



BIOMASS BASED POWER GENERATION PLANT AT VILLAGE CHANNU, PUNJAB



Document Prepared By: LGAI Technological Center, S.A. (Applus+ Certification)

Project Title	<i>Biomass Based Power Generation Plant at Village Channu, Punjab</i>
Version	02
Report ID	650

Report Title	<i>Biomass Based Power Generation Plant at Village Channu, Punjab</i>
Client	<i>Universal Biomass Energy Private Limited (UBEPL)</i>
Pages	35
Date of Issue	13/01/2022
Prepared By	<i>LGAi Technological Center, S.A.(Applus+ Certification)</i>
Contact	<i>Campus UAB – Ronda de la Font del Carme, s/n 08193 Bellaterra – Barcelona (Spain) Tel.:+34 93 567 20 08 Fax.:+34 93 567 20 01</i>

	www.appluscertification.com agustin.calle@applus.com carla.debat@applus.com
Approved By	LGA Technological Center S.A. (Applus+ Certification) VVB Technical Manager – Mr. Agustín Calle de Miguel
Work Carried Out By	Pankaj Kumar- Lead Auditor/Technical expert

Summary:

Verification purpose: This project activity generates clean form of electricity through Biomass residue based power source. Universal Biomass Energy Private Limited (UBEPL) has set up a 14.50 MW biomass residue based power project in the Muktsar District, Punjab state of India. The electricity generated from the project activity is supplied to the Indian electricity grid as per Power Purchase Agreement signed with the PP and Punjab State Power Corporation Ltd. (PSPCL).

Start date of the project activity is 30/10/2009. An undertaking has been submitted by PP for double counting confirming that no GHG reduction will be claimed in any other GHG mechanism for current monitoring period. Project activity undergoes continued operation and no major breakdown had taken place except routine maintenance.

This is 2nd monitoring under VCS and covers this activity from 01/03/2011 to 28/02/2017 (inclusive both days). During the Current Monitoring Period the project activity has supplied 473,872 MWh of electricity to the national grid, and thus contributing to the GHG reductions 394,873tCO₂e.

Thus, VCS crediting period is of 10 years. The start date of crediting period is 30/10/2009 and 29/10/2019 is the end date of the crediting period.

A risk-based approach has been followed to perform this verification activity. In the course of verification, 07 Corrective Action requests (CAR), 00 Clarification Requests (CLs) and 01 Forward action requests (FARs) were raised and successfully closed. The review of the Monitoring report and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and PP have provided VVB with sufficient evidence to verify the fulfilment of the stated criteria of VCS.

LGA Technological Center S.A. (Applus+ Certification) (Hereafter referred to as Applus+ Certification) has been appointed by “Universal Biomass Energy Private Limited” to perform the 2nd periodic verification of the “Biomass Based Power Generation Plant at Village Channu, Punjab” under VCS standard 4.1 and guideline version 4.0. The objective of this verification activity is to have an independent third party for the assessment of the project design, monitoring report and Final Verification report and to ensure a thorough assessment of the proposed project activity against the applicable CDM and VCS requirements. In particular;

- the project's baseline is assessed against “AMS-I.D “Grid connected renewable electricity generation” version 15”*
- the project's monitoring plan is assessed against “AMS-I.D “Grid connected renewable electricity generation” version 15”*
- the project's compliance with, the requirements of Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords under decision 3/CMP.1, the annexes to this decision, subsequent decisions and guidance made by COP/MOP & CDM Executive Board and other relevant rules, including the Host Country legislation and sustainability criteria along with VCS guideline 4.0 and standard, version 4.1*

- CDM Validation and Verification Standard for project activities, version 03.0
- CDM Project Standard for project activities, version 03.0
- CDM project cycle procedure for project activities, version 03.0
- VCS standard, version 4.1
- VCS guideline, version 4.0

Verification is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of verified emission reductions (VERs).

The scope of the verification is the independent and objective review of the monitoring report (MR). The MR is reviewed against the relevant criteria (see above) and decisions by the CDM Executive Board and VCS executive board, including the approved baseline and monitoring methodology. The verification was based on the guidance given in the CDM Validation and Verification Standard for the project activities, version 03.0, review against registered PD and Final Validation report, CDM Project Standard for project activities, version 03.0; CDM Project Cycle Procedure for project activities, version 03.0 and VCS program guideline, version 4.0 and standard version 4.1.

The assessment team has employed a risk-based approach to assess the completeness and accuracy of the claims and conservativeness of the assumptions in the MR. The main focus of the assessment team is to identify the significant risks for the project implementation and the generation of VERs. The verification is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the monitoring report combined.

The only purpose of the verification is its usage during the issuance process as part of the VCS project cycle. Therefore, LGAI Technological Center S.A. (Applus+ Certification) can't be held liable by any party for decisions made or not made based on the verification opinion, which will go beyond that purpose.

The verification has been planned and organized to achieve a Reasonable Level of assurance as per the requirement of VCS. No sampling procedure applied for remote audit or document verifications. The entire documents checked/plant verification conducted to arrive at positive verification conclusions.

1 INTRODUCTION	5
1.1 Objective	5
1.2 Scope and Criteria	5
1.3 Level of Assurance	6
1.4 Summary Description of the Project	6
2 Verification Process	7
2.1 Method and Criteria.....	7
2.2 Document Review	9
2.3 Interviews	9
2.4 Site Inspections	10
2.5 Resolution of Findings	11
2.5.1 Forward Action Requests	12
2.6 Eligibility for Validation Activities.....	12
3 Validation Findings	13
3.1 Participation under Other GHG Programs	13
3.2 Methodology Deviations.....	13
3.3 Project Description Deviations	13
3.4 Grouped Project.....	13
4 Verification Findings	14
4.1 Project Implementation Status.....	14
4.2 Safeguards.....	16
4.2.1 No Net Harm	16
4.2.2 Local Stakeholder Consultation.....	18
4.3 AFOLU-Specific Safeguards	18
4.4 Accuracy of GHG Emission Reduction and Removal Calculations	18
4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals..	21
4.6 Non-Permanence Risk Analysis	22
5 Verification CONCLUSIONS	22
APPENDIX I: DOCUMENTS REVIEWED DURING VERIFICATION	25
APPENDIX 2: corrective action requests, Clarification requests AND FORWARD action requests (CAR/CL/FAR)	27
APPENDIX 3: Competence of team members and technical reviewers	32
APPENDIX 4: Abbreviations	34
APPENDIX 5: Calibration details	35

