Validation Report

"Biomass based Renewable Energy Generation at Karnal"

Lloyd's Register Quality Assurance Limited

Project Title	Biomass based Renewable Energy Generation at Karnal
Version	04
Report ID	VCS-MUM-0062112

Report Title	Validation Report "Biomass based Renewable Energy Generation at Karnal"
Client	Modern Dairies Limited
Pages	46
Date of Issue	26-September-2014
Prepared By	Lloyd's Register Quality Assurance Limited
Contact	Hiramford Middlemarch Office Village Siskin Drive, Coventry CV3 4FJ, United Kingdom Email address: climate-change@lr.org Telephone: +44 (0) 24 7688 2287 Website: www.lrqa.com
Approved By	Prabodha C Acharya
Work Carried Out By	Sanjay Kumar Agarwalla (Team Leader) Ankush Jain (Technical Reviewer) Archak Pattanaik (Sector expert to Technical Reviewer)

Summary:

Lloyd's Register Quality Assurance Limited (LRQA) has been contracted by Modern Dairies Limited (MDL), the project proponent, to carry out the validation of the project - "Biomass based Renewable Energy Generation at Karnal", with regard to the relevant requirements of VCS programme guidelines and standard (VCS standard version 3.4, VCS Validation and Verification Manual version 3.1 & VCS program guide version 3.5). Relevant requirements of the UNFCCC for CDM project activities, as well as criteria for consistent project operations, monitoring and reporting has been applied for validation.

The baseline and monitoring methodology AMS I.C, version 19.0: "Thermal energy production with or without electricity", an approved methodology of UNFCCC CDM program is applied.

The project activity involves the retrofitting of three pet coke fired boilers of capacities 12 TPH, 12 TPH and 3 TPH to rice husk fired boilers of the same capacities at the project site of MDL in Karnal district of Haryana state in India. The biomass (rice husk) used in the project activity is locally available within a radial distance of 100 km from the project site. The steam produced by the boilers is consumed for captive consumption in the dairy plant of the PP. Thus the project activity displaces equivalent amount of coal and leads to an estimated annual GHG emission reductions of 50,843 tCO_2e and a total of 508,430 tCO_2e during the crediting period of 10 years.

A risk based approach has been followed to perform this validation. In the course of validation 12 Clarification Requests (CLs) were raised and successfully closed.

The review of the project design documentation and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and stakeholders have provided LRQA with sufficient evidence to validate the fulfilment of the stated criteria.

In detail the conclusions can be summarised as follows:

- The project is in line with all relevant host country criteria (India) and all relevant VCS and UNFCCC requirements for CDM
- The project additionality is sufficiently justified in the PD.
- The monitoring plan is transparent and adequate.
- The calculation of the emission reductions is carried out in a transparent and conservative manner, so that the calculated emission reductions of 508,430 tCO_2eq are most likely to be achieved within the 10 years crediting period.

The conclusions of this report show, that the project, as it was described in the project documentation, is in line with all criteria applicable for the validation.

The validation based on the information made available to LRQA and the engagement conditions detailed in this report. Hence, LRQA cannot be held liable by any party for decisions made or not made based on this report.

Table of Contents

1 INTRODUCTION

1.1 Objective

Lloyd's Register Quality Assurance Limited (LRQA) has been contracted by Modern Dairies Limited (MDL), the project proponent (PP), to undertake the validation of the project titled "Biomass based Renewable Energy Generation at Karnal".

The purpose of this validation is to have an independent third party assessment of whether the project activity conforms to the qualification criteria set out in the VCS Version 3 standard to attain real, measurable, additional and permanent emission reductions.

The validation statement/opinion is a written assurance that the project complies with all the applicable VCS requirements and has the ability to generate the emission reductions stated over the project's crediting period.

The validation followed the requirements of the current version of the VCS Standard Version 3.4 and VCS program guide 3.5 to ensure the quality and consistency of the validation work and the report.

