

BIOMASS BASED STEAM GENERATION PROJECT BY GUJARAT AMBUJA EXPORTS LTD



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

Project Title	Biomass based steam generation project by Gujarat Ambuja Exports Ltd
Version	Version 1
Report ID	8110894311-14/010

Report Title	Biomass based steam generation project by Gujarat Ambuja Exports Ltd
Client	Gujarat Ambuja Exports Limited
Pages	28
Date of Issue	04/03/2014
Prepared By	TÜV NORD CERT GmbH
Contact	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
Approved By	Stefan Winter
Work Carried Out By	Pankaj Patel (TL) Hemang Shah (TM/TE) Indrapal Parmar (TM)

Summary:

Gujarat Ambuja Exports Limited has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project “**Biomass based steam generation project by Gujarat Ambuja Exports Ltd**” with regard to the requirements of VCS Version 3 Standard.

The project activity involves setting up a biomass-based boiler of capacity 30 TPH in the agro processing manufacturing facility of the project proponent. The biogas generated due to anaerobic digestion of wastewater in the plant is also co-fired along with biomass in the boiler. The project reduces green house gas emission by combusting biomass residue available in the region thereby substituting consumption of fossil fuel.

Reporting period: 01/01/2013 to 31/12/2013 (Including both days)

In the course of the verification 06 Corrective Action Requests (CARs) and 01 Clarification Requests (CLs) were raised. No Forward Action Request (FAR) are raised in this verification.

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

As the result of the 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 (01/01/2013 to 31/12/2013) as follows:

Emission reductions 30,964 t CO₂ equivalents

ABBREVIATIONS

BAU	Business as usual
CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CDM	Clean Development Mechanism
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
QC/QA	Quality control/Quality assurance
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

1	Introduction	5
1.1	Objective	5
1.2	Scope and Criteria	5
1.3	Level of assurance	5
1.4	Summary Description of the Project	6
2	Validation Process, Findings and Conclusion	6
2.1	Validation Process	6
2.2	Validation Findings.....	6
2.2.1	Gap Validation.....	6
2.2.2	Methodology Deviations.....	6
2.2.3	Project Description Deviations	6
2.2.4	New Project Activity Instances	6
2.3	Validation Conclusion.....	6
3	Verification Process	7
3.1	Method and Criteria.....	7
3.2	Document Review	8
3.3	Interviews	9
3.4	Site Inspections	9
3.5	Resolution of Any Material Discrepancy	10
4	Verification Findings.....	10
4.1	Project Implementation Status	11
4.2	Accuracy of GHG Emission Reduction or Removal Calculations	13
4.3	Quality of Evidence to Determine GHG Emission Reductions or Removals	20
4.4	Management and Operational System	22
5	Verification conclusion	23

1 INTRODUCTION

Gujarat Ambuja Exports Limited has commissioned the TÜV NORD JI/CDM Certification Program to carry out the verification of the project:

“Biomass based steam generation project by Gujarat Ambuja Exports Ltd”

with regard to the relevant requirements of the Voluntary Carbon Standard version 3^{VCS/}. The verifiers have reviewed the implementation of the monitoring plan (MP) in the validated VCS project for the monitoring period 01/01/2013 to 31/12/2013 (both days included),

The applied methodology is AMS IC^{/AMSIC/} “Thermal energy for the user with or without electricity”.

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 registered CDM PDD;
- 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.
- To assess conformity of monitoring plan of the project with applied methodology, AMS IC “Thermal energy for the user with or without electricity”.

1.2 Scope and Criteria

The verification is based on the draft monitoring report^{/MR/}, revised monitoring report^{/MR/}, the monitoring plan as set out in the registered CDM PDD^{/PDD/}, Supplementary VCS project design^{/SUP-PD/}, the validation report^{/VAL/}, Supplementary VCS validation report^{/SUP-VAR/} emission reduction calculation spreadsheet^{/XLS/} and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant 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 Level of assurance

The verification has been planned and organized to achieve a

☒ Reasonable level of assurance

☐ Limited level of assurance

1.4 Summary Description of the Project

The project activity involves setting up a biomass-based boiler of capacity 30 TPH in the agro processing manufacturing facility of the project proponent. The biogas generated due to anaerobic digestion of wastewater in the plant is also co-fired along with biomass in the boiler. The steam produced from the boiler is consumed in process. The project reduces green house gas emission by combusting surplus biomass residue (rice husk) available in the region thereby substituting consumption of fossil fuel. The project has already been commissioned^{/CC/} and is operational since 28/03/2008.

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

2.1 Validation Process

Since the validation of the project under VCS is already carried out as well as the 1st and 2nd periodic verification, this section is not applicable.

