VERIFICATION / CERTIFICATION REPORT

"SUQIAN KAIDI BIOMASS CO-GENERATION PROJECT" IN CHINA

(UNFCCC Registration Ref. No. 3068)

Monitoring Period:
11 January 2011 to 31 December 2011

REPORT NO. 2012-9602
REVISION NO. 01

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VERIFICATION / CERTIFICATION REPORT

Date of first issue: 11 December 2012	Project No.: PRJC-314603-2011-CCS-CHN
Approved by: Ole A. Flagstad	Organisational unit: DNV KEMA Energy & Sustainability Accredited Climate Change Services
Client: Wuhan Kaidi Holding Investment Co., Ltd	Client ref.: Mr. Xue Fei

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Summary:

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions reported for the "Suqian Kaidi Biomass Co-generation Project" in China (UNFCCC Registration Ref. No. 3068 for the period 11 January 2011 to 31 December 2011.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (version 2.0) of 27 July 2012 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology ACM0006 (version 09) and ACM0002 (version 10), and the monitoring plan contained in the revised Project Design Document (version 05 of 27 July 2012).

DNV Climate Change Services AS is able to certify that the emission reductions from the "Suqian Kaidi Biomass Co-generation Project" in China during the period 11 January 2011 to 31 December 2011 amount to 138 686 tonnes of CO_2 equivalent.

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Report title: "Suqian Kaidi Biomass Co-generation Project" in China		**Indexing terms** Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism Service Area Verification Market Sector Energy Industry
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Abbreviations

CAR	Corrective Action Request
CFB	Circulating Fluidized Bed
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DOE	Designated Operational Entity
ECPG	East China Power Grid
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
NCV	Net Calorific Value
PDD	Project Design Document
PS	Clean Development Mechanism Project Standard
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard

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 CDM project activity 3068 "Suqian Kaidi Biomass Co-generation Project" in China (the project) in the period 11 January 2011 to 31 December 2011. Wuhan Kaidi Holding Investment Co., Ltd was authorised by the project participant Suqian Kaidi Green Energy Development Co., Ltd to contract DNV for the verification /33/. 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 "Suqian Kaidi Biomass Co-generation Project" for the period 11 January 2011 to 31 December 2011.

1.2 Scope

The scope of the verification is to verify that:

- The project activity has been implemented and operated in accordance with the registered PDD or any approved revised PDD;
- The monitoring plan complies with the monitoring methodology and the actual monitoring complies with the monitoring plan, including compliance with any guidance provided by the Board regarding deviations from the provisions of a registered plan and/or methodology;
- The data and calculation of GHG emission reductions have been assessed to correctly support the emission reductions being claimed.

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), Switzerland and the United Kingdom of Great Britain and Northern Ireland (other Party)
Title of project activity:	Suqian Kaidi Biomass Co-generation Project
UNFCCC registration No:	3068
Baseline and monitoring methodology	ACM0006 (version 09) and ACM0002 (version 10)

Project Participants:	Suqian 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:	Suqian City, Jiangsu Province, China
Project's crediting period:	11 January 2011 to 10 January 2018 (Renewable)
Period verified in this verification:	11 January 2011 to 31 December 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 09) /44/ and ACM0002 (version 10) /45/ for the baseline scenario 2.

According to the revised PDD (version 05 dated 27 July 2012) /36/, the project will not claim GHG emission reductions from displacing the heat that would otherwise be produced within Wanzai 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* and will not be updated during the first crediting period. Since the baseline scenario 2 was applied for the project activity in the PDD, EG_y corresponds 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 residues ($BF_{PJ,k,y}$) that would not be used in absence of the project activity, with the net calorific 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 ($EF_{km,CO2,y}$).

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

(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" /46/.

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

(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 ($\mathrm{FE_{EL,j,y}}$) and a factor to account for transmission losses ($\mathrm{TDL_{j,y}}$) according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /47/.

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

(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 calorific 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 09), 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:

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

According to the PDD, the leakage from the project activity is zero in the ex-ante estimation of emission reduction calculation, as the surplus of biomass residues is far greater than the quantity of residues used by the project activity. The real situation of leakage will be monitored once the project owner begins collecting biomass residues.

2 METHODOLOGY

DNV has assessed and determined that the implementation and operation of the project activity, and the steps taken to report emission reductions comply with the CDM criteria and relevant guidance provided by the Board.

The assessment involved a desk review of relevant documentation as well as an on-site visit(s).

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	Leiroz	Andrea	Brazil					✓	
Sector Expert assisting Technical Reviewer	Liu	Jin Wei	China					✓	✓

Duration of verification

Monitoring report publication:	29 May 2012
Desk review:	30 May 2012 to 27 June 2012
On-site assessment:	28 June 2012
Reporting, calculation checks and QA/QC:	29 June 2012 to 11 December 2012

2.1 Desk review

In addition to the monitoring report /1/ (version 1.0 dated 26 April 2012 and version 2.0 dated 27 July 2012), DNV reviewed:

- The registered PDD for the project activity (version 04 of 31 March 2010) /34/ including the monitoring plan and the corresponding validation report /35/; and the revised PDD (version 05 dated 27 July 2012) /36/, including the monitoring plan and corresponding validation opinion /37/;
- The approved baseline and monitoring methodology ACM0006 (version 09) /44/ and ACM0002 (version 10) /45/ applied by the project;
- Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board /41/-/43/; and
- Other information and references relevant to the project activity /2/-/33/.

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 /19/-/26/;
- 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 /9/-/14/; 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 /16/.

2.2 On-site assessment

On 28 June 2012, DNV performed on-site assessments. During the on-site assessment DNV carried out:

- An assessment of the implementation and operation of the registered project activity is as per the registered PDD for the project activity /34/;
- A review of information flows for generating, aggregating and reporting the monitoring parameters;
- Interviews with relevant personnel to determine whether 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 /24/- /26/;
- A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD and the selected methodology /9/-/14/;
- 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 /16/.

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 Suqian

Kaidi Green Energy Development Co., Ltd, 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 09) /44/ and ACM0002 (version 10) /45/, and the management system were assessed during the site visit.

2.3 Closing out of verification findings

The objective of this phase of the verification was to resolve any issues which needed be clarified prior to DNV's conclusion that i) the project activity has been implemented and operated in accordance with the revised PDD, ii) the monitoring plan complies with the monitoring methodology and the actual monitoring complies with the monitoring plan and iii) the data and calculation of GHG emission reductions are correct.

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

i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;

ii. Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;

iii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;

iv. 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.

The verification identified five CARs and six CLs, and no FAR was raised. The CARs and CLs were satisfactorily addressed by the project participants by among other revising the monitoring (please refer to Appendix A for further details). In addition to the changes made to the monitoring report as a result of the verification findings, the following changes to the monitoring report (version 2.0 dated 27 July 2012) were made compared to the initial version of the monitoring report received for verification (version 1.0 dated 26 April 2012):

- For conservativeness, the total baseline emissions are rounded down and total project emissions are rounded up in the calculation of emission reductions;
- The type/model of flow meter 1# and 2# was updated from LWY-10C to LWY-10 to reflect the monitoring practice.

3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "Suqian Kaidi Biomass Co-generation Project" for the period 11 January 2011 to 31 December 2011.

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

This monitoring period 11 January 2011 to 31 December 2011 is the first verification of the project. No remaining issues were identified from the validation /35/.

3.2 Post registration changes

The post registration changes described in Appendix B were identified by DNV during this verification. These post registration changes were assessed by DNV.