1.2 Scope and Criteria

The scope of validation was an independent and objective review of the project's VCS PD. In particular, the specific objectives of the validation work involve:

- To verify that the project activity meets the requirements of VCS Standard Version 3.4, VCS Validation and Verification Manual version 3.1 and VCS program guide 3.5 including additionality, proof of title and compliance with local laws

- To assess whether the baseline and monitoring plan are in conformance with the applied methodology from the VCS approved GHG program

- To certify that the information presented are completed, consistent, transparent and free of omission or material error

The information in the PD is reviewed against the criteria of VCS Standard 3.4, the VCS program guide 3.5 and the applied simplified baseline and monitoring CDM methodology AMS I.C, version 19.0. LRQA has performed validation based on a risk based approach focusing mainly on the significant risks to meet the qualification criteria and the ability to generate Verified Carbon Units (VCUs).

The work carried out by LRQA is free from any conflict of interest.

1.3 Level of assurance

The validation report is based on VCS PD, Financial and emission reduction calculation spread sheet and supporting documents made available to the validator and information collected through performing interviews and during the on-site assessment.

The validation has been planned and organised to achieve a

☒ Reasonable level of assurance with 5% materiality as per VCS standard 3.3.

☐ Limited level of assurance

1.4 Summary Description of the Project

The project generates process steam required at the dairy Modern Dairies Limited, by using biomass (rice husk) instead of pet coke, thereby leading to reduction in carbon dioxide emissions by the avoidance of fossil fuel emissions. For this, the project proponent has converted three pet coke fired boilers of 12 TPH, 12 TPH and 3 TPH in rice husk fired boiler of same capacities by retrofitting. The two 12 TPH boilers produce steam at 17.5 kg/cm^2 and the 3 TPH boiler at 10.5 kg/cm^2. One 8 TPH pet coke fired boiler remains as stand by, which was also present in the baseline scenario. The biomass used in the project activity is available locally within a distance of 100 km from the project site.

The commissioning dates of the three project boilers are as follows:

Boiler	**Make**	**Original commissioning date**	**Commissioning date after retrofitting**	**End of life time date (Date $_{baseline\ retrofit}$)**
12 TPH (Boiler 1)	Thermax	13 March 2007	03 Oct 2012	12 March 2032
12 TPH (Boiler 2)	IBL	29 June 1999	03 Jan 2013	28 June 2024
3 TPH (Boiler 3)	Thermax	06 March 2003	28 May 2013	05 March 2028

The technical life time of the boilers is considered as 25 years in accordance with the “Tool to determine the remaining lifetime of equipment” version 01, Annex 15, EB 50.

The earliest date of commission of the three boilers after retrofitting as 03/10/2012 is considered as the VCS start date.

The boilers are operational since the commissioning and obtained all necessary statuary clearances.

2 VALIDATION PROCESS

2.1 Method and Criteria

The validation consists of the following phases:

1. Desk review of the VCS PD, Financial and Emission reductions spread sheet and other relevant documents;
2. On-site visit (including follow-up interviews with project stakeholders) and issuance of draft validation report / findings log;
3. Resolution of outstanding issues;
4. Final Validation reporting;
5. Technical review
6. Final approval of validation

2.2 Document Review

During the document review, LRQA has applied standard auditing techniques to assess the quality of information provided. On receipt of the project description from the PP, the completeness check of information made available as per VCS Version 3 requirements was reviewed. A desk review was further carried out to assess the following:

- The project details as per VCS PD template
- Appropriateness of methodology applied
- Compliance with relevant laws and regulations
- Correctness of application of baseline and monitoring methodology
- Demonstration of additionality
- Monitoring plan
- Stakeholder comments
- Proof of title
- Other external documents like IPCC emission factor, grid emission factor, etc. where applicable

The VCS PD version 01 dated 12-March-2014 was initially reviewed and LRQA requested the PP to present the supporting information and documents and such additional information and documents that were also reviewed by LRQA. The documents reviewed by LRQA are listed below. Through the process of the verification, the revised VCS PD and the supporting documents were evaluated to confirm the actions taken by the PP to the CARs and CLs issued by LRQA. LRQA reviewed the final version of the VCS PD version 04 dated 26-September-2014 to confirm that all changes agreed had been incorporated.