2.2 Validation Findings

2.2.1 Gap Validation

The project has not participated under any other GHG program. An undertaking to confirm the same was submitted by project proponent to the DoE during 1st and 2nd periodic verification of the project. This is evident from the verification report^{/VER/} of the 1st and 2nd periodic verification of the project.

Assessment on the project description in line with the additional information provided in the supplementary VCS project description is as below.

2.2.2 Methodology Deviations

Since the validation of the project under VCS is already carried out as well as the 1st and 2nd periodic verification, this section is not applicable.

2.2.3 Project Description Deviations

Same as above

2.2.4 New Project Activity Instances

Same as above

2.3 Validation Conclusion

Same as above

3 VERIFICATION PROCESS

3.1 Method and Criteria

The verification of the project consisted of the following steps:

- Contract review,
- Appointment of team members and technical reviewers,
- 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

Table 3-1: Verification sequence

Topic	Date
Assignment of verification	08/01/2014
On-site visit	06/02/2014-07/02/2014
Draft reporting finalised	08/02/2014
Final reporting finalised	27/02/2014
Technical review on final reporting finalised	03/03/2014
Final corrections	04/03/2014

Table 3.2: Involved Team Members

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Scheme competence ³⁾	Technical competence ⁴⁾	Verification competence ⁵⁾	Host country Competence	On-site visit
☒ Mr. ☐ Ms.	Pankaj Patel	TUV-India	TL	LA	☒	-	☒	☒	☐
☒ Mr.	Hemang Shah	TUV-India	TM ^{A)}	LA	☒	1.1	☒	☒	☒

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Scheme competence ³⁾	Technical competence ⁴⁾	Verification competence ⁵⁾	Host country Competence	On-site visit
☐ Ms.									
☒ Mr. ☐ Ms.	Indrapal Parmar	TUV-India	TM ^{A)}	A	☒	-	☒	☒	☐
☒ Mr. ☐ Ms.	Stefan Winter	TN Germany	TR ^{B)}	SA	☒	1.1	☒	☐	-
☒ Mr. ☐ Ms.	Martin Saalman	TN Germany	TR/FA _{B)}	SA	☒	-	☒	☐	-

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; LA: Lead Assessor; SA: Senior Assessor; T: Trainee; TE: Technical Expert

³⁾ GHG auditor status (at least Assessor)

⁴⁾ As per S01-MU03 or S01-VA070-A2 (such as 1.1, 1.2, ...)

⁵⁾ In case of verification projects

A) Team Member: GHG auditor (at least Assessor status), Technical Expert (incl. Host Country Expert or Verification Expert), not ETE

B) No team member

3.2 Document Review

The VCS PD^{/PD/}, monitoring report 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 7.

3.3 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 / ISO 14064. 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 were summarized in Table 3-4.

Table 3-4: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
1. Project Owner & Operations Personnel, Gujarat Ambuja Exports Limited 2. Consultant, Emergent Ventures India	• General aspects of the project • Technical equipment and operation • Changes since implementation • Monitoring and measurement equipment • Remaining issues from validation • 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

3.4 Site Inspections

The verification team has carried out an inspection on site on 06/02/2014 and 07/02/2014 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^{/IM01/} 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.

3.5 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 4 of this report.

4 VERIFICATION FINDINGS

In this section the assessments and findings from the desk review of the VCS PD / GHG Report PD, site visit, interviews and supporting documents as well as the final assessments are summarised. Table 4-1 includes an overview of all raised CARs, CLs and FARs.

Table 4-1: Overview of CARs, CLs and FARs issued

No.	Topic / Chapter	CAR	CL	FAR
4.1	Project implementation status	2	-	-
4.2	Accuracy of GHG emission reduction or Removal calculations	3	1	-
4.3	Quality of evidence to determine emission reductions or removals	1	-	-
4.4	Management and operational system	-	-	-
	SUM	6	1	0

4.1 Project Implementation Status

Description

The project activity involves setting up a biomass-based boiler of capacity 30 TPH in the agro processing manufacturing facility of the project proponent. The biogas generated due to anaerobic digestion of wastewater in the plant is also co-fired along with biomass in the boiler. The steam produced from the boiler is consumed in process. The project reduces green house gas emission by combusting surplus biomass residue (rice husk) available in the region thereby substituting consumption of fossil fuel. The project has already been commissioned^{/CC/} and is operational since 28/03/2008.

The commercial operation start date of the manufacturing plant i.e. 28/03/2008 since when the project has started reducing emission reduction has been considered as the start date of the project.