For post registration changes not requiring prior approval by the CDM EB in accordance with Appendix 1 to the CDM Project Standard /42/, the assessment of the changes (in the form of a duly completed "Post-registration changes request form" (F-CDM-PRC) and DNV's assessment opinion on the changes) /37/ is submitted together with the revised PDD (version 05 of 27 July 2012) /36/ for acceptance by the CDM EB as part of the request for issuance for this monitoring period.

The assessment of compliance with the project description and the monitoring plan contained in the PDD, as described in the following sections, is based on the revised PDD (version 05 of 27 July 2012).

3.3 Project implementation

The project is a biomass cogeneration plant, located in Suqian Economic Development Area, Suqian City, Jiangsu Province of China. The electricity generated is delivered to the East China Power Grid (ECPG) and the heat generated is proposed to be supplied to the plants in the Suqian Economic Development District. The project activity was registered as CDM project on 11 January 2011, which is later than the estimated starting date of the crediting period of 1 January 2011 as stated in the revised PDD. Hence, 11 January 2011 was identified as the starting date of crediting period, and the selected monitoring period 11 January 2011 to 31 December 2011 is within the first crediting period of 11 January 2011 to 10 January 2018.

DNV has verified that the cogeneration plant included the installation of two sets of 65 t/h circulating fluidized 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 revised PDD /36/. The project activity started to operate on 23 August 2009 /18/. After the commissioning, the test and joint inspection report for the project has been accepted by project Acceptance and Assessment Committee /4/, which proved that the project is constructed as planned and was able to satisfy the requirements of operation and implementation. 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 /3/.

In the registered PDD /34/, the generator's manufacturer was "Nanjing Steam Turbine (Group) Co.,". However, by checking the nameplate and generator supply contract during the site visit,

DNV found the manufacturer of the generator was “Nanjing Steam Turbine (Group) Co., Ltd”. The typo error on the generator has been corrected in the revised PDD to be “Nanjing Steam Turbine (Group) Co., Ltd”, which also was included as part of a post registration change requested.

All the steam turbine and generator, other facilities and equipment as described in the registered PDD have been installed. The details of boilers, steam turbine and generator with respect to their number, type and model of the machines have been verified /27/-/29/ /34/ during the on-site visit. As stated in the registered PDD /34/, 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 registered PDD that under conditions where there is no steam extraction the steam turbines can theoretically generate at 2×15 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.

In the registered PDD, the heat generated by the project activity will be supplied to the plants in Suqian Economic Development District to meet the process demand. 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 because the heat supply contract is still under the negotiation between the project owner and the heat users /5/. Therefore, DNV confirmed that there was not heat export by the project activity in this monitoring period.

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, oil seed rape straw, maize straw”. However, by checking the daily operating log /18/ during the site visit, DNV was able to confirm that besides the rice husk, rice straw, wheat straw and maize straw as mentioned in the registered PDD, the additional types of biomass residues were utilized by the project activity including peanut shell and bark. Thus, the biomass residues utilized for the project are rice husk, rice straw, wheat straw, maize straw, peanut shell and bark. The changes are considered to be permanent. As of this, a post registration change has been requested. The post registration change on correcting the types of biomass residues applied in the proposed project has been assessed by DNV based on the relevant evidences /8/ /21/ /30/ /31/ and the change has been reflected in the revised PDD (version 05 of 27 July 2012) /36/.

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 /18/, there were 6 times and 14 times unplanned shutdowns for maintenance on 1# and 2# unit in this monitoring period, respectively, and one planned shutdown for maintenance for 2# unit. No retrofit/modification was found for the project activity by checking the plant operation log /18/ and interviewing with the manager and operator /48/. DNV confirmed that 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 /15/ and their implementation was confirmed by interview with the key operators and observing the operation /48/.

DNV has verified that the project is fully implemented according to the description in the revised PDD (version 05 of 27 July 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.

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

As stated in the above section, a post registration change has been requested for the change of biomass compared with the registered PDD /34/. The quantity and nature of each biomass residue used in the *ex-ante* calculation of emission reductions are changed as follows due to the change of biomass used:

Biomass type	Registered PDD			Revised PDD		
	Quantity (tons/dry basis)	Moisture content (%)	NCV (GJ/ton)	Quantity (tons/dry basis)	Moisture content (%)	NCV (GJ/ton)
Rick husk	82 626	6	12.964	51 894	13.51	13.35
Rice straw	71 590	18.4	11.883	10 219	27.01	12.88
Wheat straw		18.6	14.317	31 586	12.26	14.48
Oil seed rape straw		25.4	15.187	-	-	-
Maize straw		26.8	14.240	30 348	32.56	11.86
Peanut shell	-	-	-	11.431	18.35	13.73
Bark	-	-	-	33 834	43.61	10.20

Based on the same total energy consumed by the boilers, the estimated annual emission reductions of the project are thus changed from 101 084 tCO_2 to 99 149 tCO_2 as stated in the assessment opinion on the changes which is submitted together with the revised PDD (version 05 of 27 July 2012) /36/.

The emission reductions in this monitoring period are 138 686 tCO_2e in the period from 11 January 2011 to 31 December 2011 (i.e. 355 days). The annually expected emission reductions according to the revised PDD is 99 149 tCO_2e, which corresponds to the emission reductions of 96 433 tCO_2e for this monitoring period (i.e. 355 days). Hence, the reported emission reductions are 43.82% higher than the estimation in the revised PDD.

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

Items	Actual value in this monitoring period	Estimated value in the revised PDD for this monitoring period
Emission reductions (tCO_2e**)**	138 686	96 433
Baseline emissions (tCO_2e**)**	151 489	116 359
Displacement of electricity (tCO_2e)	141 732.68	109 543
Natural decay of anthropogenic sources of biomass residue (tCO_2e)	9 757.08	6 816
Project emissions (tCO_2e)	12 803	19 926
Emissions from transportation of biomass (tCO_2e)	7 347.71	16 289
Emissions from on-site consumption of fossil fuel (tCO_2e)	840.97	231
Emissions from consumption of electricity (tCO_2e)	2 236.13	1 608
Emissions from combustion of biomass (tCO_2e)	2 377.25	1 799

DNV could assess that the main reasons for high emission reductions in this monitoring period are due to the high baseline emissions from displacement of electricity and the low project emissions are observed in this monitoring period. The high baseline emissions from displacement of electricity are because of more electricity supplied in this monitoring period. The reported electricity supplied in this monitoring period is 159 465.21 MWh, which is 29.39% higher than the estimated value of 123 248.22 MWh in the revised PDD for this monitoring period (126 720 MWh on yearly basis). This is because no steam was extracted from steam turbines as heat export in this monitoring period and all steam generated from steam turbines was used for electricity generation. As stated in Section 3.3 above, the generators of the project were sized at 2×15 MW and to allow for possible peak generation and to avoid damage to the generation unit by sudden load change in abnormal situations. Hence, the generators have the capacity to generate at 2×15 MW. Further, as stated in the revised PDD, for the scenario where no heat was generated and the project generated at 2×15 MW, the project activity still is additional due to the financial unattractiveness (with project IRR of 5.06%). In such scenario, by the sensitivity analysis, the project activity will reach the benchmark of 8% when the power supply increases by 14%. However, the electricity supply in this monitoring period was only 3.51% ((159 465.21 MWh / 355 days * 365 days - 158 400 MWh) / 158 400 MWh, 158 400 MWh was the net electricity supply based on the generation capacity of 2×15 MW without heat supply) higher than the electricity quantity based on the generation capacity at 2×15 MW. Further, besides the generation capacity, other main parameters affecting the project financial character between these two scenarios are the biomass consumption and price. Compared to the estimated biomass consumption and price (185 700 t and 240 RMB/t, respectively) under the scenario of generation capacity at 2×15 MW, the actual values both are higher (358 255 t and actual prices are higher than 240 RMB/t for each type of biomass). Therefore, it is conservative to use the estimated biomass consumption and price in the financial assessment. In conclusion, the electricity supply 159

