



VOLUNTARY CARBON STANDARD 2007.1

VERIFICATION REPORT

15 MW BIOMASS RESIDUE BASED POWER PROJECT AT GHAZIPUR, INDIA

**Monitoring Period: 2009-02-14 to 2010-01-11
(incl. both days)**

Report No: 53601410 - 10/297

Date: 2011-07-05

TÜV NORD CERT GmbH
JI/CDM Certification Program
Langemarckstraße, 20
45141 Essen, Germany
Phone: +49-201-825-3335
Fax: +49-201-825-3290
www.tuev-nord.de
www.global-warming.de

Name of Verification company:	Date of the issue:
TÜV NORD CERT GmbH	2011-07-05
Report Title:	Approved by:
Verification report of report of "15 MW Biomass Residue Based Power Project at Ghazipur, India"	Mr. Rainer Winter
Client:	Project Title:
Sukhbir Agro Energy Ltd.	15 MW Biomass Residue Based Power Project at Ghazipur, India
Summary:	
M/s. Sukhbir Agro Energy Ltd has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project "15 MW Biomass Residue Based Power Project at Ghazipur, India" in Ghazipur district, Uttar Pradesh state, India with regard to the requirements of VCS 2007.1 Standard. The project activity involves operation of a 15 MW biomass based cogeneration system that meets the in-house requirement for steam & electricity and exports the surplus power to the regional grid. Reporting period: From 14-02-2009 to 11-01-2010 In the course of the verification 3 Corrective Action Requests (CARs), 2 Clarification Requests (CLs) were successfully closed. The verification is based on the draft monitoring report, revised monitoring report, the monitoring plan as set out in the validated PD, the validation report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant. As the result of the 1st periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows: Emission reductions 65,347 t CO2 equivalents	

Work carried out by:	Number of pages:
Mr. Ma Paa Puratchikkanal Ms. Manjari Chandra Ms. C Indumathi Mr. R Narendra Kumar	31

Abbreviations

BAU	Business as usual
CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CO₂	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
CP	Certification Program
CL	Clarification Request
DNA	Designated National Authority
EB	CDM Executive Board
EIA	Environmental Impact Assessment
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MR	Monitoring Report
NCV	Net calorific Value
PVVNL	Purvanchal Vidyut Vitran Nigam Limited
QC/QA	Quality control/Quality assurance
SAEL	Sukhbir Agro Energy Limited
TPH	Tonnes per Hour
TPD	Tonnes per Day
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
VCS - PD	VCS - Project Description
VCU	Voluntary Carbon Unit
VVM	Validation and Verification Manual

Table of Contents	Page
1 INTRODUCTION	6
1.1 Objective.....	6
1.2 Scope and Criteria	6
1.3 VCS Project Description.....	7
1.3.1 Project Characteristics	7
1.3.2 Project Location	7
1.3.3 Technical Project Description.....	7
1.3.4 Appointment of team members and technical reviewer.....	10
1.4 Level of Assurance	10
2 METHODOLOGY	11
2.1 Review of Project Documentation	12
2.2 On-Site Assessment	12
2.2.1 Review of Performance Records.....	12
2.2.2 Follow-up Interviews	12
2.2.3 Collection of Measurements.....	13
2.2.4 Observation of established practices and testing of the accuracy of monitoring equipment.....	13
2.3 Determination of the reductions in GHG emissions	15
2.4 Review of additional data from other sources if appropriate	15
2.5 Review of monitoring results and verification of the correct application of monitoring methodologies	16
2.6 Resolution of any material discrepancy	16
3 VERIFICATION FINDINGS	17
3.1 Remaining issues, including any material discrepancy, from previous validation	17
3.2 Project implementation	18
3.3 Completeness of monitoring	19
3.4 Accuracy of emission reduction calculations	23
3.5 Quality of evidence to determine emission reductions	26
3.6 Management and operational system	26
4 VERIFICATION STATEMENT.....	28
5 REFERENCES	29

1 INTRODUCTION

M/s. Sukhbir Agro Energy Ltd has commissioned the TÜV NORD JI/CDM Certification Program to carry out the verification of the project:

“15 MW Biomass Residue Based Power Project at Ghazipur, India”

with regard to the relevant requirements of the Voluntary Carbon Standard 2007.1^{/VCS/}. The verifiers have reviewed the implementation of the monitoring plan (MP) in the registered VCS project for the monitoring period 14-02-2009 to 11-01-2010,

The applied monitoring methodology is ACM0006 “Consolidated methodology for electricity generation from biomass residues” version 6.2.

1.1 Objective

The purpose of this verification, by independent checking of objective evidence, is as follows:

- to verify that the project is implemented as described in the project design document;
- to assess the implementation of the monitoring plan (MP) content in the VCS-PD;
- to assess the project's compliance with other relevant rules, including the host country (India) legislation;
- to confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions (VERs / VCUs) without any double counting; and
- to establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The verification of this project is based on the validated project design document^{/VCS-PD/}, the monitoring report^{/MR/}, emission reduction calculation spread sheet^{/XLS/}, supporting documents made available to the verifier and information collected through performing interviews and during the on-site assessment. Furthermore publicly available information was considered as far as available and required.