It has been verified that the project is implemented as it is described in the validated project description^{/VCS PD/}. The boiler was commissioned^{/CC/} on 27/03/2008. All the measuring equipments required for the project monitoring are installed at the respective places of project site. These equipments include steam temperature and pressure gauge, steam flow meter, inlet water temperature gauge, biogas flow meter and weigh bridge. The crediting period selected for the project activity as per the validated VCS PD^{/PD02/} is 01/04/2008 to 31/03/2018. The ongoing monitoring period spans the duration from 01/01/2013 to 31/12/2013.

The project has been in the continual and successful operation during the requested monitoring period. None of the major technical equipment has been found to be exchanged during the monitoring period. The technical specification^{/TS/} of the boiler including serial number, rated capacity etc. have been verified during onsite verification conducted by the verification team. The commissioning certificate^{/CC/} of the boiler is also verified and found to be appropriate. The technical specifications^{/TS/} of the measuring equipments were physically verified during onsite verification and found to be appropriate.

Essential data of the project is presented in the following Table 4-1a.

Table 4-1a: Project Characteristics

Item	Data			
Project title	Biomass based steam generation project by Gujarat Ambuja Exports Ltd			
Project owner	Gujarat Ambuja Exports Limited			
Any specific project categories	☒	Project: Less than or equal to 300,000 tonnes of CO ₂ e per year.		
	☐	Large projects: Greater than 300,000 tonnes of CO ₂ e per year.		
VCS PD/GHG Report PD dated	Draft:	—	Final:	25/09/2009
Applied Methodology	AMS IC "Thermal energy for the user with or without electricity".			
Project starting date	28/03/2008 (start date of commercial operation of the plant)			
Crediting period	☐	Renewable Crediting Period (7 y)		
	☒	Fixed Crediting Period (10 y)		

Start of crediting period	01/04/2008
---------------------------	------------

The details of the project location are given in table 4-1b:

Table 4-1b: Project Location

No.	Project Location
Host Country	India
Region:	State- Uttarakhand
Project location address:	Sitarganj, District-Udhamsingh Nagar
Latitude:	28° 55' 43" N
Longitude:	79° 42'25" E

The key parameters of the project are given in table 4-1c:

Table 4-1c: Technical data of the project

Technical Specification of the power plant:

Parameter	Unit	Value
Boiler type	-	Semi-outdoor, Bi-drum, Water tube, AFBC boiler
Boiler Make	-	Cheema Boilers
Capacity	TPH	30 TPH
Steam Pressure	kg/cm ²	17.5
Steam Temperature	-	Saturated

Related Findings

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

Finding:	CAR 4.1.1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The monitoring report is not filled using the latest report template version no, V3.3 available on the VCS website (Current Version: v3.3 Issued: 8 October 2013)		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The revised monitoring report has been converted into VCS latest template version v3.3.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and VT assessments (#2, #3, etc.) shall be added.</i>	The revised monitoring report submitted by the project proponent is found to be filled using the latest template v3.3 available in the VCS website. CAR is closed.		

Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed
---	--

Finding:	CAR 4.1.2		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Technical description of the installed boiler e.g. steam generation capacity, pressure etc is not provided in Monitoring report		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Technical description of the installed boiler e.g. steam generation capacity, pressure etc has been provided in section 2.1 of the revised Monitoring report.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and VT assessments (#2, #3, etc.) shall be added.</i>	Section 2.1 of the monitoring report is now revised by project proponent to include the technical details of the 30 TPH boiler operating in the project activity. Technical details are checked by verification team and found to be correct and in line with onsite visit observation. CAR is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Final Assessment

The verification team concludes that the project has been implemented and operated as it has been defined in the registered CDM PDD.

4.2 Accuracy of GHG Emission Reduction or Removal Calculations

The project proponent has submitted the emission reduction calculation excel sheet with respect to the monitoring report. An elaborate calculation for the emission reduction including the values of the monitoring parameters is provided in the emission reduction calculation sheet. The calculation procedure along with the equations used for the calculation is verified by the verification team and found to be correct and in line with the validated VCS PD^{/VCS PD/} and applied methodology AMS I C, version 16^{/AMS I C/}. Since coal was combusted in the boiler along with biomass during the monitoring period, as per the applied version of the methodology^{/AMS I C/}, two different approaches are used for the calculation and the lowest among the two has been considered as the final value of emission reduction. The same has been verified by the verification team and found to be correct.

The emission reduction calculation is based on the actual monitoring values of the following monitoring parameters. The conformity of the monitoring parameters with the validated VCS PD is assessed as below.