465.21 MWh in this monitoring period did not affect the project's additionality.

The low project emissions are mainly due to the low emissions from biomass transportation. As stated in Section 3.7.2, in both ex-ante and ex-post calculation of emissions from biomass transportation, the IPCC default value was used as the CO_2 emission factor from fuel used for transportation and 200 km was used as the average round trip distance between the biomass fuel supply sites and the project site. Hence, the less actual number of truck trips and higher average load of trucks are the reason. The biomass residues transported (358 255 tonne on wet weight in 355 days, and 33 490 trips) are higher than the expected quantity in the PDD (229 000 tonne yearly basis and corresponds to 198 472 tonne in 355 days, and 76 333 trips on yearly basis and corresponds to 74 242 trips). As stated in the revised PDD, the average diesel consumption for trucks with load around 10 t will be about 20 liter/100km in China and the corresponding emission factor is 0.00054 tCO_2e/km. Therefore, the used $EF_{km,CO2,y}$ of 0.001097 tCO_2e/km is conservative when the trucks with average load is 10.7 t (358 255 t / 33 490 trips). DNV considers the low emissions from biomass transportation are reasonable to reflect the operation practice.

Hence, DNV was able to confirm that the emission reductions claimed during this monitoring period 11 January 2011 to 31 December 2011 was reasonable.

3.5 Compliance of monitoring plan with monitoring methodology

DNV is able to confirm that the monitoring plan contained in the revised PDD (version 05 of 27 July 2012) /36/ is in accordance with the approved methodology applied by the project activity, i.e. ACM0006 (version 09) /44/.

3.6 Compliance of monitoring with the monitoring plan

The monitoring has been carried out in accordance with the monitoring plan contained in the revised PDD (version 05 of 27 July 2012) /36/.

The below section describe for each parameter, which is to be measured according to the monitoring plan and how DNV has verified that i) the actual monitoring complies with the monitoring plan and that ii) data have been assessed to correctly support the emission reductions being claimed.

3.6.1 Factor and datum determined ex-ante

All reported factors determined *ex-ante* by the monitoring methodology ACM0006 (version 09) /44/ and indicated in the revised PDD (version 05 of 27 July 2012) /36/ 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 /36/ /40/.

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" /36/ /47/.

c. Baseline emission factor of ECPG (EF_y)

As per the revised PDD /34/, the *ex-ante* determined emission factor 0.8888 tCO_2/MWh for the ECPG 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, the IPCC default value of 30 kgCH_4/TJ /40/ 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 09) /44/, 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/tonne is used, the uncertainty is deemed greater than 100%, resulting in a conservativeness factor of 0.73. Hence, an emission factor of 0.001971tCH_4/tonne is used for the emission reduction calculation.

3.6.2 Factors 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 Test 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, and verified by DNV against the testing reports /8/.

Biomass type	NCV tested in December 2010 (MJ/kg)	NCV tested in June 2011 (MJ/kg)
Rice husk	13.63	13.07
Rice straw	13.25	12.50
Wheat straw	14.20	14.76
Peanut straw	14.27	13.19
Maize straw	11.51	12.21
Bark	10.12	10.27

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

The project participants chose to apply 200 km as the average round trip distance between the biomass fuel supply sites and the project site, which is conservative and also is in line with the requirement of revised PDD. DNV confirmed that the reported AVD_y (200 km) in this monitoring period is reasonable and conservative.

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 /18/ and aggregated into monthly reports /19/. 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 from revised IPCC 1996 /39/ was applied for the average CO_2 emission factor of the diesel trucks in the revised PDD /36/. DNV has

checked the updated IPCC 2006 /40/ 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 revised PDD /36/ and the methodology /44/, 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 /38/ 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 /36/, the IPCC default value 74 100 $kgCO_2e/TJ$ /40/ 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. According to the methodology /44/, 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" /46/, 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 $kgCO_2e/TJ$ /39/ 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 $kgCO_2e/TJ$ /40/ 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 /30/, 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 /30/ for the biomass supply and demand in Suqian City where the project located. The investigation of the biomass residues utilized shows that the quantity of available residues of the above mentioned biomass types in 70 km away from the project plant are all more than 25% larger than the quantity of available biomass. In the registered PDD /34/, it stated "the geographical boundary in the biomass availability report is covering a radius of 100 km around the project site". As the boundary with the radius of 70 km around the project site has proved that the surplus quantity of biomass is available for the project, the boundary with radius of 100 km around the project site has the same conclusion, i.e. the project will not influence the present biomass utilisation and it will not create any leakage. This is in compliance with ACM0006 (version 09) /44/. The detail data is indicated as follows:

Table 1: Biomass resources in 70 km radius from the plant in Suqian City

Biomass type	Rice Husk	Rice straw	Wheat straw	Maize straw	Peanut shell	Bark
Total biomass generation in the region (10kt)	49.68	170.91	161.44	61.76	7.45	70
Biomass loss (10kt)	4.97	25.64	24.22	9.26	1.12	7

Available biomass in the region (10kt)	44.71	145.27	137.22	52.50	6.33	63.00
Biomass utilised in traditional method (10kt)	6.71	21.79	20.58	0.95	7.87	9.45
Biomass utilised other power plants (10kt)	7.20	16.05	13.86	0.00	0.00	7.40
Biomass utilised by the project (10kt)	4.05	0.96	1.23	0.89	15.21	13.48
Total biomass utilised, including the project (10kt)	17.96	38.80	35.67	1.84	23.08	30.33
Available biomass/Total biomass utilised	249%	374%	385%	344%	227%	208%

Except the biomass utilised by the project, other values are sourced from the assessment report of biomass residues in Suqian City the project located issued by the FSR designer; the biomass utilised by the project are from the actual consumption within this monitoring period.

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

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of PDD):	Net quantity of increased 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 monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Gate meter 1# /10/ Type/Model: DSSD135 SN: 827411 Accuracy: 0.2S Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 20 October 2010 and 4 September 2011 Calibration validity: 3 September 2012 Gate meter 2# /10/ Type/Model: DSSD135 SN: 827410 Accuracy: 0.2S Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 27 September 2010 and 9 August 2011 Calibration validity: 8 August 2012 In the revised PDD /36/, it stated "The accuracy of all the meters will not be lower than 0.5%". The gate

	meters have higher accuracy level 0.2S (0.2%) than the value stipulated in the revised PDD.
Calibration frequency /interval:	Annually
Is the calibration interval in line with the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The revised PDD specified that "the calibration frequency is once a year". The calibration frequency of the electricity meters is annual /10/, which meets the requirement from the revised PDD.
Company performing the calibration:	Suqian City Measurement and Test Bureau for gate meters.
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 gate meters can cover the whole monitoring period 11 January 2011 to 31 December 2011.
If applicable, has the reported data been cross-checked with other available data?	Yes. The monthly electricity export and import /20/ was cross-checked with the monthly electricity sales receipt /25/. The meter reading was recorded at the last day monthly jointly by the project owner and power company, which will be the basis for the sales receipt. Since this monitoring period started from 11 January 2011, and the sales receipt was on the monthly basis, the power company issued the notification /24/ to cross-check the reported values for the period 11 January 2011 to 31 January 2011. DNV considered that is reasonable.
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. The amount of net electricity generated is determined by monitoring meter on the hourly and daily basis when the power plant is operating, and these daily readings /20/ are aggregated into monthly reports /19/. DNV has verified these values to be consistent with the information used in the ER spreadsheet /2/.
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 /16/, 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 applicable.