1 INTRODUCTION

1.1 Objective

LGAI Technological Center S.A. (Hereinafter referred as Applus+ Certification) has been appointed by “Universal Biomass Energy Private Limited (UBEPL)” to perform the 2nd periodic verification of the project entitled “Biomass Based Power Generation Plant at Village Channu, Punjab” under VCS standard version 4.1 and guideline version 4.0. The objective of this verification activity is to have an independent third party for the assessment of the project design, monitoring report and final verification report and to ensure a thorough assessment of the proposed project activity against the applicable CDM and VCS requirements. In particular;

- the project's baseline is assessed against “AMS-I.D “Grid connected renewable electricity generation” version 15”
- the project's monitoring plan is assessed against “AMS-I.D “Grid connected renewable electricity generation” version 15”
- the project's compliance with the requirements of Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords under decision 3/CMP.1, the annexes to this decision, subsequent decisions and guidance made by COP/MOP & CDM Executive Board and other relevant rules, including the Host Country legislation and sustainability criteria along with VCS guideline, version 4.0 and standard version 4.1
- CDM Validation and Verification Standard for project activities, version 03.0
- CDM Project Standard for project activities, version 03.0
- CDM project cycle procedure for project activities, version 03.0
- VCS standard, version 4.1
- VCS guideline, version 4.0

Verification is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of estimated verified emission reductions (VERs).

1.2 Scope and Criteria

The scope is defined as an independent and objective review of the Monitoring report (MR) prepared as per the registered PD and registered approved methodology AMS-I.D “Grid connected renewable electricity generation” version 15. The MR is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board and VCS standard, version 4.1 and guideline version 4.0, including the approved baseline and monitoring methodology AMS-I.D “Grid connected renewable electricity generation” version 15. The verification was based on the requirements in the CDM validation and verification standard for project activities, Version 03.0, CDM Project Standard for project activities, version 03.0, CDM

project cycle procedure for project activities, version 03.0 and VCS program guideline, version 4.0 and standard version 4.1

The verification is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the Monitoring report. In line with Guidelines for Application of materiality in verifications, the verification team has conducted a complete verification of all the information presented in the monitoring report and data monitored as presented in the emission reduction calculation spread sheet. It invoices follows the paper trail back to the raw data such as meter reading records and invoices. There are no material errors, overestimation of ER, omission or misstatement. The verification team has reviewed all the documents like commissioning certificates, Joint Balance Sheet, invoices etc.

1.3 Level of Assurance

The verification has been planned and organized to achieve a Reasonable Level of assurance as per the requirement of VCS. The entire documents checked/Power plant verification conducted to arrive at positive verification conclusions

1.4 Summary Description of the Project

The main purpose of this project activity is to generate clean form of electricity through Biomass residue based power source. Universal Biomass Energy Private Limited (UBEPL) has set up 14.50 MW of biomass residue based power project in Muktsar District, Punjab state of India. The electricity generated from the project activity is supplied to Indian electricity grid. The commissioning dates and locations of all plant is mentioned in section 4.1.

The Project activity is a Biomass residue based power energy, a renewable energy generation and the electricity generated by the project activity is exported to the Indian electricity grid. The project will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. The PP has entered into long term power purchase agreement with Punjab State Power Corporation Ltd. (PSPCL). The electricity generated by the project activity is supplied to the Indian electricity grid.

During the Current Monitoring Period from 01/03/2011 to 28/02/2017 (First and last date included) the project activity has supplied 473,872 MWh of electricity, and thus contributing to the GHG reductions 394,873 tCO₂e.

2 VERIFICATION PROCESS

2.1 Method and Criteria

Verification Process: The project assessment is based on the Clean Development Mechanism Validation and Verification Standard for project activities, version 03.0 and VCS standard 4.1 and guideline, version 4.0 and is conducted using standard auditing techniques to assess the correctness of the information provided by the project participants. Before the assessment begins, members of the team covering the technical scope(s), sectoral scope(s), and relevant host country experience for evaluating the VCS project activity are appointed.

Once the project is received by the assessment team, the members of the assessment team carried out:

- I. **A desk review of the monitoring Report against the registered PD;**
- II. **Follow-up interviews with project participant;**
- III. **The resolution of outstanding issues and the issuance of the final verification report and opinion.**

The prepared verification report and other supporting documents then undergo an internal quality control at the HQ (Accredited office) before being submitted to the VCS executive board.

In order to ensure transparency, assumptions must be clear and stated explicitly and background material must also be referenced. LGAI Technological Center, S.A. (Applus+ Certification) has developed a specific checklist customized for the project. The checklist demonstrates, in a transparent manner, the project criteria (requirements), discussion on each criterion by the assessment team, and the results from verifying the identified criteria.

Appointment of the assessment team

According to the sectoral scope / technical area and experience in the sectoral or national business environment, LGAI Technological Center S.A. (Applus+ Certification) has composed a project assessment team in accordance with the appointment rules in the internal Quality Management System of LGAI Technological Center S.A. (Applus+ Certification).

The composition of audit team shall be approved by the LGAI Technological Center S.A. (Applus+ Certification) ensuring that the required skills are covered by the team.

The four qualification levels for team members that are assigned by formal appointment rules are as presented below:

- **Lead Auditor (LA).**
- **Auditor (A) / Auditor in Training (AiT).**
- **Technical Expert (TE).**

- **Technical Reviewer (TR).**

The sectoral scope / technical area knowledge linked to the applied methodology/ies shall be covered by the assessment team.

Name	Role	SS Coverage	TA Coverage	Financial aspect	Host country experience
Pankaj Kumar	LA/TE	YES	YES	NA	YES
Denny Xue	TR	YES	YES	NA	NA

The complete list of CVs is included as Appendix 3 of this report.

Document review

The Monitoring Report version 1 submitted by the PP was reviewed against the approved methodology, registered PD, final validation report and other relevant criteria to verify the correctness, credibility, and interpretation of the presented information. Furthermore, a cross-check between information provided and information from other sources has been done. A complete list of all documents and evidence material reviewed is included in this report below in appendix 1.

Follow-up interviews

A remote audit was conducted by LGAI Technological Center S.A. (Applus+ Certification) who performed interviews, telephone conferences with project stakeholders to confirm selected information and to resolve issues identified in the document review. The detail is provided in this report in the below sections.