S.I No.	Parameters	Measurement procedure	Source of the data	Means of verification
1	Quantity of steam generated	The data is measured from the steam flow meters on hourly basis and recorded in the daily log book.	Log book ^{/LOG/}	The daily log books are verified and the initial and final readings of the flow meter are crosschecked to ensure the net quantity of steam considered for ER calculation.
2	Temperature of the steam generated	The data is measured from the temperature gauge on hourly basis and recorded in the daily log book.	Log book ^{/LOG/}	The monitored values of the parameters are transferred from hard log sheets into the soft form (excel sheet). The values complied in soft form were verified by the verification team and their correctness was ensured from the log book.
3	Pressure of the steam generated	The data is measured from the pressure gauge on hourly basis and recorded in the daily log book. The monthly average values determined from all the monitored values of a particular month have been used for the emission reduction calculation.	Log book ^{/LOG/}	The monitored values of the parameters are transferred from hard log sheets into the soft form (excel sheet). The values complied in soft form were verified by the verification team and their correctness was ensured from the log book.
4	Temperature of the feed water into boiler	The data is monitored from the temperature gauge on hourly basis and recorded in the daily log book. The maximum value out of all the recorded values in a particular month has been considered for the calculation of emission reduction in that particular month. This is more conservative.	Log book ^{/LOG/}	The monitored values of the parameters are transferred from hard log sheets into the soft form (excel sheet). The values complied in soft form were verified by the verification team and their correctness was ensured from the log book.

5	Quantity of biomass of type i combusted in year y	The quantity of biomass combusted in the boiler is measured in the weigh bridge and recorded in the SAP	Log book ^{/LOG/}	The daily log sheets were verified by the verification team during site visit. The monthly total values of the entire monitoring period were verified and found to be tally with the values considered for emission reduction calculation. Further, the biomass consumption was also crosschecked from the procurement data found to be consistent. The quantity of biomass procured is recorded in SAP from the invoices whenever the biomass is procured at site.
6	Quantity of fossil fuel of type i combusted in year y	The quantity of coal combusted in the boiler is measured in the weigh bridge and recorded in the SAP.	Log book ^{/LOG/}	The daily log sheets were verified by the verification team during site visit. The monthly total values of the entire monitoring period were verified and found to be tally with the values considered for emission reduction calculation. Further, the coal consumption was also crosschecked from the procurement data found to be consistent. The quantity of coal procured is recorded in SAP from the invoices whenever the coal is procured at site.
7	Net calorific value of biomass of type i used	The NCV of biomass is tested in the in house laboratory whenever it is received at site. The monthly average of all the monitored values in a particular month has been used for the emission reduction calculation for that month. Moreover, in line with the validated registered PD, the NCV test is also carried out once in six a six month period.	Log book ^{/LOG/}	The monitored values of the parameters are transferred from hard log sheets into the soft form (excel sheet). The values complied in soft form were verified by the verification team and their correctness was ensured from the log book. The external NCV test report of biomass are also verified by the verification team and found to be appropriate.

8	Net calorific value of fossil fuel of type i used	The NCV of coal is tested in the in house laboratory whenever it is received at site. Moreover, in line with the validated registered PD, the NCV test is also carried out once in a six month period. However, it should be noted that the maximum value of the coal NCV amongst the weighted average NCV for the entire monitoring period as per the internal laboratory test and all the values of NCV as per external laboratory test reports conducted in each six month (half yearly basis) has been considered for the emission reduction calculation. This has been assessed by the verification team to be conservative and hence acceptable. The detail calculation for deriving maximum coal NCV has been provided in the emission reduction calculation sheet.	Log book ^{/LOG/} External test reports ^{/NCVCOAL/}	The monitored values of the parameters are transferred from hard log sheets into the soft form (excel sheet). The values complied in soft form were verified by the verification team and their correctness was ensured from the log book. The external NCV test report of biomass are also verified by the verification team and found to be appropriate.
9	Amount of biogas combusted in boiler in year y	The biogas consumed in the boiler is measured by the gas flow meter and the daily cumulative values are recorded in the log sheet.	Log book ^{/LOG/}	The monitored values of the parameters are transferred from hard log sheets into the soft form (excel sheet). The values complied in soft form were verified by the verification team and their correctness was ensured from the log book.
10	Net calorific value of biogas	In accordance with the validated VCS PD, the NCV of biogas is tested once in a six month period. The average value of all the values as per the external test report has been used for the emission reduction calculation.	External test reports ^{/NCVBIOGAS/}	The external test reports covering the entire monitoring period are verified by the verification team and found to appropriate.

The specific energy consumption of biomass used for the calculation has been correctly sourced from the validated VCS PD^{/VCS PD/}. The efficiency of the baseline boiler has been considered as 100% for the emission reduction calculation which is conservative. The default value of the emission factor of the baseline fuel i.e. coal, 96.1 tCO₂/TJ has been correctly sourced from 2006 IPCC Guidelines for National Greenhouse Gas Inventories^{/IPCC/}. The values of steam enthalpy and feed water enthalpy considered for the calculation are verified from the steam table^{/STEAM/} and found to be correct.