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?	

	Assessment/ Observation
Data / Parameter: (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 revised PDD /36/ and methodology /44/. The electricity consumed by the project operation itself has been included as the self-consumption in the net quantity of electricity exported by the project. 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. 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 methodology, the reporting frequency (monthly) for this parameter did reflect to the monitoring practise. In the revised PDD, it stated "aggregated at least annually". Monthly report for electricity consumed on site was issued as the aggregated records, which was more frequent than the stipulation in the revised PDD. DNV considers that is reasonable.
Type of monitoring equipment:	Electricity meters
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Meter 1# for biomass /10/ Type/Model: DSSD1008 SN: 30001002 Accuracy: 0.5S Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 3 January 2011 Calibration validity: 2 January 2012 Meter 2# for biomass /10/ (put into use in October 2011, and detail refers to information below)

	Type/Model: DSSD1008 SN: 30001004 Accuracy: 0.5S Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 31 January 2012 Calibration validity: 30 January 2013 In the revised PDD /36/, for the electricity consumed on site it stated "The accuracy of the meter will not be lower than 0.5%". The accuracy of meter for biomass 0.5S (i.e. 0.5%) is consistent with that.
Calibration frequency /interval:	Annually
Is the calibration interval in line with the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Yes. The revised PDD specified that "the calibration frequency is once a year". The calibration frequency of the electricity meters is annual /10/, which meets the requirement from the revised PDD.
Company performing the calibration:	Suqian City Measurement and Test Bureau
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is (are) calibration(s) valid for the whole reporting period?	The calibration of meter 1# for biomass can cover the whole monitoring period 11 January 2011 to 31 December 2011; however, the calibration of meter 2# for biomass cannot cover the whole monitoring period. The meter 2# for biomass was only put into operation in October 2011, which can be confirmed by the daily operation and maintenance record /18/. As stated below, from the conservative consideration, the higher on-site electricity consumption from the chippers by calculation based on the weight of straws and bark smashed in tonnes and the electricity consumption factor was used in the calculation of project emissions. Hence, the monitoring readings from the meter 1# and 2# for biomass were not used in the calculation of project emissions due to the on-site electricity consumption. Therefore, DNV considers that the invalid calibration for meter 2# for biomass did not affect the accuracy and conservativeness of emission reduction calculation, and is acceptable.
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 revised 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 that there were two chippers used for straw and bark (except rice husk and peanut

	shell). By checking the nameplate and technical specification of chippers /32/, DNV confirmed that the chippers have the power rate 224.546 kW and production efficiency 33 tonne/h. Hence, the electricity consumption factors for these chippers are 6.8044 kWh/tonne. Considering the consumption quantity of straw and bark 308 122 tonne in this monitoring period /19/, the on-site electricity consumption was calculated as 2 096.59 MWh. Since the measurement results from the meter was 253.95 MWh /20/, as the conservative principle, the higher on-site electricity consumption 2 096.59 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 /19/ /20/.
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 /16/, 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: (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 in accordance with the monitoring plan /36/ and monitoring methodology /44/. 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. In the revised PDD, it stated "energy balance will be prepared annually". The energy balance has been prepared and verified for this monitoring period /2/, which reflected to the annual frequency.
Type of monitoring equipment:	Belt weigher
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Belt weigher 1# /12/ Type/Model: ICS-ST4-1000 SN: 0903112 Accuracy: 0.5% Calibration frequency: once per half year Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 4 November 2010, 4 May 2011 and 3 November 2011 Calibration validity: 2 May 2012 Belt weigher 2# /12/ Type/Model: ICS-ST4-1000 SN: 0903113 Accuracy: 0.5% Calibration frequency: once per half year Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 4 November 2010, 4 May 2011 and 3 November 2011 Calibration validity: 2 May 2012 In the revised PDD /36/, it stated "The accuracy of the belt weigher will not be lower than 1%". The actual accuracy of the belt weigher 0.5% is higher than the stipulated, which is reasonable by DNV.
Calibration frequency /interval:	Once per half year
Is the calibration interval in line with the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The PDD specified that "the calibration frequency is once a year". The calibration frequency of the belt weigher is once per half year /10/, which is more frequent than the requirement of the PDD. DNV considers that calibration frequency of once per half year is reasonable.
Company performing the calibration:	Suqian City Measurement and Test Bureau /11/
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 11 January 2011 to 31 December 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 /2/, which was based on purchased quantities and stock changes. The conclusion from the energy balance reflected to the reasonable energy input and output.
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 /21/ and the monthly reports /19/ 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 /21/. The measured values were adjusted to the quantity of dry biomass by the moisture content in order to determine the emission reduction calculations.
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 /16/, 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: (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 monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Balance 1# /13/ Type/Model: JA5003 SN: SHP07033 51102 Accuracy: ±0.1 mg Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 18 November 2010 and 18

	November 2011 Calibration validity: 17 November 2012 Balance 2# /13/ Type/Model: JA5003 SN: SHP07033 54274 Accuracy: ±0.1 mg Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 18 November 2010 and 18 November 2011 Calibration validity: 17 November 2012 Dry cabinet 1# /13/ Type/Model: G2X-9076MBE SN: C00 Accuracy: ±1℃ Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 18 November 2010 and 18 November 2011 Calibration validity: 17 November 2012 Dry cabinet 2# /13/ Type/Model: SD101-2 SN: 30873 Accuracy: ±1℃ Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 18 November 2010 and 18 November 2011 Calibration validity: 17 November 2012 There is not specific requirement for the accuracy level of the balance and dry cabinets in the revised PDD /35/. The accuracy of the balance and dry cabinet meet requirement of the monitoring methodology /44/, and also present good monitoring practice in China.
Calibration frequency /interval:	Annually
Is the calibration interval in line with the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The revised PDD /36/ specified that “the calibration frequency is once a year”. The calibration frequency of the balances and dry cabinets is annual /13/, which meets the requirement from the revised PDD.
Company performing the calibration:	Suqian City Measurement and Test Bureau /11/
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 11 January 2011 to 31 December 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 /21/ and aggregated into monthly reports /19/.
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 /16/, 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: (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 in accordance with the monitoring plan /36/ and monitoring methodology /44/. 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 monitoring plan? If the monitoring plan does not specify the accuracy of the	Flow meter 1# /14/ Type/Model: LWY-10 SN: 11758

monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Accuracy: 1% Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 10 January 2011 Calibration validity: 9 January 2012 Flow meter 2# /14/ Type/Model: LWY-10 SN: 11744 Accuracy: 1% Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 10 January 2011 Calibration validity: 9 January 2012 Flow meter 3# /14/ Type/Model: LWY-10C SN: 08069 Accuracy: 1% Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 10 January 2011 Calibration validity: 9 January 2012 Flow meter 4# /14/ Type/Model: LWY-10C SN: 08083 Accuracy: 1% Calibration frequency: annual Calibration entity: Suqian City Measurement and Test Bureau Calibration date: 10 January 2011 Calibration validity: 9 January 2012 In the revised PDD /36/, it stated "The accuracy of the flow meter will not be lower than 1%". The actual accuracy of the flow meters 1% is the same as stipulated in the revised PDD.
Calibration frequency /interval:	Annually
Is the calibration interval in line with the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The PDD specified that "the calibration frequency is once a year". The calibration frequency of the flow meters is annual /14/, which meets the requirement from the PDD.
Company performing the calibration:	Suqian City Measurement and Test Bureau
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is (are) calibration(s) valid for the whole	Yes. The calibrations for the volume flow meters

reporting period?	can cover the whole monitoring period 11 January 2011 to 31 December 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 /26/ 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 /22/ and aggregated into monthly reports /19/. The consumption of diesel was monitored in volume and converted to the mass using the standard density of diesel (0.85 kg/liter) as per the revised PDD to calculate the project emissions from the diesel consumption.
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 /16/, 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: (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 in accordance with the monitoring plan /36/ and monitoring methodology /44/. 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 monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	The consumption of diesel was monitored by using diesel purchase and consumption log book.
Calibration frequency /interval:	Not applicable
Is the calibration interval in line with the monitoring plan? If the monitoring plan 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 and stock change /26/.
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 /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 /16/, 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.

