Power Company: Electricity sale invoice for the period August 2010 to March 2011.

/29/ Hubei Jinzhou Branch of Sinopec: Invoices for diesel, from July 2010 to August 2010.
Hubei Jinzhou Branch of China Petro and Natural Gas Co., Ltd: Invoices for diesel, from September 2010 to March 2011.

/30/ Wuhan Kaidi Electric Power Engineering Co., Ltd and Jiangxi Jianglian Energy and Environmental Protection Co., Ltd: Purchase contract of boiler, 27 November 2007.

/31/ Wuhan Kaidi Electric Power Engineering Co., Ltd and Nanjing Steam Turbine (Group) Co., Ltd: Purchase contract of turbine, dated November 2007.

/32/ Wuhan Kaidi Electric Power Engineering Co., Ltd and Nanjing Steam Turbine (Group) Co., Ltd: Purchase contract of generator, dated November 2007.

/33/ Department of Industry and Transport Statistics of National Statistics Bureau and Energy Bureau of NDRC of China: China Energy Statistical Yearbook 2006 to 2010.

/34/ IPCC: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Energy);
IPCC: 2006 IPCC guidelines for national greenhouse gas inventories reference manual, 2006.

/35/ Wuhan Kaidi Power Engineering Co., Ltd: Investigation report for the biomass supply and demand for year 2010 in Jianli County, dated August 2011.

/36/ Hubei Jianli Economic Development Management Committee: Notification of heat supply in industrial park, dated 30 October 2011.

/37/ Jianli Kaidi Green Energy Development Co., Ltd: Nameplate and technical specification of chippers

*Background documents related to the design and/or methodologies employed in the design or other reference documents.*

/38/ CDM Executive Board: Validation and Verification Manual, version 1.2.

/39/ CDM Executive Board: Consolidated methodology electricity generation from biomass

residues, ACM0006, version 6.2.

/40/ CDM Executive Board: Approval for validation opinion on changes in the PDD for Jianli Kaidi Biomass Power Project on 28 February 2012.

/41/ CDM Executive Board: Issuance completeness checklist, version 2.

/42/ CDM Executive Board: Issuance information and reporting checklist, version 2.

/43/ CDM Executive Board: Guidelines on completeness check of requests for issuance, version 1.

/44/ CDM Executive Board: Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion, version 2.

/45/ CDM Executive Board: Tool to calculate baseline, project and/or leakage emissions from electricity consumption, version 1.

*Persons interviewed during the initial verification, or persons who contributed with other information that are not included in the documents listed above.*

/46/ Jianli Kaidi Green Energy Development Co., Ltd:
Wang Tong, Director of power plant
Tian Zhongyuan, Vice director of power plant
Pei Zhenlin, CDM Project monitoring manager
Chen Yuanlin, Manager assistant of power plant
Chen Tieming, Accountor of power plant
Ma Chunyu, analyst of Laboratory
Peng Dali, Calibration technician of fuel department
Chen Chuan, CDM assistant

/47/ Wuhan Kaidi Holding Investment Co., Ltd:
Xue Fei, Director of Carbon Asset Center
Zhu Jianmei, Monitoring project manager
He Li, Monitoring project manager

/48/ Camco International Limited:
Zhang Yong, Senior project manager
Fang Liqiang, Technical manager

- o0o -

# APPENDIX A

## CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS

## Corrective action requests

| CAR ID | Corrective action request | Response by Project Participants | DNV's assessment of response by Project Participants |
|---|---|---|---|
| CAR 1 | In the section D1 of MR, the ex-ante value 0.001971 $tCH_4/GJ$ shall be the product of $NCV_k$ and $EF_{burning,CH4,k,y}$, according to the PDD and methodology. The correction shall be addressed.<br>In the section D2 of MR, the frequency of measuring, reading and reporting for monitoring parameters shall be addressed to reflect the monitoring practice. | 1. It is a typo mistake. $NCV_k$*$EF_{burning,CH4,k,y}$ is used in the revised MR version 2.0.<br><br>2. The frequency of measuring, reading and reporting for all parameters are described to reflect the monitoring practice in the section D2 of the revised MR version 2.0. | OK. $NCV_k$*$EF_{burning,CH4,k,y}$ has been addressed in the updated MR as the parameter for the $CH_4$ emission factor for controlled burning of the biomass residue in the project plant.<br>The frequency of measuring, reading and reporting for monitoring parameters have been addressed in the updated MR.<br>CAR 1 is closed. |
| CAR 2 | The accuracy level of dry cabinet 2# is 0.1℃ in the calibration report and confirmed by the physical observation, which is inconsistent with the value (0.2) in the MR. The correction is requested. | The MR is revised to correct this issue. 0.1℃ is used to describe the accuracy level of dry cabinet 2# in the revised MR version 2.0. | OK. The correct accuracy of 0.1℃ has been addressed in the updated MR.<br>CAR 2 is closed. |
| CAR 3 | Inconsistency was found between data recording and sale invoice for monthly electricity generation. The appropriate method shall be taken for such inconsistency. | By checking the total number of the electricity generation in data recording and sale invoices during the monitoring period, it is found that the inconsistency is 0.765 MWh, which is minor and caused by deducting the so-called low-quality electricity from the total electricity generation.<br>For power plant interconnected to the grid, its operation has to flow the grid dispatch order, otherwise the power plant will be penalized by deducting a certain amount of electricity, or low-quality electricity, from its total electricity generation. This situation happened in July, August, September, October and November of 2010 | OK. Conservative principle has been taken in the calculation, which leads to the decrease of emission reductions claimed in the public MR, and the ER spread sheet also has been updated.<br>CAR 3 is closed. |