The emission reduction for the entire monitoring period thus calculated to be 30,964 tCO₂.

Comparison of emission reduction with VCS PD:

The actual number of emission reduction (tCO₂) realized during the monitoring period is 30,964 tCO₂ while as per the validated VCS PD^{/VCS PD/} the estimated number of emission reduction for the same duration of monitoring period is 45,523 tCO₂. Since the actual number of emission reduction is in the negative side, the verification team concluded that the baseline and additionality of the project are still valid.

Related Findings

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

Finding:	CAR 4.2.1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	All data and parameters available at the time of validation and used for emission reduction calculation and fixed Ex-ante are not included under section 3.1 of the MR.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	SEC _{Biomass, PJ, y} & SEC _{Coal, PJ, y} fixed Ex-ante parameters have been added in section 3.1 of the revised MR.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and VT assessments (#2, #3, etc.) shall be added.</i>	Section 3.1 of the monitoring report now includes the ex-ante parameter available at the time of validation of the VCS project. Details included in section 3.1 of the monitoring report are correct and in line with registered VCS documents. Thus, it is concluded by verification team that the information included in section 3.1 is correct and accurate. CAR is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Finding:	CAR 4.2.2		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Steam pressure reading for the date 31/01/2013 at 8.0 PM does not match with the log book.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Steam pressure reading for the date 31/01/2013 at 8:00 PM has been corrected as per the log book.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and VT assessments (#2, #3, etc.) shall be added.</i>	Steam pressure reading for the date 31/01/2013 is now corrected in the revised excel sheet submitted by project proponent. Same is verified by verification team and found to be correct and ok. CAR is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Finding:	CL 4.2.3		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Clarification is required how steam flow is calculated for the month of September 2013 w.r.t initial and final reading of the steam flow integrator meter		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Due to UPS failure & Power cut problem steam flow integrator meter get reset many times. However at every meter reset point difference of final reading and initial reading is taken for the steam flow calculation.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and VT assessments (#2, #3, etc.) shall be added.</i>	Justification submitted by project proponent for steam flow measurement is accepted to verification team. Due to meter reset steam flow is calculated as the difference of final reading and initial reading to get the steam flow in tab "Boiler Data", Cell E13 of emission reduction sheet, which is correct and accurate procedure. PP has submitted the log sheet for maintained steam flow ^{/LOG/} with explanation for every meter reset for the monitoring period. CAR is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Finding:	CAR 4.2.4		
Classification	☒ CAR	☐ CL	☐ FAR

Finding:	CAR 4.2.4																	
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Accuracy classes of the monitoring equipments (feed water & steam temperature gauge, steam pressure gauge and steam flow meter) as per the registered PD are not in line with the actual situation. Justification and appropriate correction is required in this regard.																	
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Accuracy class of monitoring equipments as per standards are: <table><tr><th>Monitoring Equipment</th><th>Accuracy Class</th><th>Source</th></tr><tr><td>Feed Water Temp. Gauge</td><td>Class A, B¹</td><td>Manufacturer (http://www.miepl.com/Product.aspx?Subcategory_ID=3&Product_ID=67)</td></tr><tr><td>Steam Temperature gauge</td><td>Class 1 (+/- 1%)</td><td>Manufacturer http://www.tempsensindia.com/catlog/master-sensor.pdf</td></tr><tr><td>Steam Pressure gauge</td><td>Maximum accuracy class 4%</td><td>http://www.wika.co.in/upload/DS_IN0002_GB_1372.pdf</td></tr><tr><td>Steam flow meter</td><td>+/-3%</td><td>Manufacturer (http://www.manasmicro.in/pdf/orifice-flow-meter.pdf)</td></tr></table> For steam temperature gauge actual monitored error which is 1.6% at 200⁰C has been observed for emission reduction calculation. For feed water temperature gauge as per manufacturer accuracy class is Class A,B, Class B governs accuracy of 0.8 % at 100⁰ C and PP has been taken 1 % error for emission reduction calculation, this is a conservative approach.. Steam pressure gauge & Steam flow meter accuracy class not affect the emission reduction calculation.			Monitoring Equipment	Accuracy Class	Source	Feed Water Temp. Gauge	Class A, B ¹	Manufacturer (http://www.miepl.com/Product.aspx?Subcategory_ID=3&Product_ID=67)	Steam Temperature gauge	Class 1 (+/- 1%)	Manufacturer http://www.tempsensindia.com/catlog/master-sensor.pdf	Steam Pressure gauge	Maximum accuracy class 4%	http://www.wika.co.in/upload/DS_IN0002_GB_1372.pdf	Steam flow meter	+/-3%	Manufacturer (http://www.manasmicro.in/pdf/orifice-flow-meter.pdf)
Monitoring Equipment	Accuracy Class	Source																
Feed Water Temp. Gauge	Class A, B ¹	Manufacturer (http://www.miepl.com/Product.aspx?Subcategory_ID=3&Product_ID=67)																
Steam Temperature gauge	Class 1 (+/- 1%)	Manufacturer http://www.tempsensindia.com/catlog/master-sensor.pdf																
Steam Pressure gauge	Maximum accuracy class 4%	http://www.wika.co.in/upload/DS_IN0002_GB_1372.pdf																
Steam flow meter	+/-3%	Manufacturer (http://www.manasmicro.in/pdf/orifice-flow-meter.pdf)																