3.6.3 Energy balance

According to the methodology ACM0006 (version 09) /44/, 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 20.87% /2/. Based on the relevant design information from the suppliers and equipment purchase agreement of boiler, generator and turbine /27/-/29/, 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 about 27% in theory for the set of boiler-turbine-generator. Considering the deviation between the actual operation and theoretical design value, 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.

3.7 Assessment of data and calculation of emission reductions

DNV confirms that appropriate methods and formulae for calculating baseline emissions, project emissions and leakage have been applied for this project activity.

3.7.1 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 ECPG without the project activity:

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

The emission factor of the ECPG is determined *ex-ante* as 0.8888 tCO_2/MWh for the first crediting period. The net electricity delivered to the grid is 159 465.21 MWh /19/, which results in the baseline emission reductions 141 732.68 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 /36/ and the methodology /44/, 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 235 729.44 tonnes (dry matter), which results in the baseline emission reductions 9 757.08 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 rounded down to 151 489 tCO_2e as conservative.

3.7.2 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 /39/. The project participants chose to apply 200 km as the average round trip distance between the biomass fuel supply sites and the project site, which is conservative and also is in line with the requirement of revised PDD /36/. The number of truck trips for the transportation of biomass residues was accounted as 33 490 in this monitoring period. Hence, the project emissions were calculated as 7 347.71 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" /46/:

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

The consumption of diesel was monitored in volume and converted to mass using the standard density of diesel (0.85 kg/liter) as per the revised PDD. The diesel combusted in the project plant (11.07 tonnes), and diesel combusted at the collection sites and project site for other purposes that are attributable to the project activity (252.53 tonnes) /22/ /23/ are both considered in the calculation. As stated in section 3.6.2 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 /40/, and the net calorific value of diesel refers to latest reliable national data of China Energy Statistical Yearbook as 0.042652 TJ/t /38/. Hence, the project emissions were calculated as 840.97 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" /47/:

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

Since the electricity consumption is purchased from the grid only, the Scenario A mentioned is applicable to the proposed project /34/. The power grid emission factor 0.8888 tCO_2/MWh is applied, and 20% was chosen as the default value of $TDL_{j,y}$ 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 2 096.59 MWh as stated in the above section 3.6.2, which resulted in the project emissions as 2 236.13 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 09) /44/, 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 /19/ and NCV for each type of biomass residues /8/ used in the project were applied. The project emissions due to methane emissions from combustion of biomass residues were calculated to be 2 377.25 tCO_2e.

Therefore, the total project emissions occurred in this monitoring period are calculated and rounded up to 12 803 tCO_2e as conservative /2/.

3.7.3 Leakage

As stated in section 3.6.2, 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.

3.7.4 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 3.7.1 to 3.7.3, the following information has been achieved:

$BE_y = ER_{electricity,y} + BE_{biomass,y}$ = 151 489 tCO_2e

PE_y = 12 803 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 138 686 tCO_2e.

The emission reduction calculations have been based on actual monitored data of the plant, from 11 January 2011 to 31 December 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 138 686 tCO_2e during chosen monitoring period 11 January 2011 to 31 December 2011 (355 days) are higher than the *ex-ante* emission reductions estimated 96 433 tCO_2e (355 days) in the revised PDD (99 149 tCO_2e estimated in

yearly basis in the revised PDD) /36/. The detail assessment on the highest emission reductions in this monitoring period has been addressed in section 3.4. DNV was able to confirm that the emission reductions claimed during this monitoring period 11 January 2011 to 31 December 2011 were reasonable.

3.8 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.

3.9 Management system and quality assurance

Suqian 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 /16/, 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 /16/.

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 /15/ 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 CDM project activity 3068"Suqian Kaidi Biomass Co-generation Project" in China for the period 11 January 2011 to 31 December 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 activity.

It is DNV's responsibility to express an independent verification statement on the reported GHG emission reductions from the project activity. 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 baseline and monitoring methodology ACM0006 (version 09) and ACM0002 (version 10), the monitoring plan contained in the revised PDD (version 05 of 27 July 2012) and the monitoring report (version 2.0) dated 27 July 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 reported for the project activity for the period 11 January 2011 to 31 December 2011 are fairly stated in the monitoring report (version 2.0) dated 27 July 2012.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology ACM0006 (version 09) and ACM0002 (version 10), and the monitoring plan contained in the revised PDD (version 05 of 27 July 2012).

DNV Climate Change Services AS is able to certify that the emission reductions from the CDM project activity 3068 "Suqian Kaidi Biomass Co-generation Project" in China during the period 11 January 2011 to 31 December 2011 amount to 138 686 tonnes of CO_2 equivalent.

Beijing and Oslo, 11 December 2012

Lin Wu
CDM Verifier
DNV Beijing, China

Ole A. Flagstad
Approver
DNV Climate Change Services AS

5 REFERENCES

5.1.1 Documentation provided by the project participants

/1/ Suqian Kaidi Green Energy Development Co., Ltd: Monitoring Report of Suqian Kaidi Biomass Co-generation Project for the period 11 January 2011 to 31 December 2011, version 1.0 of 26 April 2012 and version 2.0 of 27 July 2012.

/2/ Suqian Kaidi Green Energy Development Co., Ltd: ER calculation spreadsheet, version 1.0 of 26 April 2012 and version 2.0 of 27 July 2012.

/3/ Suqian City Environmental Protection Bureau: Check and acceptance on project environmental protection, dated 2 November 2010.

/4/ Acceptance and Assessment Committee (including project owner, construction unit, supervision company, design company and commission ing company): Acceptance report for 1# unit on 23 August 2009and acceptance report for 2# unit on 7 March 2010.

/5/ Suqian Economic Development District: Statement of heat supply from Suqian Kaidi Biomass Co-generation Project, 1 July 2012.

/6/ Suqian Economic Development District: Notification of heat supply within Suqian economic development district, 1 July 2012.

/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 (still valid when the last test was conducted on 9 June 2011).

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

- Testing reports for rice husk, rice straw, wheat straw, maize straw, peanut shell and bark, dated 10 December 2010;
- Testing reports for rice husk, rice straw, wheat straw, maize straw, peanut shell and bark, dated 9 June 2011.

/9/ Jiangsu Province Quality and Technical Bureau: Laboratory accreditation certificate for Suqian City Measurement and Test Bureau, dated 15 December 2006 and valid up to 14 December 2011.