The TÜV NORD JI/CDM CP has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

1.3 VCS Project Description

1.3.1 Project Characteristics

Essential data of the project is presented in the following Table 1-1.

Table 1-1: Project Characteristics

Item	Data
Project title	15 MW Biomass Residue Based Power Project at Ghazipur, India
Project owner	SUKHBIR AGRO ENERGY LTD.
Any specific project categories	☐ Mega project ($> 10^6$ t CO _{2eq} / a) ☐ Micro project (< 5000 t CO _{2eq} / a) ☐ AFOLU project ☐ Grouped project ☒ No specific project category
VCS MR dated	Draft: 2010-07-24 Final: 2010-11-24
Applied Methodology	ACM0006 "Consolidated methodology for electricity generation from biomass residues" version 6.2
Project starting date	2009-02-14
Crediting period	☐ Renewable Crediting Period (7 y) ☒ Fixed Crediting Period (10 y)
Start of crediting period	2009-02-14

1.3.2 Project Location

The details of the project location are given in table 1-2:

Table 1-2: Project Location

No.	Project Location
Host Country	India
Region:	Uttar Pradesh
Project location address:	Fatehullahpur Village, Ghazipur District
Latitude:	between 25° 19' and 25° 54' North
Longitude:	between 83° 4' and 83° 58' East

1.3.3 Technical Project Description

SAEL installed a new co-generation plant to generate steam and electricity and export surplus power to the regional grid. The project involves operation of a 70TPH capacity travelling grate boiler and one 15 MW extraction cum condensing turbine to generate steam and electricity. The other accessories include auxiliary installations and systems, including Electrostatic precipitator (ESP), cooling water system, ash handling system, feed water system, raw water system and DM plant and power

evacuation system. The generated power of the 15 MW is exported to the Grid after meeting the captive requirement of about 2MW. The co-generation plant is commissioned within the premises of a 40 TPH milling capacity Rice Mill for paddy processing and a 500 TPD Solvent Extraction Plant.

The project activity has been planned to be fired primarily with rice husk, a byproduct of processed paddy. The set-up generates energy during on-season and off-season as well. During on-season the project is expected to deliver net surplus energy after meeting the captive requirements of about 2MW. In the off-season the captive requirements are estimated to be about 1MW. The net surplus energy would be delivered to the grid as per the PPA agreement with Purvanchal Vidyut Vitran Nigam Limited (PVVNL).

In the baseline, the electricity demand was met through supply from grid and the heat demand was met through 10 TPH rice husk fired boiler.

The project activity is registered under CDM on 2008-01-12 and claims CER thereafter. And it claims pre-registration VCS credit between the date of commissioning and the date of registration in the UNFCCC. The estimated amount of emission reductions over the crediting period is 67,259 tCO_{2e} per year.

The key parameters of the 15 MW capacity extraction cum condensing type turbo generator and 70 TPH Boiler are given in tables 1-3 and 1-4.

The key parameters of the project are given in table 1-3:

Table 1-3a: Technical data of the project

Parameter	Unit	Value
Boiler		
Manufacturer		M/s. ISGEC John Thomson (IJT)
Type		Bi-drum, natural circulation, balanced draft, bottom supported, outdoor water tube type, travelling grate
Steam flow at main steam stop valve outlet (100% BMCR)	TPH	70
Steam pressure at main steam stop valve outlet	Kg/cm ² (g)	67
Steam temperature at main steam stop valve outlet	°C	490±5
Feed water temperature at the economizer inlet	°C	126
Design code for pressure parts		IBR
Turbo-generator		
Supplier		M/s. Qingdao Jieneng Power Station Engineering Co., Ltd (QJPS)
Type		Extraction cum condensing
Rated capacity of the turbine	MW	15 (with 10TPH extraction at 2.5 ata)

Parameter	Unit	Value
Steam conditions at turbine inlet pressure (abs)	Kg/cm ² (g)	64
Temperature of inlet steam	°C	485±5
Condenser operational pressure	ata	0.106
Recommended temperature rise in the cooling tower	°C	9.6
Rating at the generator terminals	MW	15
Electrical generator		One 11kV, 50Hz, 0.8 power factor

Table 1-3b: Parameters confirmed during verification

Parameter	Name	Unit	Value
Rated capacity	Boiler	THP	70
Rated capacity	Generator	MW	15

1.3.4 Appointment of team members and technical reviewer

On the basis of a competence analysis and individual availabilities a verification team was appointed. Furthermore also the personnel for the technical review and the final approval was determined.

The list of involved personnel, the tasks assigned and the qualification status are summarized in the table 1-4 below.