Resolution of Clarification and Corrective Action Request

The objective of this phase of the Verification was to resolve the requests for corrective actions and clarification and any other outstanding issues which need to be clarified for Applus+ Certification positive conclusion on the Monitoring report. The Corrective Action Requests and Clarification Requests raised by Applus+ Certification were resolved during communications between the Client and Applus+ Certification to guarantee the transparency of the verification process, the concerns raised and responses given are summarized below in the Appendix 2.

The final MR Version 02 submitted by PP on 05/01/2022 serves as the basis for the final assessment presented. Additional changes to the project during the verification process are not considered to be significant with respect to the main CDM/VCS objectives. The two CDM/VCS main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country

Internal quality control

As final step of a verification of the final documentation including the final verification report and the checklist have to undergo an internal quality control by the technical review committee, i.e. each report has to be finally approved either by the head of the technical review committee

or the deputy. In case one of these two persons is part of the assessment team approval can only be given by the other one to avoid any conflict of Interest.

After confirmation of the project owners the positive verification opinion and relevant documents are submitted to the VCS secretariat through the VCS web-platform.

2.2 Document Review

The details of the document observed during the verification process are listed below in appendix 1 of this report.

2.3 Interviews

A remote audit was conducted for the project activity on 08/01/2022. Remote audit was conducted due to ongoing COVID-19 pandemic situation in the entire state of India. Taking into account the rules of relevant national and local authorities (local to the DOE offices as well as to locality of the site visits), World Health Organization (WHO) recommendations, policies of the DOE and other relevant travel restrictions and guidance (for example, a requirement to self-isolate upon return). Moreover, The VCS Program does not explicitly mandate site visits as part of the validation and verification process, only that VVBs must achieve a reasonable level of assurance on all validations and verifications (per Section 4.1.2 of the VCS Standard, v4.1).

The VVB has taken alternative measures to reach reasonable level of assurance and conducted remote audit through Skype/Telephone with site personal & consultant (refer section 2.3) with the PP representative. This is also in line with the COVID-19 travel guidance for projects of VERRA.

Technical details & metering/monitoring arrangement verified through onsite photographs/name plates and calibration certificates shared by PP. All the documents were cross checked to ensure conservative estimation of emission reduction.

During the remote audit, the PP representatives were questioned about the implementation of the project activity. Several topics like the verification of commissioning date of meters, the generation, recording, and monitoring of the data and the error accountability were discussed. To cross check the information provided by PP, various documents like technical specifications, commissioning certificates, PPA, JMR sheets, invoice, calibration certificates, s, etc. were also verified. The names of the persons interviewed during remote audit through skype & telephonic interview is given below;

Organization	Name of Persons/Designation	Topics discussed	Team Member
Universal Biomass Energy Private Limited (UBEPL)	Mr. Jasbir Singh	Project activity implementation Operation, Calibration, O&M practices, JMR etc. LSC mechanism Mechanical maintenance Electrical maintenance	Pankaj Kumar

Organization	Name of Persons/Designation	Topics discussed	Team Member
		Project description Invoicing practices	
Universal Biomass Energy Private Limited (UBEPL)	Mr. Abhishek Garg	Project activity implementation Operation, Calibration, O&M practices, JMR etc. LSC mechanism Mechanical maintenance Electrical maintenance Project description Invoicing practices	
EKI Energy	Saroj Sahoo, Consultant (EKIESL)	MR, ER calculations etc.	

During the remote audit, the PP representatives/ O & M personal were questioned about the implementation of the project activity. Several topics like the verification of commissioning date of meters, the generation, recording, and monitoring of the data and the error accountability were discussed. Various documents like the log sheets, plant records, on-site Photographs includes TG set name plates, meter specifications, key technical specifications of the major equipment like Boiler, Turbines etc. provided to assessment team were verified on skype video call to establish the current status and the implementation of the Project Activity.

2.4 Site Inspections

Remote Audit: 08/01/2022				
No.	Activity performed on-site	Site location	Date	Team member
1.	Assessment team checked the implementation of the project, Baseline emission, Emission reduction calculation, technical description of the project and Monitoring. Assessment team also checked that whether the monitoring plan as described in the VCS PD is actually practised onsite. Also assessment team checked any change in host country criteria which may affect the baseline of the project activity.	Remote audit (Through Skype)	08/01/2022	Pankaj Kumar

2.5 Resolution of Findings

The objective of this phase of the verification was to resolve the requests for corrective actions and clarification and any other outstanding issues which need to be clarified for LGAI Technological Center S.A. (Applus+ Certification)'s positive conclusion on the project design and Monitoring report. The Corrective Action Requests and Clarification Requests raised by LGAI Technological Center S.A. (Applus+ Certification) were resolved during communications between the Client and LGAI Technological Center S.A. (Applus+ Certification) to guarantee the transparency of the verification process, the concerns raised and responses given are summarized below in the appendix 2.

The final MR Version 02 submitted by project owners on 05/01/2022 serves as the basis for the final assessment presented. Additional changes to the project during the verification process are not considered to be significant with respect to the main CDM/VCS objectives. The two CDM/VCS main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country.

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Project design document and Monitoring report	00	00	00
Description of project activity	00	00	00
Application of selected baseline and monitoring methodology and selected standardized baseline			
- Applicability of methodology and standardized baseline	00	01	00

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
- Deviation from methodology	00	00	00
- Clarification on applicability of methodology, tool and/or standardized baseline	00	00	00
Project boundary	00	00	00
Establishment and description of baseline scenario	00	00	01
Demonstration of additionality	00	00	00
Emission reductions	00	01	00
Calibration details	00	01	00
Monitoring plan	00	01	00
No Net harm assessment	00	00	00
Local stakeholder consultation	00	00	00
Others (please specify)- -Matter related to double counting Declaration - ER Sheet -PPA Agreement -Country's DNA	00	03	00
Total	00	07	01

The list of findings and their resolution is presented in appendix 2 of this report.

2.5.1 Forward Action Requests

This is 2nd periodic verification of the project activity and one FAR was raised from previous validation or/and during this verification process.

2.6 Eligibility for Validation Activities

This section is not applicable for present verification, as Applus+ Certification holds the accreditation for Validation of projects under this Sectoral Scope.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

The project activity was registered under VERRA (<https://registry.terra.org/app/projectDetail/VCS/650>) and VERs were issued from previous monitoring periods under VCS mechanism. As per MR and undertaking provided, PP would not consider the credit from any other mechanism for the current monitoring plan. The undertaking is provided to confirm that there is no any double accounting for current monitoring period. Further, Assessment team confirms that the project activity is not participating in any other form of environmental credits.