/10/ Suqian City Measurement and Test Bureau: Calibration reports of electricity meters

- Gate meter 1# (SN: 827410), issued on 27 September 2010 and valid up to 26 September 2011, issued on 9 August 2011 and valid up to 8 August 2012;
- Gate meter 2# (SN: 827411), issued on 20 October 2010 and valid up to 19 October 2011, issued on 4 September 2011 and valid up to 3 September 2012;
- Meter 1 for biomass (SN: 30001002), issued on 3 January 2011 and valid up to 2 January 2012;
- Meter 2 for biomass (SN: 30001004), issued on 31 January 2012 and valid up to 30 January 2013.

/11/ China National Accreditation Service for Conformity Assessment: Laboratory accreditation certificate on Changcheng Institute of Metrology & Measurement, dated 25 March 2010 and valid up to 24 March 2013.

/12/ Suqian City Measurement and Test Bureau: Calibration reports of belt balances

- Belt weighter (SN: 0903112), issued on 4 November 2010 and valid up to 3

May 2011, issued on 4 May 2011 and valid up to 3 November 2011, issued on 3 November 2011 and valid up to 2 May 2012;

- Belt weighter (SN: 0903113), issued on 4 November 2010 and valid up to 3 May 2011, issued on 4 May 2011 and valid up to 3 November 2011, issued on 3 November 2011 and valid up to 2 May 2012.

/13/ Suqian City Measurement and Test Bureau: Calibration reports of balances and dry cabinets

- Balance 1# (SN: SHP07033 51102), issued on 18 November 2010 and valid up to 17 November 2011; issued on 18 November 2011 and valid up to 17 November 2012;
- Balance 1# (SN: SHP07033 54274), issued on 18 November 2010 and valid up to 17 November 2011; issued on 18 November 2011 and valid up to 17 November 2012;
- Dry cabinet 1# (SN: C00), issued on 18 November 2010 and valid up to 17 November 2011; issued on 18 November 2011 and valid up to 17 November 2012;
- Dry cabinet 2# (SN: 30873), issued on 18 November 2010 and valid up to 17 November 2011; issued on 18 November 2011 and valid up to 17 November 2012.

/14/ Changcheng Institute of Metrology & Measurement: Calibration reports of volume flow meters

- Flow meter 1# (SN: 11758), issued on 10 January 2011 and valid up to 9 January 2012;
- Flow meter 2# (SN: 11744), issued on 10 January 2011 and valid up to 9 January 2012;
- Flow meter 1# (SN: 08069), issued on 10 January 2011 and valid up to 9 January 2012;
- Flow meter 1# (SN: 08083), issued on 10 January 2011 and valid up to 9 January 2012.

/15/ Suqian Kaidi Green Energy Development Co., Ltd: Training record related to CDM activity, dated 20 October 2010, 2 March 2011 and 27 November 2011.

/16/ Wuhan Kaidi Holding Investment Co., Ltd: CDM monitoring and operating manual, September 2010.

/17/ Suqian Kaidi Green Energy Development Co., Ltd and Jiangsu Province Power Company: Power purchase agreement (PPA), dated 21 May 2009 and valid to 20 May 2014.

/18/ Suqian Kaidi Green Energy Development Co., Ltd: Daily operational and maintenance records for the period January 2011 to December 2011.

/19/ Suqian 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 January 2011 to December 2011.

/20/ Suqian Kaidi Green Energy Development Co., Ltd: Original data record of electricity imported and exported for the period January 2011 to December 2011.

/21/ Suqian Kaidi Green Energy Development Co., Ltd: Daily and monthly report of quantity and moisture of biomass residues for the period January 2011 to December

2011.

/22/ Suqian Kaidi Green Energy Development Co., Ltd: Daily and monthly report of diesel consumption for boiler start-up for the period January 2011 to December 2011.

/23/ Suqian Kaidi Green Energy Development Co., Ltd: Daily and monthly report of diesel consumption on-site for the period January 2011 to December 2011.

/24/ Jiangsu Province Power Company Suqian Power Supply Company: Notification about electricity import in year 2011, 9 December 2011.

/25/ Suqian Kaidi Green Energy Development Co., Ltd: Electricity sale invoice (export) for the period January 2011 to December 2011.

/26/ Jiangsu Suqian Branch of Sinopec: Invoices for diesel, from January 2011 to December 2011.

/27/ Wuhan Kaidi Electric Power Engineering Co., Ltd and Jiangxi Jianglian Energy and Environmental Protection Co., Ltd: Purchase contract of boiler, dated January 2008.

/28/ Wuhan Kaidi Electric Power Engineering Co., Ltd and Nanjing Steam Turbine (Group) Co., Ltd: Purchase contract of turbine, dated November 2007.

/29/ Wuhan Kaidi Electric Power Engineering Co., Ltd and Nanjing Steam Turbine (Group) Co., Ltd: Purchase contract of generator, dated November 2007.

/30/ Wuhan Kaidi Power Engineering Co., Ltd: Investigation report for the biomass supply and demand in Suqian City, dated May 2012.

/31/ Suqian Kaidi Green Energy Development Co., Ltd: Invoice of biomass supply, October 2011.

/32/ Suqian Kaidi Green Energy Development Co., Ltd and Balama Equipment Agency: Nameplate and technical specification of chippers.

/33/ Suqian Kaidi Green Energy Development Co., Ltd: A letter of authority to Wuhan Kaidi Holding Investment Co., Ltd in the CDM development, 16 April 2011.

5.1.2 Other project documents or documents used by DNV to verify the information provided by the project participants

/34/ Camco International Limited: Registered Project Design Document of Suqian Kaidi Biomass Co-generation Project, version 04 of 31 March 2010.

/35/ TUV Rheinland Group: Validation Report, version 03 of 25 October 2010.

/36/ Camco International Limited: Revised Project Design Document of Suqian Kaidi Biomass Co-generation Project, version 05 of 27 July 2012; the revised Project Design Document is submitted together with the assessment of the post registration changes for acceptance by the CDM EB as part of the request for issuance for this monitoring period.

/37/ DNV: Validation opinion for the post registration change, dated 11 December 2012.

/38/ Department of Industry and Transport Statistics of National Statistics Bureau and Energy Bureau of NDRC of China: China Energy Statistical Yearbook 2007 to 2010.

/39/ IPCC: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Energy).

/40/ IPCC: 2006 IPCC guidelines for national greenhouse gas inventories reference manual, 2006.

5.1.3 Methodologies, tools and other guidance by the CDM Executive Board

/41/ CDM Executive Board: Clean Development Mechanism Validation and Verification Standard, version 02.0.

/42/ CDM Executive Board: Clean Development Mechanism Project Standard, version 01.0.

/43/ CDM Executive Board: Clean Development Mechanism Project Cycle Procedure, version 02.0.

/44/ CDM Executive Board: Consolidated methodology electricity generation from biomass residues, ACM0006, version 09.

/45/ CDM Executive Board: Consolidated baseline methodology for grid-connected electricity generation from renewable sources, ACM0002, version 10.

/46/ CDM Executive Board: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, version 2.

/47/ CDM Executive Board: Tool to calculate baseline, project and/or leakage emissions from electricity consumption, version 1.