Table 1-4: Involved Personnel

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Scheme competence ³⁾	Technical competence ⁴⁾	Host country Competence	Team Leading competence
☒ Mr. ☐ Ms.	Ma.Pa. Puratchikkanal	TUV India Pvt Ltd, Bangalore	TL	SA	☒	U	☒	☒
☐ Mr. ☒ Ms.	Manjari Chandra	TUV India Pvt Ltd, Bangalore	TM	A	☒		☒	☐
☐ Mr. ☒ Ms.	C. Indumathi	TUV India Pvt Ltd, Bangalore	TM	A	☒	U	☒	☐
☒ Mr. ☐ Ms.	R. Narendra Kumar	TUV India Pvt Ltd, Bangalore	OT ³⁾	T	☐		☒	☐
☒ Mr. ☐ Ms.	Lendzian, Heiner	TN CERT GmbH	TR ³⁾	A	☒	U	☐	☐
☒ Mr. ☐ Ms.	Rainer Winter	TN CERT GmbH	FA	SA	☒	U	☐	☒

¹⁾ TL: Team Leader; TM: Team Member, TR: Technical review; OT: Observer-Team, OR: Observer-TR; FA: Final approval

²⁾ GHG Auditor Status: A: Assessor; E: Expert; SA: Senior Assessor; T: Trainee; TE: Technical Expert

³⁾ No team member

⁴⁾ As per S01-MU03 or S01-VA070 A2 (such as A, B, C.....)

1.4 Level of Assurance

The verification has been planned and organized to achieve a

☒ reasonable level of assurance

☐ limited level of assurance.

2 METHODOLOGY

The verification of the project consisted of the following steps:

- Contract review
- Appointment of team members and technical reviewers
- Publication of the monitoring report
- Desk review of the Monitoring Report^{/MR/} submitted by the client and additional supporting documents.
- Verification planning,
- On-Site assessment,
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,
- Draft verification reporting
- Resolution of corrective actions (if any)
- Final verification reporting
- Technical review
- Final approval of the verification.

The sequence of the verification is given in the table 2.1 below:

Table 2.1: Verification sequence

Topic	Time
Assignment of verification	2010-05-19
On-site visit	2010-10-12
Draft reporting finalised	2010-10-21
Technical review on draft reporting finalised	2010-10-22
Final reporting finalised	2011-01-18
Technical review on final reporting finalised	2011-07-05
Final corrections	2011-07-05

The main verification steps are described below.

2.1 Review of Project Documentation

The VCS PD ^{/PD/} and supporting background documents related to the project design and baseline were reviewed.

Furthermore, the verification team used additional documentation by third parties like host party legislation, technical reports referring to the project design or to the basic conditions and technical data.

The references used in the course of this verification are summarized in section 5.

2.2 On-Site Assessment

2.2.1 Review of Performance Records

The verification team has carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore the on-site assessment was conducted and monitoring data were checked with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include,

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

Responsibilities related to monitoring are executed as defined in the monitoring plan ^{/PD/ & /MR/} and were assessed and found to be OK.

The on-site audit was carried out on 2010-10-12 by our verification team.

2.2.2 Follow-up Interviews

The verification team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for the VCS.

During verification the verification team has performed interviews to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in Table 2-2.

Table 2-2: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
Project proponent representatives ^{/IM01/}	- General aspects of the project - Technical equipment and operation - Changes since validation - Monitoring and measurement equipment - Remaining issues from validation / previous verifications - Calibration procedures - Quality management system - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan - Monitoring data management - Data uncertainty and residual risks - GHG calculation - Procedural aspects of the verification - Maintenance - Environmental aspects - Editorial issues of the Monitoring Report

A comprehensive list of all interviewed persons is part of section 5 'References'.#

2.2.3 Collection of Measurements

The main parameters monitored in this project activity are Net electrical energy generated by the project activity, Quantity of biomass residue (rice husk) combusted in the project activity during the year y, Moisture content of biomass residues, Average round trip distance (from and to) between biomass fuel supply sites and the project site, Number of truck trips for the transportation of biomass, Quantity of biomass residues of type k that are utilized in the defined geographical region, Quantity of available biomass residues of type k in the region and Net Calorific value of biomass residue type k.

The energy generated in the project activity is replaced the electricity of NEWNE Grid of India during the reported monitoring period and is in line with the validated VCS PD^{/PD/}.

The net electricity generated by the project activity is the difference between gross power generation and auxiliary consumption. The gross power generation is measured by gross energy meter (EM6) and the auxiliary consumption is measured by two auxiliary meters (EM3 & EM4).

Quantity of biomass residue (rice husk) combusted in the project activity during the year y, is measured in weigh bridge and recorded in plant log records. Moisture content of biomass residues type k and Net Calorific value of biomass residue type k is measured every six month in authorized laborites. Average round trip distance (from and to) between biomass fuel supply sites and the project site, Number of truck trips for the transportation of biomass are logged in plant records in every trips.

The Quantity of biomass residues of type k that are utilized in the defined geographical region and Quantity of available biomass residues of type k in the region are assessed through a biomass assessment study conducted every year.

During the on-site visit, the information about the energy meter and auxiliary meters which was mentioned above was verified. In addition all the log book records are and biomass test certificates are verified. All the procedure followed in the site are found to be in line with the monitoring plan ^{/PD/} & the PPA ^{/PPA/} signed for the project and deemed to be OK. No significant, lack of evidence and missing data were detected.

2.2.4 Observation of established practices and testing of the accuracy of monitoring equipment

All required instruments and operating procedures implemented for the project are in an appropriate manner and in line with the registered PDD ^{/PDD/}. Responsibilities related to monitoring are executed as defined in the monitoring plan ^{/PDD/} & ^{/MR/}. Calibration procedures of all energy meters covering the reported monitoring period was verified for their frequency and traceability to industry standards. As per registered PDD ^{/PDD/} the gross energy meter and auxiliary meters should be calibrated once in a year by an independent third party. Similarly the weigh bridge used for measuring the biomass quantity should also be calibrated once in a year.