¹ http://www.omega.co.uk/temperature/pdf/pt100_tolerance.pdf

(Class A = $\pm(0.15 + 0.002 \cdot t)$ °C or 100.00 $\pm$ 0.06 at 0°C

Class B = $\pm(0.3 + 0.005 \cdot t)$ °C or 100.00 $\pm$ 0.12 at 0°C)

Finding:	CAR 4.2.4
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and VT assessments (#2, #3, etc.) shall be added.</i>	Revised emission reduction sheet and monitoring report is now submitted to verification team. In Section 3.2 of the revised monitoring report project proponent has included the accuracy class^{/TS/} of the monitoring equipments (Feed Water Temp. Gauge; Steam Temperature gauge; Steam Pressure gauge and Steam flow meter) as per manufacturer's specification. Further for steam pressure and steam flow meter accuracy class is as per manufacturer's detail which is correct. In revised emission reduction sheet project proponent has conservatively applied the maximum permissible error i.e. 1% for enthalpy calculation for feed Water Temperature. Error applied by the PP is accepted to VT as this is conservative then the accuracy class B (0.8% at 100 °C) and actual observed value as per calibration certificate which is 0.9%. While, for steam temperature project proponent has conservatively applied the maximum actual observed error i.e. 1.6% for enthalpy calculation. Verification team has verified the meter calibration certificate to ensure that the applied observed error is conservatively applied in emission reduction sheet. Verification team would like to highlight here that for enthalpy calculation of saturated steam project proponent has used the steam temperature for enthalpy calculation in emission reduction sheet. CAR is closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

Final Assessment

The verification team concludes that the emission reduction calculation has been carried out correctly and in line with the validated VCS PD.

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

All the parameters are monitored using the measuring equipments installed at site. The parameters are recorded in the daily log sheet^{/LOG/} by the shift operators under the purview of shift in charge. The plant in charge is responsible for overall recording, completeness and reliability of the recorded data. The steam flow, temperature, pressure and inlet water temperature are recorded on hourly basis as it has been defined in the validated VCS PD^{/VCSPD/}. The periodic calibrations of all the measuring equipments are carried out at the required frequency by competent persons as per the validated VCS PD^{/VCSPD/}. The

quantity of biomass and coal used in the project activity during the monitoring period is measured by the weighing scale which is under the custody of the project proponent and recorded in the daily log sheet^{/LOG/}. The daily log sheets were verified by the verification team during site visit and the values used in the emission reduction calculation are found to be consistent. The calibration certificates^{/CAL/} of the weighing scale are verified and found to be appropriate. The quantity of biomass and coal consumed in the boiler is cross checked from the procurement record for the entire monitoring period and found consistent. The procurement quantity of biomass and coal is recorded in SAP^{/SAP/} from the invoice raised by the suppliers whenever the fuel is received at site. The NCV tests for coal and biomass are carried out by the project proponent in the in-house laboratory whenever the fuel is received at site. The values of NCV are mentioned in the daily log book by the operation personals. The daily log books^{/LOG/} were verified and the values considered for the emission reduction were found to be correct. The test report^{/BOMB-CERT/} of the bomb calorimeter used for the in house NCV test is verified and found to be appropriate. Apart from that in accordance with the validated VCS PD^{/VCSPD/} the project proponent has also carried out the NCV test of biomass and coal in the external laboratory once in six month. The maximum value of coal NCV recorded in the in-house laboratory and external laboratory during the entire monitoring period has been considered for the emission reduction calculation which is more appropriate and accurate. The monthly average values of biomass NCV are used for the calculation which has been assessed by the verification team to be appropriate. The values obtained from the external laboratory test of biomass are compared with the internal laboratory test values and found to be appropriate. In line with the validated VCS PD^{/VCSPD/}, the project proponent has carried out the NCV test of biogas by external laboratory and used the values mentioned there in for the emission reduction calculation. All the biogas NCV test reports^{/NCV-BIOGAS/} are verified by the verification and found to be appropriate.