3.2 Methodology Deviations

The project activity used AMS-I.D “Grid connected renewable electricity generation” version 15 which is as per the registered VCS PD and thus no deviation is sought regarding the methodology. The project complies with all the requirement of the methodology and thus deviation to the methodology is not a requirement for the present project activity.

3.3 Project Description Deviations

This is 2nd monitoring period and no deviation in project description observed in previous verifications, and no deviation applicable for current monitoring period as checked from VERRA website (<https://registry.terra.org/app/projectDetail/VCS/650>)

3.4 Grouped Project

The project does not involve any addition of new project activity and thus the project do not fall under grouped project.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

During remote audit it was concluded that the project is implemented as per the instruction of the VCS PD and this is verified from the commissioning certificate. During the current monitoring period it was observed that no unforeseen situation evolved which can impact the operation of the project activity. The same was verified through the breakdown summary sheet of the project activity. Scheduled maintenance was carried out as per the instruction of the manufacturer and the same is acceptable to the assessment team.

Project location is confirmed by the assessment team through interview with PP during remote audit and assessment of monitoring report. Assessment team also checked the technical details of the project site containing latitude and longitude of the project site and confirmed that the details as mentioned in the registered PD are correct.

The coordinates of project activity site, Village: Channu (Tehsil Malout) are:

Latitude: 30 degree 07' 15.95"N to 30 degree 07' 21.38"N

Altitude: 164 Metres above mean sea level.

The technical specifications have been verified during remote audit as well as with the technical specifications of TG sets/ Boilers and also cross checked from the technical manual of the Manufactures.

Technical specification of boiler and turbine generator confirmed as follows:

Major Technical Parameters of the Boiler

Description	Parameters
No. of boilers	One (1)
Makers	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)	70 TPH
Steam pressure at main steam stop valve outlet	67 kg/cm ² (g)
Steam temperature at main steam stop valve outlet	475 +/- 5 deg C.
Feed water temperature at the economizer inlet	126 deg C
Design code for pressure parts	IBR IWT-6212

Major Technical Parameters of the Steam Turbine Generator

Description	Parameters
No of Turbine	One (1)
Makers	Qingdao Jieneng Power Station Engineering

	Co., Ltd (QJPS)
Type	Condensing
Rated capacity of turbine	14.5 MW with 10TPH extraction at 2.5 ata
Steam conditions at turbine inlet pressure (g)	64.5281 kg/cm ²
Temperature	485 deg C.
Condenser operational pressure	0.0098 M Pascal
Designed temperature drop in the cooling tower (deg C)	10
Rating at the generator terminals (MW)	14.50
Electrical generator	Jinan Power Equipment Factory

The start date of the project is 30/10/2009. This is connected to Indian grid in line with the approved VCS PD and VCS Standard version 4.1.

The assessment team confirmed through interview with O&M personal during site visit that there are no changes into the project design during this monitoring period. It was found that the monitoring plan was implemented as per the requirement of the VCS PD & approved monitoring Plan and applied methodology AMS-I.D Version 15 “Grid-connected electricity generation from renewable sources”. The organisational role and responsibility as mentioned in the registered VCS PD is followed onsite. The calibration of energy meter is done as per the required frequency mentioned in the VCS PD. All the emergency preparedness as mentioned in the registered VCS PD is followed onsite and no discrepancies were found regarding the same.

The Project participant contribution from the project activity towards sustainable development in accordance to host country as explained below:

Social well-being:

- The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.

Economic well-being:

- **The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state.**

The project is not involved in any other form of GHG emission program and VERs generated from this verification will not be used for other trading program to avoid any kind of double counting. The same is confirmed by the PP during the verification remote audit Assessment team also conducted independent review regarding the same and found that the statement of the PP is accurate and project is not involved in any other kind of GHG trading for the present verifications/monitoring period.

The assessment team observed that the project is in line with the registered PD and applied methodology and thus no clarification/deviation is sought. 07 CAR was raised during the verification process. Please refer below Appendix 2 for the detail closure of the CAR

Assessment team confirms following during the verification remote audit:

1. Start date of the project is 30/10/2009 (as per VCS PD).
2. An undertaking letter dated: 03/01/2022 has been submitted by PP for double counting with any other GHG program. PP also has given a written declaration that project has not claimed other form of GHG credit for the concerned monitoring period.
3. Assessment team confirms that this is the 2nd monitoring under VCS and covers the activity from 01/03/2011 to 28/02/2017 (inclusive of both dates). Thus, VCS crediting period should be maximum of 10 years till end date of VCS crediting period. 30/10/2009 is the start date and crediting period end on 29/10/2019.
The GHG credits from 01/03/2011 to 28/02/2017 will be claimed under VCS only. At any point of time during the crediting period, the project proponent will abide by the "Double Counting".
4. Assessment team checked and found that the Project proponent of the project activity is as below for the current monitoring period:

Organization name	Universal Biomass Energy Private Limited (UBEPL)
Contact person	Mr. Jasbir Singh
Title	Director
Address	Giddarbaha-Lambi Road, Village: Channu District: Muktsar, Punjab Post-152107
Telephone	+911637241501
Email	universalbiomass@rediffmail.com

VVB also confirmed that EKIESL is other entity as verified from VERRA registry.

5. The quantified emission reduction calculation for the monitoring period is correct and conservative. Assessment team also compared actual VER with the estimated VER and found that the actual VER is 394,873 tCO₂e which is 12.20% less than the estimated emission reduction 449,756 tCO₂e during this monitoring period which is due to climatic conditions and low PLF attained by the biomass residue based power plant during the current monitoring period.

4.2 Safeguards

4.2.1 No Net Harm

No potential environment or socio-economic matter was found during the discussion with PP during site visit. The project is renewable energy project and thus no negative impact observed onsite as confirmed by PP during remote audit.

The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean, renewable energy technology for electricity generation. The report on “Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects” prepared by MNRE dated September 2013. This report clearly mentioned that biomass residue based power project activity operations do not result in direct air pollution, noise pollution.