As per registered PDD ^{/PDD/}, all the energy meters and weigh bridge are calibrated annually during the reported monitoring period. During the monitoring period of 2009-02-14 to 2010-01-11 the calibration of monitoring equipments was done on the following dates

Equipment	Calibration date
Gross energy meter	2009-08-30
Auxiliary meter-1	2009-08-30
Auxiliary meter-2	2009-08-30
Weigh bridge - 60 tonnes	2008-04-30 & 2009-04-30
Weigh bridge – 100 tonnes	2008-11-27 & 2009-12-16
Steam flow meter	2009-08-30

The energy meter is calibrated once in a year. But the calibration validity 100 tonne weigh bridge is ended on 2009-11-26 but the next calibration is done only on 2009-12-16 which is 20 days later from the end of validity of previous calibration. However

as per the registered PDD the value of 'Quantity of biomass residue (rice husk) combusted in the project activity during the year y' is not used in determination of emission reduction and hence the error correction factor is not applied for the non calibration validity period.

In the calibrations it is found that error of all the equipments are within their acceptable limit. All the calibration certificates^{/cal/} are submitted by PP and the same has been verified by verification team and found to be OK. Hence it is confirmed that all the monitoring equipments used in the project activity were working appropriate manner during the monitoring period and hence the data measured by the equipments which are used for ER calculation are correct and reliable.

2.3 Determination of the reductions in GHG emissions

The verification team has verified and found out that GHG emission reduction achieved by the project activity is calculated as the baseline emission minus project emission minus leakage emission.

The baseline emission is calculated based on the net electricity generated by the project activity during the monitoring period which would have been produced from the NEWNE grid connected power plants in the absence of the project activity multiplied by emission factor of NEWNE grid. The net electricity generated by the project activity in the reported monitoring period is 82,204 MWh. The emission factor of NEWNE grid which was fixed ex-ante in the CDM registered PDD^{/PDD/} is 0.80 tCO₂/MWh. Hence the baseline emission in the project activity is calculated as 65,764 tCO₂e.

The project emission is due to the transportation of biomass from the source to the industry. This is calculated based on the distance travelled by trucks used for biomass transportation during the monitoring period. Total number of trips by trucks in the monitoring period is 9783 and the average round trip distance travelled by each truck is 98 km. By considering IPCC emission factor and NCV of diesel, the project emission is calculated that the project emission is calculated as 417 tCO₂.

In the project situation there is no exchange of major equipment happened in of project activity during the monitoring period. Also by verifying the daily rice husk procurement data^{/PE/} it is found that the rice husk is procured within the boundary where the biomass assessment study was conducted and found that the surplus biomass available in the region. Hence as per the methodology the leakage due to this project activity is zero.

Thus the emission reduction achieved in the reported verification period (from 2009-02-14 to 2010-01-11 (incl. both days)) is 65,347 tCO₂e.

The Verification team has checked the input values as well as the computation in the emission reduction spreadsheet^{ER/}. The estimation of the emission reduction was realized in a transparent and conservative manner.

2.4 Review of additional data from other sources if appropriate

Hourly steam flow data^{/steam/} is verified with the gross electricity generation data and found that the electricity generation data is deemed to be acceptable.

2.5 Review of monitoring results and verification of the correct application of monitoring methodologies

The verification team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for the VCS.

2.6 Resolution of any material discrepancy

Material discrepancies identified in the course of the verification are addressed either as CARs, CLs or FARs.

A **Corrective Action Request (CAR)** is established where:

- mistakes have been made in assumptions, application of the methodology or the project documentation which will have a direct influence the project results,
- the requirements deemed relevant for verification of the project with certain characteristics have not been met or
- there is a risk that the project would not be registered or that emission reductions would not be able to be verified and certified.

A **Clarification Request (CL)** will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

A **Forward Action Request (FAR)** will be issued when certain issues related to project implementation should be reviewed during the first verification.

A detailed list of the CARs CLs and FAR raised and discussed in the course of this verification is included in the next section 3 of this report.

3 VERIFICATION FINDINGS

In this section the assessments and findings from the desk review of the VCS PD, site visit, interviews and supporting documents as well as the final assessments are summarised. Table 3-1 includes an overview of all raised CARs, CLs and FARs.

Table 3-1: Overview of CARs, CLs and FARs issued

No.	Topic / Chapter	CAR	CL	FAR
3.1	Remaining issues, including any material discrepancy			
3.2	Project implementation			
3.3	Completeness of monitoring	3		
3.4	Accuracy of emission reduction calculations		2	
3.5	Quality of evidence to determine emission reductions			
3.6	Management and operational system			
-	SUM	3	2	0

3.1 Remaining issues, including any material discrepancy, from previous validation

Description

All raised CARs and CRs were successfully closed during the CDM Validation of the project design. And there were no FAR raised during the validation stage. The Verification has been carried out based on the CDM registered PDD^{/PDD/}, Final validation report^{/FVR/}, Validated Emission reduction calculation sheet^{/xls/}, supplementary VCS-PD^{/SPD/} and supplementary VCS validation report^{/SVal/}. There are no remaining issues prevailing in these documents.