The calibration of the monitoring equipments including steam mass flow meter, steam temperature and pressure gauge, feed water temperature gauge, weigh bridge, biogas mass flow meter is carried out at the required frequency by the competent personals as per the validated monitoring plan^{/VCSPD/}. The calibration details are incorporated in the monitoring report and the calibration certificates^{/CAL/} are submitted to the verification team. The certificates are reviewed by the verification team and found to be appropriate. The verification team has observed that all the measuring equipments were installed at the time of project commission and were in use till the end the monitoring period. None of the measuring equipment has been found to be replaced during the requested monitoring period. This was confirmed by physical verification of the equipments during site visit e.g. serial number and make etc.

Related Findings

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

Finding:	CAR 4.3.1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Bomb calorimeter calibration date as specified in MR as 07/10/2012 does not match with calibration register.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Bomb calorimeter calibration date has been corrected as 12/10/2012 in the revised MR.
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and VT assessments (#2, #3, etc.) shall be added.</i>	The calibration date of the bomb calorimeter is now correctly included in the revised monitoring report which is now in line with the date included in the calibration register. Further, the calibration reports ^{/BOMB-CERT/} are verified by the verification team and found to be correct. CAR is closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

Final Assessment

The verification team concludes that the quality of the evidences is up to mark and the data used for the emission reduction calculation are reliable and authentic.

4.4 Management and Operational System

Description

The project proponent has formed an organization structure for the purpose of data monitoring, collection, archiving and calibration of the measuring equipments. The project head is responsible for overall functioning and maintenance of the project activity. The responsibility for data record, reliability of data and QA/QC has been vested with the plant in charge. The daily monitored data is recorded by the shift operators under the guidance of shift in charge. The operation department is responsible for the proper functioning of the equipments. The concern persons were interviewed by the verification team to confirm the management operational system followed for the project activity.

Related Findings

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

Final Assessment

The verification team concludes that the management and operational system for the project activity has been adequately defined and implemented in accordance with the validated VCS PD.

5 VERIFICATION CONCLUSION

Gujarat Ambuja Exports Limited has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project “Biomass based steam generation project by Gujarat Ambuja Exports Ltd” located at ELDECO – SIDCUL Industrial Park, Sitarganj, Udham Singh Nagar District, of Uttarakhand, India with regard to the requirements of VCS 3 Standard.

The project activity involves setting up a biomass-based boiler of capacity 30 TPH in the agro processing manufacturing facility of the project proponent. The biogas generated due to anaerobic digestion of wastewater in the plant is also co-fired along with biomass in the boiler. The project reduces green house gas emission by combusting biomass residue available in the region thereby substituting consumption of fossil fuel.

Reporting period: From 01/01/2013 to 31/12/2013 (Including both days)

In the course of the verification 06 Corrective Action Requests (CARs) and 01 Clarification Requests (CLs) were raised. No Forward Action Request (FAR) is raised in this verification.

The verification is based on the draft monitoring report^{/MR/}, revised monitoring report^{/MR/}, the monitoring plan as set out in the validated VCS PD^{/VCS PD/}, emission reduction calculation spreadsheet^{/XLS/} 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 methodology, AMS IC “Thermal energy for the user with or without electricity”.
- 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 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:

Years	Estimation of overall emission reductions (tCO ₂ e)
2013	30,964
Total Emission reduction	30,964 (rounded down)