5.1.4 Persons interviewed during the verification

/48/ Suqian Kaidi Green Energy Development Co., Ltd:
Li Zhongyi, Director of power plant
Lu Jing, Vice director of power plant
Yuan Kesheng, Manager of production
Dong Guoxin, Manager assistance of production

/49/ Wuhan Kaidi Holding Investment Co., Ltd:
Zhu Jianmei, Monitoring project manager
He Li, Monitoring project manager

/50/ Camco International Limited:
Fang Liqiang, Technical manager

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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 D2 of MR, the frequency of measuring, reading and reporting for monitoring parameters ($BF_{k,y}$, moisture content of the biomass residues, AVD_y and N_y) shall be addressed to reflect the monitoring practice.	The frequency of measuring, reading and reporting for monitoring parameters ($BF_{k,y}$, moisture content of the biomass residues, AVD_y and N_y) have been updated, for details see the section D2 of revised MR.	The frequency of measuring, reading and reporting for monitoring parameters have been addressed in the updated MR /1/ and verified by DNV to be in compliance with the applied methodology /44/ and revised PDD /36/. CAR 1 is closed.
CAR 2	In the MR, section A.1, it only described that the purpose of the project activity is to produce 126 720 MWh of electricity per year from burning biomass residues. However, the project scenario is a biomass cogeneration project as stated in the PDD. The project's natural description shall be provided. In the MR, section B.1 it stated the project put into operation since 2 January 2010. However, by checking the operation log in the control room, DNV confirmed that the project started to operate on 23 August 2009 from 1# generator. The correction shall be conducted. In the MR, section E.1, it stated that the CO_2 emission factor for the electricity displaced due to the project activity is 0.8236 tCO_2/MWh. However, such grid emission factor has been ex-ante in the PDD as 0.8888 tCO_2/MWh. The correction shall be conducted.	In the section A.1 of revised MR, the description about the project scenario has been revised, and added the description of supplying heat. The beginning day of operation of the project is from 23 August 2009, it has been corrected in the revised MR. The CO_2 emission factor for the electricity displaced due to the project activity is 0.8888 tCO_2/MWh, it has been corrected in the revised MR.	The corrections have been taken in the updated MR /1/ and verified by DNV to be correct. CAR 2 is closed.
CAR 3	The NCV of maize straw in the test report on 9 June 2011 was 12.21 MJ/kg, while such NCV of maize in the MR was 11.21 GJ/ton. The correction shall be conducted. The 2# meter for on-site electricity	The NCV of maize straw in the test report on 9 June 2011 was 12.21 MJ/kG, it was a typo, and it has been corrected in the revised MR and ER spreadsheet.	The NCV of maize straw has been corrected in the updated MR and verified by DNV to be correct. The calibration frequency requirements for measuring instruments stipulated in the "Clean

	consumption attributable to the project activity was put into operation on 2 October 2011. However, the 2# meter was calibrated on 31 January 2012, which means such calibration can not cover the monitoring period 11 January 2011 to 31 December 2011. The correction shall be conducted.	The on-site electricity consumption for pretreating biomass was calculated conservatively, the amount is far larger than the monitored valve, so it has no influence on $PE_{EC,y.}$	Development Mechanism Validation and Verification Standard" /41/ and "Clean Development Mechanism Project Standard" /42/ has been used to assess the time gap of calibrations of 2# meter, i.e. applying the maximum permissible error of the instrument to the measured values taken during the period, which is conservative and reasonable by DNV. CAR 3 is closed.
CAR 4	In the MR, for the parameter $EG_{project\ plant,y,}$ it stated that "the net electricity equals to electricity supplied to the grid minus electricity purchased from the grid minus electricity purchased from the 10 kV backup power". However, by inspection on-site and interviewing with the project operator, there was not 10 kV backup power for the project activity. The correction shall be conducted.	The project there was not 10KV backline, it has been corrected in the revised MR.	There was not information for 10 kV backup power in the PDD, and by on-site visit, DNV also can confirm no 10 kV backup power was there. Hence, DNV confirmed 10 kV backup power was a typo error in the original MR. The correction has been taken in the updated MR. CAR 4 is closed.
CAR 5	The net electricity equals to electricity supplied to the grid minus electricity purchased from the grid. By checking the operation log and interview with operator, the monthly recording of electricity export and import was appointed at the last day of each month. However, the monitoring period started from 11 January 2011. The recording of electricity export and import shall be reflected to the monitoring practice. Furthermore, the inconsistency was found for monthly electricity export and import when the invoices were used to cross check the recording. The conservative method shall be addressed.	The monitored data of exported electricity is slightly larger than the record provided by local power company, the revised MR used the value from the local power company for conservativeness, the exported electricity is 159 502.168 MWh from 11 January 2011 to 31 December 2011, and it reflected the invoices completely. For imported electricity of January 2011, the MR used the amount of full month for conservativeness.	The electricity export and import on 11 January 2011 has been provided and cross-checked by notification issued by the grid /24/. Conservative principle has been taken in the calculation, which leads to the decrease of emission reductions claimed in the original MR, and the ER spread sheet also has been updated /2/ and verified by DNV to be correct. CAR 5 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, besides rice husk, rice straw, wheat straw and maize straw as mentioned in the PDD, the additional types of biomass residues were utilized by the project activity which included peanut shell and bark. The clarification is sought on such inconsistency.	Additional types of biomass residues including barks and peanut shell were utilized since the end of 2010. The PDD has been revised regarding the change of biomass types, and the validation opinion by DOE indicated that the change has no impact for the additionality, the applicability and the application of the applied methodology..	A revised PDD is requested according to the project design change: The biomass residue utilized has been updated in the revised PDD (version 05 of 27 July 2012) /36/. The assessment of the changes /37/ is submitted together with the revised PDD for acceptance by the CDM EB as part of the request for issuance for this monitoring period. 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, would not change the applicability of ACM0006 (version 09). 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. 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.	It has been added in the revised MR and ER spreadsheet.	DNV has checked the energy balance calculation spread sheet and confirmed the integrated electricity generation efficiency to be 20.87% /2/. Based on the relevant design information from the suppliers and equipment purchase agreement of boiler, generator and

			turbine /27/-/29/, 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 deviation between the actual operation and theoretical design value, DNV considers that the efficiency observed in this monitoring period for the project activity is reasonable. CL 2 is closed.
CL 3	By checking the equipment purchase contracts and on-site inspection, DNV found the following inconsistencies: • 1# generator's manufacturer is Nanjing Steam Turbine (Group) Co., Ltd, which is inconsistent with the manufacturer's name (Nanjing Steam Turbine (Group) Co.,) in the PDD; • 1# turbine's model is C12-4.90/0.981-12, which is inconsistent with the model (C12-4.90/0.981-12/435℃) in the PDD. The clarification is sough on the above inconsistencies.	The generator' manufacture is Nanjing Steam Turbine (Group) Co., Ltd, the generators and steam turbines were manufactured by the same manufacturer. There was a typo without "Ltd" in the manufacturer's name (Nanjing Steam Turbine (Group) Co.,) in the PDD. The turbine' model (C12-4.90/0.981-12/435℃) in PDD was according to the Technical Agreement of turbines at equipment purchase stage, "435℃" indicated the Main steam temperature is 435℃. The turbines' nameplate shows the model is "C12-4.90/0.981-12" without "435℃". Omitting the main steam temperature is the common practice of domestic turbine manufacturers in printing nameplates.	By checking the nameplate and generator supply contract during the site visit, DNV found the manufacturer of the generator was "Nanjing Steam Turbine (Group) Co., Ltd". The typo error on the generator has been corrected in the revised PDD to be "Nanjing Steam Turbine (Group) Co., Ltd". The assessment of the correction is submitted together with the revised PDD for acceptance by the CDM EB as part of the request for issuance for this monitoring period. By checking the technical specification of the turbine /26/, DNV confirmed the inconsistency was due to the different expression of the name, and C12-4.90/0.981-12 and C12-4.90/0.981-12/435℃ are the same for the turbine. CL 3 is closed.
CL 4	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	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 default values at the upper limit of the uncertainty at a 95% confidence interval 74 800 $kgCO_2e/TJ$ /39/ 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