However, assessment team still conducted the No net harm assessment for some of the parameters and the result is described below:

SL.NO	Indicator	Assessment team opinion
1	Air quality	The project generates clean energy which replaces the fossil fuel intensive electricity generation. PP has installed Electro Static Precipitators (ESP) to reduce the air pollution and all emission from stacks are in line with guidelines prescribed by State Pollution Control Board. Adequate measures were taken to mitigate the envisaged impacts like spraying water on the road side to reduce dust level, etc. This was confirmed by the local stakeholders. Therefore, it is validated that mitigation measures were robustly implemented on ground for air quality issues project will have a positive impact on air quality.
3	Soil condition	Fly ash generating from power plant is disposed in line with SPCB guidelines and Fly ash notification. Fly ash is being used for brick making which was confirmed during remote audit It was also confirmed that, the vegetation done at site helps for soil erosion. The same is confirmed during the discussion with stakeholders during remote audit. Therefore, it can be concluded that the project has no effect on soil conditions during its operation because it has no waste coming out.
4	Ecology	VVB confirmed that project area is not situated in ecologically sensitive zone or any biodiversity hotspots. No water body near to project site, hence no harm caused to aquatic ecology as well.
5	Employment Generation	The project activity employed local population as skilled workers as well as security guards which were envisaged during the validation remote audit. The personnel employed by the project activity are also provided trainings and exposed to various awareness programs therefore a positive indicator has been accepted.

4.2.2 Local Stakeholder Consultation

All the stakeholders are happy with the implementation and operation of the project activity and no negative comments envisaged for the project activity. There was no change in project description from the VCS PD. Complaint/suggestion/feedback register is maintained at site as a part of ongoing communication with stakeholders in line with clause 3.16.17 of VCS Standard, ver. 4.1 and appropriate actions taken time to time by PP. Assessment team confirmed the same during remote audit and document review i.e. grievance register etc.

4.3 AFOLU-Specific Safeguards

Not applicable

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

Means of verification	The verification team assessed whether the data and calculations of GHG emission reductions achieved resulting from the MR. The verification team has checked whether calculations of baseline GHG emissions, project GHG emissions and leakage GHG emissions have been carried out in accordance with the formulae and methods described in the monitoring plan of the VCS PD and MR.
Findings	CAR 06 was raised and closed successfully.
Conclusion	Baseline emission: The baseline Emissions for a given year is calculated by multiplying the energy baseline (EB) with the regional grid emission factor of the grid. Formula Used:- $BE_y = EG_y \times EF_y$ Where; BE_y = Baseline emission in tCO₂e EG_y = Net electricity supplied per annum in the project activity in MWh EF_y is the CO₂ emission factor of the southern grid Ex-ante parameters" The grid emission factor i.e. 0.84 tCO₂/MWh is sourced from the VCS registered PDD. The same is used for calculation of emission reductions. In addition to this, other ex-ante parameters which are sourced from the VCS registered PDD are provide below: $EF_{grid,OM,y}$ - Operating Margin CO₂ emission factor in year y. The value monitored is 1.01 tCO₂/MWh. $EF_{grid,BM,y}$ - Build Margin CO₂ emission factor in year y. The value monitored is 0.68 tCO₂/MWh.

	Monitored Parameters EG_{facility,y} Quantity of net electricity generation supplied by the project plant/unit to the grid in year y in MWh. The value monitored is 473,872 MWh. The verification team has checked the entire monthly Joint metering report applicable for the monitoring period as per the project activity applied for verifications and found the monitoring parameters are monitored and recorded as per the monitoring plan in the registered VCS PD. The net electricity supplied by project activity to grid is calculated by subtracting total electricity imported by project from grid from total electricity delivered by project to grid. The verification team has crosschecked the emission reduction sheet and monitoring report data with the Joint balance sheet and sales invoice bills and found all the values are matching. Parameters $Q_{y,cottonstalk}$, $Q_{y,mustardstalk}$, $BF_{k,y,cottonstalk}$, $BF_{k,y,mustardstalk}$ also monitored and its value cross checked with the plant log/ records and found to be correct and values in the ER sheet are consistent with the plant records. These parameters are not used for baseline emission calculation. Project emissions: The emission due to transportation of biomass is considered as project emission in the project. The emission due to transportation is calculated based on the number of trips, average round trip distance, vehicle mileage and the emission factor of diesel. The possible project emissions account only due to transportation of biomass residue to project site. The following equation is used to calculate the total project emissions of the project activity during the monitoring period: $PET_y = N_y * AVD_y * EF_{km,CO_2}$ Where, PET_y is CO₂ emissions during the year y due to transport of the biomass residues to the project plant(tCO₂/yr) - N_y is Number of Truck trips per during the monitoring period - AVD_y is Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the monitoring period (km) - EF_{km,CO₂} is Average CO₂ emission factor for the trucks measured during the year, y(tCO₂/km) All the above parameters to calculate project emission determined from plant records which maintains the record of no. of trucks and average round trip distance covered by trucks for transportation of biomass.
--	--

The calculation of project emission is tabulated as below.

Year	Total number of trucks received	Avg. distance travelled km/trip	Project Emission (PE _y) (tCO ₂)
2011	9498	79.5	333
2012	12198	78.4	421
2013	16404	80.4	581
2014	17545	78.0	603
2015	15672	79.1	546
2016	18834	77.2	640
2017	1438	82.0	52
Total	91589		3,176

The estimated project emission in the monitoring period is PE_y = 3,176tCO₂.

All the input values considered for calculation of project emission due to transportation of biomass are provided in the ER sheet Which was verified by VVB as correct.

Leakage: According to AMS-I.D., the leakage is zero since the technology utilized is new and not transferred from another project activity.

In line with the attachment C to Appendix B, VVB confirmed that the project activity utilizes only cotton stalk and mustard stalk (biomass residue), the implementation of project activity did not lead to shifting of pre-project activities.

The only possible source of leakage in the project activity can be competing uses of biomass - The biomass residue may in the absence of the project activity be used elsewhere, for the same or a different purpose. VVB verified the biomass residue assessment report prepared by 3rd party .The biomass assessment study demonstrates that the quantity of available biomass in the region is larger than 25% after considering the biomass residue utilization in the area; hence this source of leakage is neglected.