Vadodara, 04/03/2014



Mr. Pankaj Patel

TÜV NORD JI/CDM Certification Program
Verification Team Leader

Essen, 04/03/2014



Mr. Martin Saalman

TÜV NORD JI/CDM Certification Program
Final Approval

ANNEX 1 REFERENCES

Table Annex 1.1: Documents provided by the project participant

Reference	Document
/BOMB-CERT/	Test certificate of bomb calorimeter used for in house NCV test of biomass and coal dated 12-10-2012 and 09-10-2013.
/CAL/	Calibration Certificates of all the measuring equipments used during monitoring period; • Steam mass flow meter with serial no; 10070322 for the calibration dated 20-03-2012 and 09-03-2013 • Steam temperature gauge with serial no: GAEL/BL/89 for the calibration dated 20-03-2012 and 09-03-2013 • Steam pressure gauge with serial no: 6390 for the calibration dated 20-03-2012 and 19-03-2013 • Feed water temperature gauge with serial no: GAEL/BL/90 for the calibration dated 20-03-2012 and 09-03-2013 • Biogas mass flow meter with serial number 10070323 for the calibration dated 12/09/2008 and 06/09/2011 • Weigh bridge with serial number: 6637 for the calibration dated 08/11/2012 and 08/11/2013.
/CCI/	Commissioning Certificate of the boiler with reference number, CBL/ES/PGS/10 dated 30/01/2010
/INV/	Sample copies of invoices raised by coal & biomass supplier to the project proponent.
/NCV-BIOGAS/	External biogas analysis report containing methane composition dated, 15/01/2013 and 13/07/2013
/MR/	• Monitoring Report of the project, "Biomass based steam generation project by Gujarat Ambuja Exports Ltd", version 1.0 dated 22/01/2014 • Monitoring Report of the project, "Biomass based steam generation project by Gujarat Ambuja Exports Ltd", version 1.1 dated 08/02/2014 • Monitoring Report of the project, "Biomass based steam generation project by Gujarat Ambuja Exports Ltd", version 1.2 dated 18/02/2014 • Monitoring Report of the project, "Biomass based steam generation project by Gujarat Ambuja Exports Ltd", version 1.3 dated 04/03/2014
/LOG/	Daily Log Book / Register / SAP data maintained at site for ; 1. Temperature, pressure and quantity of steam 2. Feed water temperature,

Reference	Document
	3. Biomass and coal procurement/consumption details 4. Biogas generation/consumption details 5. NCV of biomass 6. NCV of coal
/NCVBM/	External laboratory NCV test reports of biomass dated 12/01/2013 and 10/07/2013
/NCVCOAL/	External laboratory NCV test reports of coal dated, 14/07/2012, 12/01/2013 and 10/07/2013
/SAP/	Biomass and coal procurement data maintained in SAP for the entire monitoring period, 01/01/2013 to 31/12/2013.
/TS/	Technical specification of monitoring equipments as per manufacturer's for monitoring equipments i.e. Feed Water Temp. Gauge; Steam Temperature gauge; Steam Pressure gauge and Steam flow meter.
/XLS/	- Emission reduction calculation spread sheet with respect to the monitoring report, version 1.0 dated 22/01/2014 - Emission reduction calculation spread sheet with respect to the monitoring report, version 1.1 dated 08/02/2014 - Emission reduction calculation spread sheet with respect to the monitoring report, version 1.2 dated 18/02/2014 - Emission reduction calculation spread sheet with respect to the monitoring report, version 1.3 dated 04/03/2014

Table Annex 1.2: Background investigation and assessment documents

Reference	Document
/AMS I C/	Approved CDM Methodology AMS I C, version 16: "Thermal energy for the user with or without electricity"
/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 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

Reference	Document
	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
/TS/	Photographs of the equipment name plates taken at project site by the verification team as a proof of technical specification.
/VAL-R/	VCS Validation report of the project titled “Biomass based steam generation project by Gujarat Ambuja Exports Ltd” dated 26/03/2010.
/VER/	Documentations i.e. monitoring report, emission reduction calculation sheet and verification report of the previous (1 st and 2 nd) monitoring period.
VCS	Verified Carbon Standard 3
/VCSPD/	Validated VCS project description of the project, titled “Biomass based steam generation project by Gujarat Ambuja Exports Ltd” dated 25/09/2009.
/VDS-PD-T/	VCS PD Template

Table Annex 1.3: Websites used

Reference	Link	Organisation
/BIOGASDEN SITY/	http://www.biogas-renewable-energy.info/biogas_composition.html	Biogas Renewable Energy
/IPCC/	www.ipcc-nggip.iges.or.jp	IPCC publications
/STEAM/	www.spiraxsarco.com/resources/steam-tables/saturated-steam.asp	Spirax Sarco
/VCS/	www.v-c-s.org	VCSA
/UNFCCC/	http://cdm.unfccc.int	UNFCCC

Table Annex 1.4: List of interviewed persons

Reference	Moi ¹		Name	Organisation / Function
-----------	------------------	--	------	-------------------------

Reference	Moi ¹		Name	Organisation / Function
/IM01/	V	☒ Mr. ☐ Ms	R.K Gupta	Sr. General Manager, GAEL
/IM01/	V	☒ Mr. ☐ Ms	R.P Mathur	Sr. Manager (Utility), GAEL
/IM01/	V	☒ Mr. ☐ Ms	N S Bisht	Dy Manager (ETP), GAEL
/IM01/	V	☒ Mr. ☐ Ms	Lalit Mohan	Asst Manager (Instrumentation), GAEL
/IM01/	T, E	☒ Mr. ☐ Ms	Amit Gupta	Senior Manager (Implementation), EVI
/IM01/	V, T, E	☒ Mr. ☐ Ms	Rohit Garg	Consultant, EVI

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