Related Findings

- ☒ No CARs, CLs or FARs have been identified in this context
- ☐ The following finding(s) have been addressed:

Final Assessment

There were no remaining issues/ discrepancies in the CDM validation and supplementary VCS validation of the project. The registered PDD^{/PDD/}, validation report^{/val/} and supplementary VCS PD^{/SPD/} are found to be OK.

☒ There is no remaining issue pending in previous validations

3.2 Project implementation

Description

The project activity is a cogeneration project installed in a paddy processing unit by M/s. Sukhbir Agro Energy Private Limited. This power project involves installation of a 70TPH capacity travelling grate boiler and one 15 MW extraction cum condensing turbine to generate steam and electricity. The other accessories include auxiliary installations and systems, including Electrostatic precipitator (ESP), cooling water system, ash handling system, feed water system, raw water system and DM plant and power evacuation system. The generated power of the 15 MW is proposed to be exported to the Grid after meeting the captive requirement of about 2MW. The co-generation plant is proposed to be commissioned within the premises of a 40 TPH milling capacity Rice Mill for paddy processing and a 500 TPD Solvent Extraction Plant.

The project activity is located at Village Fatehullahpur in Ghazipur District in the state of Uttar Pradesh, India. The geographical coordinates of the project is 25° 34' 50.71" North and 83° 29' 6.39" East.

The project plant was synchronised with grid on 2009-02-14 and started reducing GHG emissions thereupon. Thus the start date of the project activity is 2009-02-14. The operational life time of the project activity is 20 years.

Supporting documents like grid synchronization certificates^{/syn/} and purchase orders of equipments^{/PO/} were made available to the TÜV NORD JI/CDM CP. However during site visit the site condition is verified.

It was verified in the course of this verification that the actual project activity was implemented in accordance with the registered CDM PDD^{/PDD/}

Related Findings

- ☒ No CARs, CLs or FARs have been identified in this context
- ☐ The following finding(s) have been addressed:

Final Assessment

On-site visit was carried out during Verification. The location and implementation details of the boilers in this project activity were verified during on-site visit and confirmed that the project has been implemented as described in the CDM registered PDD^{/PDD/}

- ☒ The project is implemented as described in the CDM registered PDD

3.3 Completeness of monitoring

Description

The proposed project uses CDM approved methodology ACM0006, Version 6.2: Consolidated methodology for electricity generation from biomass residues, which is approved under VCS 2007.1.

The project satisfies all criteria of ACM0006, Version 6.2. The application of monitoring methodology is assessed as correct. The main parameters monitored in the project activity are

1. Net electrical energy generated by the project activity,
2. Quantity of biomass residue (rice husk) combusted in the project activity during the year y,
3. Moisture content of biomass residues,
4. Average round trip distance (from and to) between biomass fuel supply sites and the project site,
5. Number of truck trips for the transportation of biomass,
6. Average CO₂ emission factor for the trucks during the year y
7. Quantity of biomass residues of type k that are utilized in the defined geographical region,
8. Quantity of available biomass residues of type k in the region
9. CO₂ emission factor of the most carbon intensive fuel used in the country
10. Net quantity of heat generated from firing biomass in the project plant

11. Net Calorific value of biomass residue type k (rice husk)

12. Average net energy efficiency of heat generation in the boiler that would generate heat in the absence of the project activity. Under the project activity this would be the 10 TPH boiler

The monitoring plan^{/PDD/} provides detailed information related to the collection and archiving of all relevant data needed to:

- Estimate or measure emissions occurring from GHG sources, sinks and reservoirs
- Determine the baseline emissions
- Estimate changes in emissions from the site

As most essential part of the verification exercise it is indispensable to carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore the on-site assessment is necessary to check the monitoring data with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include, but are not limited to:

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

The verification team has carried out on-site audit on 2010-10-12.

Before and during the on-site visit the verification team performed interviews with the project participants to confirm selected information and to resolve issues identified in the document review. It is assessed that the data and parameter monitored by the above said approach is accurate, conservative and transparent. It is found to be valid and acceptable.

No significant, lack of evidence and missing data were detected during on-site visit.

Related Findings

- ☐ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	3.3-1
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The calibration certificates of the following equipments needs to be provided for verification • Energy meters (EM3, EM4 & EM6) • Weigh bridges (40 tonne & 100 tonne) • Steam flow meter
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	All the calibration certificates are submitted
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The calibration certificates of the following equipments has been submitted for verification • Energy meters (EM3, EM4 & EM6) • Weigh bridges (40 tonne & 100 tonne) • Steam flow meter CAR 3.3-1 is closed
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

Finding:	3.3-2
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Please submit the report of biomass assessment study conducted on July 2009 to prove the availability of surplus rice husk in the project region
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The biomass assessment study report of 2009 prepared by third party is submitted.
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	Biomass assessment study report of July 2009 is submitted for verification. By verifying the biomass assessment study report, it is conformed that there is surplus amount of biomass available in the region. CAR is closed

Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements
---	---

Finding:	3.3-3		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	How is the gross generation high on the following days: shut down on 8-Jan-2010 for 16:46 hrs, the gross energy generation is recorded as 348,750 kWh which is very high. Similarly the following days the gross energy generation details are very high when the shut down hours are considered • 26-Apr-2009 • 24&25-Oct-2009 • 11,23&28-Nov-2009 • 5&6-Jan-2010		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	We have checked the details of the shutdown/outage since synchronization w.e.f. 14.02.2009 to 11.01.2010 and during checking some clerical/typographical errors were detected in the timings/hours mentioned in report provided earlier. The figures regarding generation are correct. These errors have now been rectified. Necessary corrections have been made in the MR (Refer: Page 4 of the MR).		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The typographical error has been corrected. CAR 4 is closed		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements		

Final Assessment

During on-site visit, the details of monitoring equipments such as make, accuracy class, type and serial numbers were recorded. The details w.r.t energy meters & weighbridge provided in the monitoring report were verified with their respective calibration certificates^{/Cal/} and registered CDM PDD^{/PDD/} and are found to be OK. Also rice husk test certificates are verified and found that the NCV & moisture content

value are comparable with the PDD^{/PDD/} values.

☒ CAR 3.3-1, CAR 3.3-2 and CAR 3.3-3 are closed

3.4 Accuracy of emission reduction calculations

Description

The value of the emission reductions depends on the net electricity generated by the project activity. GHG emission reduction is calculated as baseline emission minus project emission and leakage.

As per methodology emission reduction is calculated as follows

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

As mentioned in the registered PDD the emission reduction from heat & baseline emission from biomass is zero. Hence Emission reduction is

$$ER_y = ER_{\text{electricity},y} - PE_y - L_y$$

$$ER_y = BE_{\text{electricity},y} - PE_y - L_y$$

The baseline emissions reductions are based on the gross electricity generated from the project activity minus auxiliary electricity consumption. Emission due to transportation of biomass from the source to the plant site is calculated as project emission. Also the biomass is sourced from within 200 km radius from the plant site where the surplus amount of biomass is available^{/surp/}. Hence there is no leakage emission from the project activity.

Therefore the baseline emission minus project emission equals the Emission reductions.

$$\text{Thus, } ER_y = BE_{\text{electricity},y} - PE_y$$

Baseline Emissions:

The baseline emissions (BE_y in tCO₂) are the product of the baseline NEWNE grid emissions factor (EF_y in tCO₂/MWh) times the net electricity generated by the project activity which replaces the NEWNE grid electricity (EG_y in MWh)

$$BE_{\text{electricity},y} = EG_{\text{projectplant},y} \times EF_{\text{electricity},y}$$

Net electricity generated by the project activity is done based on gross electricity generated by the project activity minus auxiliary consumption as described below

$$EG_{\text{projectplant},y} = EG_{\text{Gross},y} - EG_{\text{Aux},y}$$

There are two auxiliary meters in the project activity. Hence

$$EG_{\text{projectplant},y} = EG_{\text{Gross},y} - (EG_{\text{Aux1},y} + EG_{\text{Aux2},y})$$

The project emission due to transportation of biomass is calculated based on the number of truck number of truck trips, average round trip distance of truck trip and emission factor of truck for transportation.

$$PE_y = N_y \cdot AVD_y \cdot EF_{\text{km},\text{CO}_2}$$

The total net electricity generated by the project activity during the monitoring period is 82,204 MWh. The baseline emission factor has been fixed ex-ante as 0.80 tCO₂/MWh based on the CEA data for NEWNE regional grid^{/CEA/}. Hence the baseline emission is calculated as 65,764 tCO₂ in the reported monitoring period.

The total number of trips done for transportation of biomass during the monitoring period is 9783 with the average round trip distance travelled of 98 km. The emission factor of truck transportation fixed ex-ante is 0.00043 tCO₂/km. Hence the project emission is calculated as 417 tCO₂ in the reported monitoring period.

Hence emission reduction achieved in the monitoring period due to the project activity is 65,347 tCO₂

Related Findings

- ☐ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	3.4-1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Monthly rice husk procurement data (File name: Rice Husk procured from outside for 15 MW VCS 16.08.10) is not matching with the daily rice husk procurement data (File name: Extract of Fuel Inward for 15 MW VCS Pre Registration)		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The daily rice husk procurement data (File name: Extract of Fuel Inward for 15 MW VCS Pre Registration) gives the quantity of rice husk procured from 1st April 2009 onwards and not from 14th Feb 2009. For daily rice husk procurement data for the period 14 Feb 2009 to 11 Jan 2010, please refer enclosed file (File name: Project Emissions_07.12.10). Necessary corrections have been made in the MR.		

DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The rice husk procurement data is now corrected. CAR 3.4-1 is closed
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

C	3.4-2		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	To be on the conservativeness of VER calculation round up option is not preferred for emission reduction. Please change		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The emission reduction is rounded down now in the revised MR.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	As a conservative option, the total emission reduction is rounded down. CL 3.4-2 is closed		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements		

Final Assessment

All the figures as per the monitoring plan were cross-checked by the verification team against the log sheet data^{/BE/,/PE/,/steam/,/SD/}. The calculation procedure described in the monitoring report^{/MR/}, baseline emission calculation sheet^{/BE/} and emission reduction calculation sheet^{/ER/} has been found to be transparent and conservative by the DOE. The equations used in the monitoring report for emission reduction is in line with the procedure defined in the registered PD^{/VCS-PD/} and methodology ACM 0006 version 6.2^{/ACM6/}

☒ CL 3.4-1 & CL 3.4-2 are closed

3.5 Quality of evidence to determine emission reductions

Description

Proper data management inclusive of data acquisition and aggregation, data management system is being followed for the project activity.