LE_y = 0

Thus, Emission Reductions are:

The emission reductions (ER_y) by the Project activity during a given year y is the difference between baseline emissions (BE_y), project activity emissions (PE_y)

	and leakage, as follows $ER_y = BE_y - PE_y - LE_y$ $= 398,049 - 3,176 - 0$ $= 394,873$ VVB confirmed that GHG reductions and removals have been quantified correctly and in line with monitoring procedure in VCS PD and applied methodology.
--	--

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Means of verification	The verification team checked the break down log for the monitoring period. During the verification of site visit, the energy meters are also checked. The Calibration details of the monitoring meters are also checked with calibration certificates.
Findings	CAR 07 was raised and closed successfully.
Conclusion	The project activity has installed the metering system which includes the main system and a back-up system that measure, record and control the various monitoring parameters. The back-up system would be used in case of failing of the main meter. The latest state -of art monitoring and control equipment that measure, record and control the various monitoring parameters. These meters record parameters including electricity exported & imported. Moreover, the meters are located at the grid connected point are of accuracy class of 0.2s for new meters replaced on 05/03/2014. Previous meters have accuracy class of 0.5s . Accuracy class of new meters is more conservative than previous one, hence accepted by verification team for project activity applied for verification. The Net electricity supplied to the grid is then calculated from export and import values. The electricity Export, Import and Net electricity exported to the grid are cross checked from the sales invoices raised to respective a state utility which is in line with Methodology requirement for small scale project activity. Hence assessment team confirmed that the value of net electricity exported to the grid as used in emission reduction calculation is correct. The main meter reading is taken jointly on a fixed day of every month for the preceding month at the delivery point and signed by the representatives of PSPCL and PP representative. In the event of failure of main meter, the check meter will be used in monitoring the electricity data. Calibration of all the meters is done as per the VCS PD. Assessment team has checked the calibration certificate and found that meters are calibrated as per calibration frequency mentioned in VCS PD. Meters replaced on 05/03/2014

	hence no delay in calibration. It is reported that the data will be kept for 2 years following the end of the crediting period or till the last issuance of VERs for the project activity whichever occurs later. The responsibilities and authorities of project management, data handling and recording, measurement methods and QA/QC procedure have been systematically established and formalized and the same was verified during the site remote audit. Site visit and interview with site personnel also confirms that the operational and organizational chart as mentioned in VCS PD is as per the site practice and thus assessment team confirms that the details are correct. The break down log is checked and found that the plant undergone scheduled maintenance and break down. VVB checked the breakdown and routine maintenance log book and confirmed that it does not have any impact on project design and monitoring procedures. No unforced error observed. VVB confirmed that data/ information used for determining GHG reductions and removals were sufficient in quantity and of appropriate quality. Calibration certificates of meters/ QA/QC procedure checked and found to be appropriate.
--	---

4.6 Non-Permanence Risk Analysis

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Not applicable	Not applicable	Not applicable	Not applicable

5 VERIFICATION CONCLUSIONS

Applus+ Certification has been engaged by Universal Biomass Energy Private Limited (UBEPL) to perform the 2nd periodic verification of the “Biomass Based Power Generation Plant at Village Channu, Punjab”

The management of the project participant/owner is responsible for the preparation of the GHG emissions data and the reported/estimated GHG emissions reductions on the basis set out within the project’s Monitoring Plan in the VCS PD and MR and the approved methodology AMS-I.D Version 15 “Grid-connected electricity generation from renewable sources”.

Our Verification approach was based on the requirements as defined under the Kyoto Protocol, Marrakesh accord, as well as those defined by the CDM Executive Board and VCS Standard version 4.1. Our approach is risk-based, drawing on an understanding of the risks associated

with reporting GHG emissions data and the controls in place to mitigate these. The verification can confirm that:

- the project is operated as planned and described in the project document;
- the monitoring plan is as per the applied methodology;
- the monitoring process in Monitoring Report is as per the PD
- the development and maintenance of records and reporting procedures are in accordance with the monitoring plan
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements.
- A reasonable level of assurance was achieved during the verification.
- No limitation observed for the present verification

Verification period: From 01/03/2011 to 28/02/2017 (first and last date included).

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions removals (tCO ₂ e)	or	Project emissions removals (tCO ₂ e)	or	Leakage emissions (tCO ₂ e)	Net emission reductions removals (tCO ₂ e)	GHG or
01-March-2011 to 31-December-2011	49,957		333		0	49,624	
01-January-2012 to 31-Decemehr-2012	61,020		421		0	60,599	
01-January-2013 to 31-December-2013	61,037		581		0	60,456	
01-January-2014 to 31-December- 2014	67,056		603		0	66,453	
01-January-2015 to 31-December- 2015	72,811		546		0	72,265	
01-January-2016 to 31-December- 2016	71,710		640		0	71,070	
01-January-2017 to 28-February- 2014	14,458		52		0	14,406	
Total	398,049		3,176		0	394,873	

The estimated emission reduction achieved from the project activity for the current monitoring period is 449,756 tCO₂e, whereas actual emission reductions achieved are 394,873 tCO₂e, which is 12.20% less than the estimated emission reductions. This is due to climatic conditions and less PLF attained by the plant during the current monitoring period. As actual VERs are less than estimated value for the MP, VVB confirmed the value is conservative and acceptable.

APPENDIX I: DOCUMENTS REVIEWED DURING VERIFICATION

No.	Author	Title	References to the document	Provider
1.	NA	Commissioning certificate	Commissioning of the biomass residue based plant	Project participant
2.	NA	Contract of the other entity with the DOE	Contract of the other entity with the DOE	Project participant
3.	NA	Technical specifications	Technical specifications of Biomass residue based Power projects manufactured	Project participant
4.	NA	Power Purchase agreement for the project activity	PPAs	Project participant
5.	NA	Approved Joint VCS PD&MR	--	VERRA
6.	NA	VCS validation report	--	VERRA
7.	NA	Initial Monitoring report Final Monitoring report	Version 01, dated 07/12/2021 Version 02, dated 05/01/2022	Project participant
8.	NA	Emission Calculation sheet	Version 1, dated 07/12/2021	Project participant
9.	NA	Emission Calculation sheet	Version 02, dated 05/01/2022	Project participant
10.	NA	Tools/ guidelines used in the project activity - UNFCCC Methodology: AMS I.D Version 15 - VCS verification report template Version 4.0 - VCS Standard, version 4.1	UNFCCC CDM web site VERRA website	UNFCCC & VERRA
11.	NA	Calibration details of the project activity undergoing verification	Calibration certificates	Project participant
12.	NA	JMR records+ Invoices for the	Joint balance sheet copies	Project