| CAR ID | Corrective action request | Response by Project Participants | DNV's assessment of response by Project Participants |
|---|---|---|---|
| | | and the deducted amount was shown on one single sale invoice with the serial number 03339442. Therefore there is minor inconsistency between data recording and sale invoice for monthly electricity generation in these months. And the data recording is consistent with the sale invoices of December 2010, January, February and March 2011.<br>The smaller figure, which excludes the low-quality electricity, is used to calculate the ERs for conservativeness. | |
| CAR 4 | In order to be transparent, the electricity imported and exported during this monitoring period is requested to be calculated separately.<br>In section C of MR, the description of monitoring system description shall reflect to actual monitoring practice, including accuracy of meters. | The electricity imported and exported during this monitoring period is calculated separately in the revised MR. And in section C of MR, the information of electricity description is given more exactly. | Separate calculation for electricity imported and exported has been addressed in the updated MR. The description of monitoring system has reflected to actual monitoring practice.<br>CAR 4 is closed. |

## Clarification requests

| CL ID | Clarification request | Response by Project Participants | DNV's assessment of response by Project Participants |
|---|---|---|---|
| CL 1 | By checking the daily operating log, DNV found that compared to the registered PDD additional types of biomass residues were utilized since December 2010, which included stump, branch, bark and wood chip. The clarification is sought. | Additional types of biomass residues included stump, branch, bark and wood chip were firstly utilized since October 2010. The request of approval of changes regarding this issue was submitted to the EB, and was approved on 28 Feb 2012. For more information, please refer to the link: http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1256015812.95/history95/history | In compliance with the "Procedures for notifying and requesting approval of changes from the project activity as described in the registered project design document", a notification for change from project activity related to use a different biomass residue is requested, and the notification has been accepted by EB on 28 February 2012 /40/. Details refer to section 3.2.<br>CL 1 is closed. |
| CL 2 | An annual energy balance shall be provided to crosscheck the quantity of biomass residues according to the applied methodology. | An annual energy balance has been provided to DOE to crosscheck the quantity of biomass residues according to the applied methodology. | DNV has checked the energy balance calculation spread sheet and confirmed the integrated electricity generation efficiency to be 16.33% /2/. Based on the relevant design information from the suppliers and equipment purchase agreement of boiler, generator and turbine /30/-/32/, the design efficiencies for these three equipment are 86%, 97 % and 32% (this is under pure condensing condition for steam turbine), respectively, which leads to an overall efficiency of 27% in theory for the set of boiler-turbine-generator. Considering the inexperienced operation from the project staff and unstable facility performance (there were 17 times and 10 times shutdowns for maintenance for 1# and 2# facility in this monitoring period, respectively), DNV considers that the |

| | | | |
|---|---|---|---|
| | | | efficiency observed in this monitoring period for the project activity is reasonable. CL 2 is closed. |
| CL 3 | The calibration of the meter for on-site electricity consumption was conducted on 11 October 2010 and valid up to 10 October 2011, which cannot cover whole monitoring period 12 August 2010 to 31 March 2011. The clarification is sought. | Before 11 October 2010, rice husk is the only type of biomass fuel consumed by the plant, which does not need mechanical treatment, so on-site electricity consumption for the mechanical treatment of the biomass fuel (only rice husk at that time) in the project site is 0.<br><br>The calibration of the meter was conducted on 11 October 2010. Since there is no electricity consumption, although the validity period cannot cover the whole monitoring period, it does not affect the emission reduction achieved. | This on-site electricity consumption was referred to the electricity consumed for the biomass residues mechanical treatment by the project plant, which was stipulated in the PDD and methodology. The electricity consumed by the project operation itself has been included as the self-consumption in the net quantity of electricity generated in the project plant. Since the biomass residues were transported to the project site and were treated on the project site, the biomass residues collection sites were used to collect and storage the biomass residues, no mechanical treatment.<br>DNV can confirm during site visit that the electricity used for mechanical treatment on cotton straw, stump, branch, bark and wood chip only started from 11 October 2010, at the time when the meter for biomass was installed, which can be confirmed by the daily operation and maintenance record /21/. Hence, for the period from 12 August 2010 to 10 October 2010, the electricity meter for biomass mechanical treatment was not installed and worked. As mentioned above, prior to 11 October 2010, since the biomass residues used by the project activity was rice husk, which did not need the mechanical treatment before being burnt in the boiler, no electricity consumption happened on site for biomass residues mechanical |