All records needed for monitoring are archived in line with the requirements of the registered monitoring plan mentioned in the registered CDM PDD^{/PDD/}. No significant, lack of evidence and missing data were detected during on-site verification. It is evident from the monitoring data that the monitoring system ensures for continuous (except some routine breakdowns or outage^{/SD/}) operation.

The monitoring personnel at site are well trained and follow reproducible routines. The training records^{/TR/} of the plant personals have been cross checked and found OK. Thus, monitoring personals are competent to carry out the relevant tasks with sufficient accuracy. All necessary monitored and measured raw data were checked during on-site verification. The gross electricity generated from the project activity, auxiliary consumption, biomass consumption and number of trips and average round trip distance are the basic monitoring parameters. All the data were verified with the plant log sheet data achieved in paper as well as in electronic format and found to be OK.

Related Findings

- ☒ No CARs, CLs or FARs have been identified in this context
- ☐ The following finding(s) have been addressed:

Final Assessment

All the monitored records^{/BE/,/PE/,/steam/,/SD/} are in line with the monitoring plan mentioned in the registered CDM PDD^{/PDD/}. All the monitoring records provided are of appropriate quality and reliability. All the monitored data provided in electronic form were verified with the logbook during the site visit and found to be OK.

- ☒ Quality of evidence to determine emission reductions are up to the acceptable level

3.6 Management and operational system

Description

All internal data are subjected to QA/QC measures. All monitored data are archived

in Electronic form. The allocation of responsibilities is documented in a written form and is followed as described in the CDM registered PDD^{/PDD/} and VCS MR^{/MR/}. This has been verified. Routines for the archiving of data are defined and documented. Calculations are laid down in the monitoring report are in line with VCS PD^{/VCS-PD/}.

The O&M staffs of the plants were trained on-site in the aspect of project operation, maintenance, monitoring and record keeping by M/s. Indure (P) Ltd during the period from December 2008 to March 2009.

The monitoring personnel at site were attended monitoring training by FICCI Quality Forum (FQF), New Delhi on 20th Nov 2007, 3rd Apr 2008, 15th July 2008, 29th August 2008 and 1st Jan 2010 and follow reproducible routines as was evident during the site visit. Members of monitoring team were interviewed. Procedure for training and maintenance of critical equipments were discussed during site visit. Day to day operation is supervised by the technically qualified site engineers and has adequate knowledge. They have the responsibility to supervise various technical staff for around the clock who engage in operation and maintenance of project activity. Training records for the monitoring personnel were reviewed during site visit. The training would be provided to the concern personnel as required. Thus, they are competent to carry out the relevant tasks with sufficient accuracy. All necessary monitored and measured raw data were checked during on-site verification.

All monitored data are archived in plant log sheet (in paper) and Electronic form. Details on monitoring constraint was verified during the site visit and found that proper procedures were adopted for data handling. The data will be stored for 2 years after the end of crediting period or till the issuance of VERs for this project activity whichever occurs later.

Related Findings

☒ No CARs, CLs or FARs have been identified in this context

☐ The following finding(s) have been addressed:

Final Assessment

The monitoring procedures and responsibilities mentioned in the monitoring report^{/MR/} are in line with the registered PDD^{/PDD/}. In the site visit it is verified and confirmed that the monitoring procedure is being followed in the site is in line with the registered PDD^{/PDD/} and the monitoring report^{/MR/}. Calculations are laid down in the monitoring report is in line with registered PDD^{/PDD/}. The monitoring personnel are well trained and thus, they have the necessary competence to carry out the relevant tasks with sufficient accuracy. The training schedules for the monitoring personnel's were checked by the verification team during the on-site verification. Thus, they have the necessary competence to carry out the relevant tasks with sufficient accuracy.

☒ Management & operational systems are implemented properly as mentioned the CDM registered PDD and found to be acceptable

4 VERIFICATION STATEMENT

M/s. Sukhbir Agro Energy Ltd has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project "15 MW Biomass Residue Based Power Project at Ghazipur, India" in Ghazipur district, Uttar Pradesh state, India with regard to the requirements of VCS 2007.1 Standard.

The project activity involves operation of a 15 MW biomass based cogeneration system that meets the in-house requirement for steam & electricity and exports the surplus power to the regional grid.

Reporting period: From 14-02-2009 to 11-01-2010

In the course of the verification 3 Corrective Action Requests (CARs), 2 Clarification Requests (CLs) were successfully closed.

The verification is based on the draft monitoring report, revised monitoring report, the monitoring plan as set out in the validated PD, the validation report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant.

In detail the conclusions can be summarised as follows:

- all operations of the project are implemented and installed as planned and described in the validated project description.
- the monitoring plan is in accordance with the applied approved methodology ,ie, ACM0006, version 6.2
- the installed equipment essential for measuring parameters required for calculating emission reductions is calibrated appropriately.
- the monitoring system is in place and functional. The project has generated GHG emission reductions.