No.	Author	Title	References to the document	Provider
		complete monitoring period	Sales Invoices for the complete Monitoring period	participant
13.	NA	PPA Agreements	Power purchase Agreement between PP and PSPCL dated 24/01/2011	Project participant
14.	NA	Break down details of the complete monitoring period	Log Sheet	Project participant
15.	NA	VCS Declaration	Declaration dated 03/01/2022 from PP for Participation under Other GHG Programs	Project participant

APPENDIX 2: CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS (CAR/CL/FAR)

CAR ID	01	Section no.	1.1/1.2/1.11	Date: 03/01/2022
Description of CAR				
1. PP is requested to mention start date and end date of the monitoring period of the project activity in the excel sheet. 2. PP shall mention correct nomenclature of grid throughout the MR as now NEWNE grid is no more existing and integrated into national grid. 3. PP is requested to check typo errors in section 1.2 of the monitoring report. 4. The link provided to verify the methodology of the project is not functional. Hence, PP is requested to provide functional weblink.				
Project participant response				Date: 05/01/2022
1. The start and end date of the monitoring period is now included in the ER sheet. 2. The name of the grid is now corrected in the revised MR being submitted. 3. The same is now corrected. 4. The functional weblink is now provided.				
Documentation provided by project participant				
ER sheet, Revised MR Version 02				
DOE assessment				Date: 07/01/2022
1. PP has now provided the duration of the monitoring period of the project in the ER sheet. The same is checked by VVB and found correct. Hence, comment closed. 2. PP has made the revision in the MR Version 02 dated 05/01/2022. Hence, comment closed. 3. PP has made requisite revision in Sec. 1.2 of the MR Version 02 dated 05/01/2022. Hence, comment closed. 4. PP has now provided the functional weblink of the applied methodology to the project activity. The same is checked by VVB and found correct. Hence, comment closed.				

CAR ID	02	Section no.	1.10	Date: 03/01/2022
Description of CAR				
PP shall provide an undertaking for no double counting of emission reduction in any other mechanism.				
Project participant response				Date: 05/01/2022
A declaration to this effect is being submitted herewith.				
Documentation provided by project participant				
<i>Signed Declaration for no double counting</i>				
DOE assessment				Date: 07/01/2022

PP has now provided the declaration certificate for no double counting, which is checked by the DOE. Hence, **comment closed**.

CAR ID	03	Section no.	1.11	Date: 03/01/2022
Description of CAR				
In section 1.11 the country's DNA seems to be wrong. Corrective action sought.				
Project participant response				Date: 05/01/2022
The same is now corrected in the revised MR.				
Documentation provided by project participant				
Revised MR, Ver. 2.1				
DOE assessment				Date: 07/01/2022
PP has corrected the name of the country's DNA in Sec. 1.11 of the revised MR Ver.02 dated 05/01/2021. Hence, comment closed .				

CAR ID	04	Section no.	2.1, 2.2	Date: 03/01/2022
Description of CAR				
1. PP shall provide latest copies of Consent to Operate and boiler inspection certificate issued by PSPCB and Boiler inspectorate valid through the current monitoring period 2. Details of ongoing stakeholders consultation mechanism is provided in section 2.2 of the MR in line with VCS guidelines to complete MR. However, PP also requested to submit records of ongoing local stakeholder consultation including grievance register etc.				
Project participant response				Date: 05/01/2022
1. All the consents and approvals of the Project received are being submitted herewith. 2. The copy of grievance register is being submitted herewith.				
Documentation provided by project participant				
Consents and approvals of the project Grievance register				
DOE assessment				Date: 07/01/2022
1. PP has now provided copy of all consents and approvals applicable to the project activity to the VVB. Hence, comment closed. 2. PP has now provided a copy of Grievance Register to the VVB. Hence, comment closed.				

CAR ID	05	Section no.	3.1	Date: 03/01/2022
Description of CAR				
PP is requested to complete section 3.1 i.e. "Implementation Status of the Project Activity" of the monitoring report.				
Project participant response				Date: 05/01/2022
The implementation status of the Project has been elaborated in the revised MR.				
Documentation provided by project participant				
Revised MR				
DOE assessment				Date: 07/01/2022

PP has elaborated the details of implementation of the project activity in the revised MR Ver.02 dated 05/01/2021. Hence, **comment closed**.

CAR ID	06	Section no.	4/5.1	Date: 03/01/2022
Description of CAR				
1. PP requested to submit copies of plant log book/ records for $Q_{y,cottonstalk}$, $Q_{y,mustardstalk}$, $BF_{k,y,cottonstalk}$, $BF_{k,y,mustardstalk}$, AVD_y and N_y for the complete monitoring period. 2. PP is requested to provide the web link to check the CEA database in section 4.2 of monitoring report. 3. In sec. 5.1, calculation of baseline emission not provided 4. In sec. 5.2, calculation for project emission not provided 5. PP shall also provide copies of JMRs and invoices for entire monitoring period along with calibration certificates of energy meters, weighbridge and other applicable monitoring equipment.				
Project participant response				Date: 05/01/2022
1. The records of the parameters are being submitted herewith. 2. The weblink of the CEA database is now incorporated in the revised MR. 3. The calculation of baseline emission is now included in sec 5.1 of the revised MR 4. The calculation of Project emission reduction is now included in sec 5.2 of the revised MR. 5. All the document sought are being submitted herewith.				
Documentation provided by project participant				
Revised MR, Ver. 2.1, Plant records, JMR, Invoices				
DOE assessment				Date: 07/01/2022
1. PP has now provided copies of plant log book/ records for checking of parameters, found correct by VVB. Hence, comment closed. 2. PP has now provided functional weblink of CEA database, which is checked by VVB. Hence, Comment closed. 3. PP has now provided the calculation of baselines emissions in Sec. 5.1 of the revised MR Version 02 dated 05/01/2022. The same is checked by VVB and found correct. Hence, comment closed. 4. PP has now provided the calculation of project emissions in Sec. 5.2 of the revised MR Version 02 dated 05/01/2022. The same is checked by VVB and found correct. Hence, comment closed. 5. PP has now submitted JMR/Invoices for the entire monitoring period, which is checked by VVB. Hence, comment closed.				