| | | | |
|---|---|---|---|
| | | | treatment. Therefore, the $EC_{PJ,y}$ value prior to 11 October 2010 was zero. The calibration confirmed proper functioning of the monitoring equipment (meter for biomass) and is valid for the remaining part of the monitoring period<br>CL 3 is closed. |
| CL 4 | According to the PDD, 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 will source from the on-site measurement by meter or calculated conservative as the weight of straws smashed in tons and the electricity consumption factor, and cross-check measurement results with invoices for purchased electricity if available. During the site visit, DNV found the meter for biomass was installed to monitor the on-site electricity consumption. There was a gate meter installed to monitor the electricity imported from the grid and the meter for biomass was part of internal electricity consumption system, which measured the electricity consumption on-site continuously and recorded monthly. However, as part of internal electricity consumption, there is not separate invoice for such on-site electricity consumption as cross-check. The further clarification shall be provided to justify the appropriateness of on-site electricity | As requested by the methodology and PDD, the project owner has installed dedicated meter to monitor on-site electricity consumption ($EC_{PJ,y}$) except auxiliary electricity consumption by the project plant. In the case of this project activity, $EC_{PJ,y}$ only includes electricity for mechanical treatment of the biomass within the project plant.<br>In accordance with the QA/QC procedure in the registered PDD and methodology, $EC_{PJ,y}$ would be crosschecked with invoices for purchased electricity **if available**. However, the specific invoices for $EC_{PJ,y}$ are not **available** since the grid only issued receipts for the total imported electricity from the grid, which include auxiliary electricity consumption by the project plant, and $EC_{PJ,y}$ is only a small part of the volume on the invoices. Thus, the QA/QC procedure is not applicable.<br>To address this issue, the following conservative option is adopted as a crosscheck:<br>As described in the PDD, $EC_{PJ,y}$ can be conservatively calculated as the weight of straws smashed in tonnes and the electricity consumption factor. | Since the invoices for purchased on-site electricity consumption is not available, the cross-check between the measurement results from the meter for biomass and its invoice is not able to be conducted. As stated in the PDD, the data source of on-site electricity consumption can use the calculated conservatively as the weight of straws smashed in tonnes and the electricity consumption factor (kWh/tonne). During the site visit, DNV found there were two chippers, one was for cotton straw and another was for residues from the forestry (including stump, branch, bark and wood chip). By checking the nameplate and technical specification of these two chippers /37/, DNV can confirm that the chipper for cotton straw has the power rate 18.5 kW and production efficiency 3 tonne/h, and the chipper for residues from the forestry has the power rate 224.546 kW and production efficiency 33 tonne/h. Hence, the electricity consumption factors for these two chippers are 6.16 kWh/tonne and 6.80 kWh/tonne, respectively. Considering the consumption quantity of cotton straw (14 030.62 tonne) and residue from the forestry (13 402.64 |