As the result of the 1st periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Project emissions	417	t CO2 equivalents
Baseline emissions	65,764	t CO2 equivalents
Emission reductions	65,347	t CO2 equivalents

Bangalore, 2011-07-05



Ma. Paa. Puratchikkanal
TÜV India Pvt Ltd., Bangalore
Verification Team Leader

Essen, 2011-07-05



TÜV NORD JI/CDM Certification
Program
Final Approval

5 REFERENCES

Table 5-1: Documents provided by the project participant

Reference	Document
/MR/	Monitoring report of the project “15 MW Biomass Residue Based Power Project at Ghazipur, India” dated 2010-07-24, Version 1 Monitoring report of the project “15 MW Biomass Residue Based Power Project at Ghazipur, India” dated 2010-11-24, Version 2
/ER/	Electricity monitoring data cum Emission Reduction calculations of the project “15 MW Biomass Residue Based Power Project at Ghazipur, India”
/PE/	Biomass transportation data cum Project emission calculation sheet of the project “15 MW Biomass Residue Based Power Project at Ghazipur, India”
/steam/	Hourly steam flow data
/SD/	Major break downs, break downs & Outrage of the project plant
/Syn/	Certificate from UP power transmission corporation limited for synchronization of the plant with grid on 2009-02-14 dated 2009-02-16
/Spec/	Manufactures specification of Boiler & turbine
/PDD/	CDM registered PDD of the project “15 MW Biomass Residue Based Power Project at Ghazipur, India” (UNFCCC Reference No: 2708)
/val/	Final validation report of the CDM project “15 MW Biomass Residue Based Power Project at Ghazipur, India” (UNFCCC Reference No: 2708)
/xls/	Emission reduction calculation sheet used for ex-ante calculation for the CDM project “15 MW Biomass Residue Based Power Project at Ghazipur, India” (UNFCCC Reference No: 2708)
/SPD/	VCS supplementary project description of CDM registered project “15 MW Biomass Residue Based Power Project at Ghazipur, India”
/Sval/	VCS supplementary validation report of CDM registered project “15 MW Biomass Residue Based Power Project at Ghazipur, India”
/Surp /	Biomass residue availability study report for 15 MW Biomass Residue Based Power Project at Ghazipur, India, conducted within 200 km radius from the project plant prepared by M/s. U Bandyopadhyay Project & Management consultant dated July 2009.

Reference	Document
/POI/	EPC Contract with M/s. The Indure Private Limited dated 16 July 2007 for provision of Design, engineering, Procurement, Manufacture, Inspection & Testing, Supply, Erection and commissioning of the proposed power plant on a Turnkey basis. Contract Agreement dated 28 May 2007 for supply of Steam Turbine, Generator and Auxiliaries with M/s. Qingdao Jieneng Power Station Engineering Co., Ltd.
/PPA/	Purvanchal Vidyut Vitaran Nigam Limited power purchase agreement dated 29 July 2006.
/BT/	Extract of daily NCV & Moisture testing results of rice Husk
/TC/	Rice husk test certificates of 2008 & 2009 for Moisture content & NCV by a Idma laboratories limited
/cal/	Calibration certificate of gross energy meter calibrated on 2009-08-30 Calibration certificate of auxiliary energy meter-1 calibrated on 2009-08-30 Calibration certificate of auxiliary energy meter-2 calibrated on 2009-08-30 Calibration certificates of 40 tonne weigh bridge calibrated on 2008-04-30 & 2009-04-30 Calibration certificates of 100 tonne weigh bridge calibrated on 2008-11-27 & 2009-12-17 Calibration certificate of steam flow meter calibrated on 2009-08-30
/TR/	Training records

Table 5-2: Background investigation and assessment documents

Reference	Document
/ACM6/	Approved CDM Methodology ACM0006, version 6.2 Consolidated methodology for electricity generation from biomass residues"
/CPM/	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)
/IPPC/	1. 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book 2. 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
/ISO 14064/	Greenhouse gases -- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and

Reference	Document
	removals Greenhouse gases -- Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements Greenhouse gases -- Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions
/ISO14065/	Greenhouse gases -- Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition
VCS	Voluntary Carbon Standard 2007.1
/CDM-MR/	CDM Monitoring report Template
/VVM/	Validation and Verification Manual (Version as per EB 51)
/CEA/	CO ₂ Baseline Database for the Indian Power Sector, Version 4.0, Central Electricity Authority

Table 5-3: Websites used

Reference	Link	Organisation
/cd4cdm/	www.cd4cdm.org	UNEP Riso Centre
/ipcc/	www.ipcc-nggip.iges.or.jp	IPCC publications
/vcs/	www.v-c-s.org	VCSA
/unfccc/	http://cdm.unfccc.int	UNFCCC

Table 5-4: List of interviewed persons

Reference	Mol ¹		Name	Organisation / Function
/IM01/	V	☒ Mr. ☐ Ms	M.L. Arora	General Manager, Sukhbir Agro Energy Ltd.,

¹⁾ Means of Interview: (Telephone, E-Mail, Visit)