CAR ID	07	Section no.	4.5	Date: 03/01/2022
Description of CAR				
1. PP requested to mention calibration details along with copies of the calibration certificates covering complete monitoring period. 2. PP is requested to provide break down details of the project activity in the MR.				
Project participant response				Date: 05/01/2022

1. The calibration details and certificates covering the entire monitoring report are being submitted herewith. 2. The breakdown details are being submitted herewith.	
Documentation provided by project participant	
Calibration certificates Revised MR Version 02	
DOE assessment	Date: 07/01/2022
1. PP has now submitted the calibration certificates, which is checked by VVB and found correct. Hence, comment closed . 2. PP has now submitted the plant breakdown details for the entire monitoring period, which is checked by VVB and found satisfactory. Hence, comment closed .	

FAR ID	01	Section no.	4.5	Date: 03/01/2022
Description of CAR				
"As per the biomass assessment study the surplus mustard stalk availability in the districts Muktsar, Bhatinda & Ferozepur of Punjab is zero. And hence the PP decided to procure required mustard stalk from the neighbouring districts of Hanumangarh, in state of Rajasthan and Sirsa in state of Haryana. Hence the verification team need to check whether the entire mustard stalk procured during the monitoring period are from Hanumangarh district of Rajasthan and Sirsa district of Haryana. If not, then leakage calculation should be applied appropriately" With refer to the above FAR raised in validation report, please justify the same for this monitoring period with supporting documents				
Project participant response				Date: 05/01/2022

The plant located at Channu is in southern part of Muktsar district of Punjab. It has Sirsa district of Haryana and Hanumangrh district of Rajasthan adjoining it. The procurement centres are located along the Inter district/Inter-state boundaries which are situated at a distance within the radius of 30-40 kms from the plant site. The local farmers bring their produce to the procurement centers for further transportation to the plant. The details of the collection centers could be verified from the fuel procurement receipts. Further, the trip distance of the vehicle used from the transportation of the biomass fuel also show that the biomass is transported from a distance of 30-40 kms from the project site.

As undertaking in this regard is submitted herewith to declare that entire quantity of mustard stalks used in the project during the monitoring period has been procured from the collection centres located in Hanumangarh district of Rajasthan and Sirsa district of Haryana.

Documentation provided by project participant

An undertaking by PP

DOE assessment

Date: 07/01/2022

VVB checked and verified the undertaking submitted by PP and also confirmed the distance of procurement centre in Hanumangarh district are less than 50 km, hence leakage assessment not required.

APPENDIX 3: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Verification findings
1.	Lead Auditor/Technical Expert	OR	Kumar	Pankaj	TQC-Outsourced entity	Yes	No	Yes	Yes

Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer (TR)	EI	Xue	Denny	Applus+ Certification
2.	Approver	IR	Calle de Miguel	Agustin	Applus+ Certification

Short CVs of the Team:

1. **Pankaj Kumar** worked as team leader – Bihar for South Asia Climate Proofing and Growth Development (CPGD) – Climate Change Innovation Programme (CCIP) supported by DFID that seeks to mainstream climate change resilience into planning and budgeting at the national and sub-national level in India, Pakistan, Nepal, and Afghanistan. Pankaj Kumar has worked previously with IL&FS Infrastructure Development Corporation and BUIDCO (Bihar Urban Infrastructure Development Corporation), Govt. Of Bihar as Environmental Specialist for WB & ADB funded projects. Prior to this, he worked with Carbon Check (UNFCCC accredited DoE), Johannesburg, RSA as Team Leader for validation, verification of around 100 GHG projects in Asia, Africa, USA, Asia Pacific & Americas. Pankaj is accredited Lead Auditor, Validator, Verifier and Technical Expert for Sectoral Scope/Technical Area – 1.1, 1.2, 3.1 & 13.1 by UNFCCC DoE (Designated Operational Entity), APPLUS, Spain. He is

also member of task force on climate change & human health, Health Department, GoB and on roster of UNICEF's WASH experts.

He is an experienced, qualified and result oriented Environment Professional having more than 14 yrs. Of relevant experience in Climate Change (Mitigation & Adaptation), Environmental Due Diligence, Disaster Risk Reduction, Validation and Verification of GHG project under CDM, Verified Carbon Standard, Gold Standard & Social Carbon Standard, Brazil. He provides technical support for environmental investigative, consultative and remedial projects involving air, water and soil, Waste management, EIA, Environmental Compliance, ISO 14001, OHSAS 18001, GHG accounting (ISO 14064) and Carbon foot printing

Pankaj Kumar is Masters in Environment Management from Forest Research Institute (University), I.C.F.R.E, Dehradun, which is Centre of Excellence in South East Asia for Forestry education & research and PGDEL from National Law School of India University, Bangalore (India).

2. Mr. Denny Xue (Master's Degree in Environmental Engineering, Bachelor's Degree in Thermal Engineering) is an Auditor appointed by Applus+ LGAI for the GHG project assessment, auditing and technical review. He has more than 6 years of work experience in CDM/GS4GG/VCS project assessment and technical review with Applus+. Before he joined Applus+ LGAI, he has been working for Shanghai Chuanji Investment and Management which is a CDM consultancy company as a project manager for CDM project development.

APPENDIX 4: ABBREVIATIONS

Abbreviations	Full texts
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CEA	Central Electricity Authority
CL	Clarification Request
CM	Combined Margin
CMS	Central Monitoring System
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
DR	Document Review
EF	Emission Factor
EIA	Environmental Impact Assessment
ER	Emission Reductions
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
PP	Project Participant
PSEB	Punjab State Electricity Board
PSPCL	Punjab State Power Corporation Limited

APPENDIX 5: CALIBRATION DETAILS

Details of the energy meters used in monitoring, of the parameter, Quantity of Electricity exported to the grid by the project during the monitoring period are furnished as below.

Meters	Type	Accuracy class	Serial number	Calibration date		
Main Meter	Trivector meter of L & T	0.5s	8043957	06-10-2011	04-10-2012	28-09-2013
Check meter	Trivector meter of L & T	0.5s	8043951	08-10-2011	04-10-2012	28-09-2013
Main meter	Trivector meter of L & T	0.2s	13196703	05-10-2014	09-05-2015	07-05-2016
Main meter	Trivector meter of L & T	0.2s	12093212	05-10-2014	09-05-2015	07-05-2016

Details of the weigh bridge used to measure quantity of the biomass are as below.

Serial Number	Model Number	Tolerance Value	Calibration date				
2008-043	FSD-501	10 Kg	12-07-2012	09-07-2013	08-07-2014	01-07-2015	14-06-2016

Note : Meters replaced on 05/03/2014