	the project will be reviewed annually on its appropriateness. 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", 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. The clarification was sought if such review has been conducted in the determination of project emissions from fossil fuel consumption.	IPCC Guidelines on National GHG Inventories.	version till now, DNV considers that 74 800 $kgCO_2e/TJ$ /40/ applied for the CO_2 emission factor of the diesel is reasonable. The update has been addressed in the MR /1/ and ER spread sheet /2/. CL 4 is closed.
CL 5	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 on-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	The project installed special meters on site to monitor the electricity consumption mainly for the mechanical treatment of biomass. But as part of internal electricity consumption system, there is not separate invoice of electricity consumption to crosscheck the quantity of electricity consumption. The value of $EC_{PJ,y}$ of Version 2 MR is calculated conservatively according to the method in the registered PDD, the largest conservatively electricity factor of the biomass crusher is 224.546 kW / 33t/h=6.8044 kWh/t, all consumed biomass residues except rice husks and peanut shells is considered to be crashed, and the quantity of crashed biomass is 308 122 t, so the $EC_{PJ,y}$ =308 122t*6.8044 kWh/t /1000=2 096.59 MWh.	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 that there were two chippers used for straw and bark (except rice husk and peanut shell). By checking the nameplate and technical specification of chippers /32/, DNV confirmed that the chippers have the power rate 224.546 kW and production efficiency 33 tonne/h. Hence, the electricity consumption factors for these chippers are 6.8044 kWh/tonne. Considering the consumption

	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 consumption used in the emission reduction calculation.		quantity of straw and bark 308 122 tonne in this monitoring period /19/, the on-site electricity consumption was calculated as 2 096.59 MWh. Since the measurement results from the meter was 253.95 MWh /20/, as the conservative principle, the higher on-site electricity consumption 2 096.59 MWh by calculation based on the electricity consumption factor was used in the calculation of project emissions due to the on-site electricity consumption. CL 5 is closed.
CL 6	In the monitoring period from 11 January 2011 to 31 January 2011 (355 days), 159 835.20 MWh net quantity of increased electricity generated in the project plant was achieved, which is 30% higher than the designed value 123 248 MWh (based on 355 days) in the registered PDD. The assessment shall be addressed on the increase as well as effect on the project's additionality.	The actual emission reduction achieved during current monitoring period is 43.82% higher than the ex-ante estimation in registered CDM-PDD, the main reasons are below: First, the higher net electricity generation contributes 76.18% to the increment of total emission reductions. The actual net electricity generation 159 465.21 MWh during the current monitoring period is 29.39% higher than the ex-ante estimated quantity 123 428.22 (based on 355 days, and is estimated under co-generation scenario). However the project there is no heat generation during this monitoring period due to the delayed construction of heating network and the heat price is still in negotiation. As a result, the project is forced to operate under pure condensing scenario. As described in the PDD, the power capacity of the project is 15MW*2=30MW with a net electricity generation of 158 400 MWh according to the registered PDD. A separate investment analysis, which was carried out for pure	DNV assessed that the main reasons for high emission reductions in this monitoring period are due to the high baseline emissions from displacement of electricity and the low project emissions are observed in this monitoring period. The high baseline emissions from displacement of electricity are because of more electricity supplied in this monitoring period, and the low project emissions are mainly due to the low emissions from biomass transportation. The detail for higher electricity supply and lower emissions from biomass transportation has been validated in section 3.4. DNV was able to confirm that the emission reductions claimed during this monitoring period 11 January 2011 to 31 December 2011 was reasonable. CL 6 is closed.

		condensing scenario or operation with no steam extraction in the registered PDD, indicates the IRR is only 5.06% (much lower than 8% benchmark), and will reach the benchmark if the equivalent operational hours (net electricity generation) increase by 14%. In fact the equivalent operation hours at full load(net electricity generation) during the current monitoring period only increased 3.51%, so the increase of net electricity generation is well within the sensitivity analysis and has no impact on the project' s additionality.	

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
NA	NA	NA

APPENDIX B

POST REGISTRATION CHANGES

Type of post registration change	Description of post registration change*	Is prior approval by CDM EB required**?	In case prior approval by CDM EB is required, when was post registration change approved?
Corrections	In the registered PDD, the generator's manufacturer was "Nanjing Steam Turbine (Group) Co.,". However, by checking the nameplate and generator supply contract during the site visit, DNV found the manufacturer of the generator was "Nanjing Steam Turbine (Group) Co., Ltd". The typo error on the generator has been corrected in the revised PDD to be "Nanjing Steam Turbine (Group) Co., Ltd".	☐ Yes ☒ No	*Not applicable*
Temporary deviations from the registered monitoring plan and/or monitoring methodology	*Not applicable*	☐ Yes ☐ No	*Not applicable*
Permanent changes from the registered monitoring plan or applied methodology	*Not applicable*	☐ Yes ☐ No	*Not applicable*
Changes to the project design of a registered project activity	The change requested to the registered PDD is mainly regarding the biomass residue utilized: It was stated in the registered PDD that "The biomass residues utilized in this proposed project will be mainly rice husk, wheat straw, rice straw, oil seed rape straw, maize straw". However, by checking the daily operating log during the site visit, DNV was able to confirm that besides the rice husk, rice straw, wheat straw and maize straw as mentioned in the PDD, the additional types of biomass residues were utilized by the project activity including peanut shell and bark. Thus, the biomass residues utilized for the project are rice husk, rice straw, wheat straw, maize straw, peanut shell and bark. These post registration changes were assessed by DNV to confirm the change of biomass types does not impact the additionality of the project activity, does not impact the scale of CDM project activity, and does not impact the applicability of ACM0006 (version 09) applied by the project. Therefore, the post registration changes of this project did not require prior approval by the CDM EB in accordance	☐ Yes ☒ No	*Not applicable*

	with Appendix 1 to the CDM Project Standard, the assessment of the changes (in the form of a duly completed "Post-registration changes request form" (F-CDM-PRC) and DNV's assessment opinion on the changes) is submitted together with the revised PDD (version 05 of 27 July 2012) for acceptance by the CDM EB as part of the request for issuance for this monitoring period.		

* For further details refer to the "Post-registration changes request form" (F-CDM-PRC) and DNV's assessment opinion on the changes
** Refer to Appendix 1 to the CDM Project Standard

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APPENDIX C

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 8 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 Baojun holds a Master Degree in Applied Chemistry. Having an overall experience of around 7 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” and “Thermal Energy Generation from Fossil Fuels and Biomass including Thermal Electricity from Solar”.

Andrea Leiroz holds a Bachelor’s Degree in Chemical Engineering, Master Degree in Material Science and Doctor Degree in Mechanical Engineering. She has an overall experience of around thirteen years.

She has experience of around 6 years in validation and verification of numerous CDM projects in DNV, both in Brazil & abroad.

Her qualification, experience in CDM demonstrates her sufficient sectorial competence in Energy Generation from renewable energy sources, Waste handling and disposal and Animal waste management.

Liu Jinwei holds a Master Degree in Thermal-Physics. Prior to joining DNV, he has 3 years of experience in thermal power industry.

He has experience of more than 1 year in validation and verification of CDM projects in DNV. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in “Energy Generation from Renewable Energy Sources” and "Thermal energy generation from fossil fuels and biomass including thermal electricity from solar".

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