| | | | |
|---|---|---|---|
| | consumption used in the emission reduction calculation. | During the currently monitoring period, $EC_{PJ,y}$ is 159 MWh based on the electricity meter, and 177.72 MWh (= $\frac{14,030.62 \times 18.5}{3 \times 1,000} + \frac{13,402.64 \times 224.546}{33 \times 1,000}$) based on conservatively calculated result.<br>To be conservative, 177.72 MWh is used to calculate the project emissions ($PE_{EC,y}$) | tonne) during this monitoring period /22/, the on-site electricity consumption was calculated as 177.72 MWh. Since the measurement results from the meter was 159 MWh /23/, as the conservative principle, the higher on-site electricity consumption 177.72 MWh by calculation based on the electricity consumption factor was used in the calculation of project emissions due to the on-site electricity consumption.<br>CL 4 is closed. |
| CL 5 | In the PDD, the IPCC default value 74 100 $kgCO_2e/TJ$ was applied for the $CO_2$ emission factor of the diesel sourced from IPCC 2006 in the estimated calculation of project emissions for fossil fuel consumption, and the $CO_2$ emission factor of fossil fuel (diesel) used in the project will be reviewed annually on its appropriateness /3/. According to the methodology, the emissions from fossil fuel consumed in the project plant will use the quantity of fossil fuel ($FC_{i,y}$) as well as its emission factor ($NCV_{i,y} \times EF_{CO2,i,y}$) according to the "*Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion*" /44/, in which it stated that IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in IPCC 2006 was applied for the $CO_2$ emission factor of fossil fuel.<br>The clarification was sought if such review has been conducted in the | As local or national data are not available, the data 74 800 $kgCO_2e/TJ$ is used for conservativeness, which is the 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. | IPCC default values at the upper limit of the uncertainty at a 95% confidence interval 74 800 $kgCO_2e/TJ$ /34/ was applied for the $CO_2$ emission factor of the diesel in the calculation of project emissions for fossil fuel consumption. Since IPCC 2006 is the latest version till now, DNV considers that 74 800 $kgCO_2e/TJ$ /34/ applied for the $CO_2$ emission factor of the diesel is reasonable. The update has been addressed in the MR and ER spreadsheet.<br>CL 5 is closed. |

| | | | |
|---|---|---|---|
| | determination of project emissions from fossil fuel consumption. | | |

## Forward action requests from previous verification

| FAR ID | Forward action request | Summary of how FAR has been addressed in this reporting period | Assessment of how FAR has been addressed |
|---|---|---|---|
| NA | This is first verification. | NA | NA |

## Forward action requests from this verification

| FAR ID | Forward action request | Response by Project Participants | DNV's assessment of response by Project Participants |
|---|---|---|---|
| NA | NA | NA | NA |

- o0o -

# APPENDIX B

## CURRICULA VITAE OF THE VERIFICATION TEAM MEMBERS

**Lin Wu:** holds a Master Degree in Chemical Engineering & Process, a Bachelor Degree in Chemical Engineering & Process and a Bachelor Degree in Computer Science & Technology, having an overall experience of around seven years. Prior to joining DNV, he has around four years experiences in chemical industry covering design of chemical process and system, piping design, commissioning and project management on site. His experience also covers the fields of desulfurization of flue gas in power plant industry.

He has experience of around 4 years in validation and verification of CDM/JI projects and other 3rd party validation/verification services.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in "Energy Generation from Renewable Energy Sources" and "Chemical Processes Industries".

**Hou Bao Jun:** holds a Master Degree in Applied Chemistry. Having an overall experience of around 6 years. Prior to joining DNV, having around 4 years experiences in thermal power plant and about 10 months experience in chemical cleaning field. He was responsible for the normal operation of water treatment equipment and was tasked to redesign the production process to raise its efficiency. He participated in the device process design and construction. He has accumulated rich experience in the construction of the power equipment. He is also familiar with other areas of a power plant, namely the boiler system, the turbine system and the electricity system. His experience covers the fields of chemistry and energy.

His qualification, industrial experience demonstrates his sufficient sectoral competence in "Energy Generation from Renewable Energy Sources", "Thermal Energy Generation from Fossil Fuels and Biomass including Thermal Electricity from Solar" and "Waste Handling and Disposal".

**Sharmistha Shome**, DNV Bangalore, India holds a Master's Degree in Energy Systems. Her educational qualification covers the fields of sustainable development, power plant technology, renewable energy technology, performance of thermal & electrical utilities and project financing.

She has experience in validation and verification of several CDM projects/JI and other 3rd party validation/verification services. She has completed the ISO14001 EMS Lead Auditor course. Her qualification and experience in CDM demonstrate her sufficient sectoral competence in renewable energy sector.

**Astakala Vidyacharan**, DNV India, is a chemical engineer and prior to joining DNV in 2005, has had 11 years of direct work experience in various chemical industries. His work experience covers 4 years in project implementations in pesticide and fine chemical industries , including environment management activities; 7 years in process operations of of pesticide, natural products and fine chemical industries.

He has received extensive training in the CDM validation and verification process. He is an appointed validator for the CDM validation and verification program of DNV and has performed validation of several CDM projects. He is also a trained auditor for GHG accounting standards and involved audit of Corporate GHG accounting. He is a qualified ISO9001, ISO 14001 Lead auditor and OHSAS 18001 auditor who has performed several audits for various industrial sectors under these management systems.

His qualification, industrial experience and experience in CDM facilitate him to assess renewable energy based on Hydro and Biomass, Energy Efficiency sectors, in particular to sufficient degree