The following table outlines the documentation reviewed during the verification:

Category A documents (documents from the PP)

1	VCS PD, version 01, dated – 12-March-2014; version 02, dated - 26-Aug-2014; version 03, dated 22-September-2014 and version 04 dated 26-September-2014
2	ER and Financial Spread Sheet, version 01, dated – 12-March-2014; version 02, dated - 26-Aug-2014 and version 03, dated 22-September-2014
3	Proof of “Right of use”

<table>
<tr><td>4</td><td>Feasibility study report for the project activity dated 25/06/2012</td></tr>
<tr><td>5</td><td>Certificate of Incorporation for Modern Dairies Limited</td></tr>
<tr><td>6</td><td>Commissioning certificates for the three boilers (both initial and after retrofitting) issued by Chartered Engineer including boiler efficiency (project start date)</td></tr>
<tr><td>7</td><td>Purchase orders for the three boiler of the project along with the work orders for the retrofit of the three boilers</td></tr>
<tr><td>8</td><td>Biomass survey report</td></tr>
<tr><td>9</td><td>Evidence for management decision for investment in the project activity</td></tr>
<tr><td>10</td><td>Evidence for the NCV of biomass and pet coke</td></tr>
<tr><td>11</td><td>Evidence for the efficiency of pet coke fired and biomass fire boilers</td></tr>
<tr><td>12</td><td>Evidence for the price of pet coke and rice husk</td></tr>
<tr><td>13</td><td>Organisation chart for MDL</td></tr>
<tr><td>14</td><td>Training records</td></tr>
<tr><td>15</td><td>- Consent to Operate certificate obtained from Haryana State Pollution Control Board – HSPCB/Water Consent/241, dated 02/07/2010 (valid till 31/03/2015)
- Consent to Operate certificate obtained from Haryana State Pollution Control Board – HSPCB/Air Consent/243, dated 02/10/2010 (valid till 31/03/2015)
- Boiler Operation Certificates issues by Chief Inspector of Boiler, Haryana, Chandigarh for the three project boilers as below:
<table>
<tr><td>Boiler Number</td><td>Registration Number</td><td colspan="4">Date of testing</td></tr>
<tr><td>1</td><td>HA-817</td><td>25/05/2011</td><td>12/06/2012</td><td>08/05/2013</td><td>14/05/2014</td></tr>
<tr><td>2</td><td>HA-1328</td><td>23/04/2011</td><td>10/04/2012</td><td>09/04/2013</td><td>29/04/2014</td></tr>
<tr><td>3</td><td>HA-1008</td><td>29/05/2011</td><td>10/04/2012</td><td>04/06/2013</td><td>05/03/2014</td></tr>
</table></td></tr>
<tr><td>16</td><td>Documents related to local stakeholders consultation conducted by the PP on 09/11/2013:
- Invitation copy for local stakeholders meeting dated 30/10/2013
- Attendance sheet for local stakeholders meeting</td></tr>
<tr><td>17</td><td>Declaration from the PP that the emission reductions generated by the project activity will not be used for compliance with an emission trading program or to meet binding limits on GHG emissions dated 26/11/2013</td></tr>
<tr><td>18</td><td>Declaration for the statement “The project proponent hereby corroborates that the project activity has not created or sought or received any other form of environmental credit” dated 26/11/2013</td></tr>
<tr><td>19</td><td>Declaration for the statement “The project activity by MDL has not been registered and is not seeking registration under any other GHG emission program to avail carbon benefits during the crediting period of the project activity” dated 26/11/2013</td></tr>
<tr><td>20</td><td>Declaration for the statement “The project proponent hereby corroborates that the project activity has not been rejected by any other GHG program” dated 26/11/2013</td></tr>
</table>

Category B documents (other documents referenced)

1	Approved CDM monitoring methodology AMS I.C, version 19.0, “*Thermal energy production with or without electricity”*
2	VCS Version 3; Program Guidelines; VCSA Rules; and VCS Guidance Document issued on 08/10/2013
3	Guidelines on the Demonstration of Additionality of Small Scale Project activities, version 09

4	Guidance on the Assessment of Investment Analysis, Version 05
5	CDM Validation and Verification Standard, version 07.0

2.3 Interviews

The detail of the on-site assessment is as follows:

Date	Location	Team Members on site	Subjects covered	Persons interviewed
27-28/05/2014	Modern Dairies Limited, Karnal	Sanjay Kumar Agarwalla	• Project implementation and management • Site tour • Confirmation of technical specifications of the project boilers • Baseline discussion • Additionality discussion • Data management and reporting systems • Data verification • QA/QC, management systems, calibration, training • Data archiving Environmental and social issues • Local stakeholder consultation process discussion	- A K Aggarwal /Executive Director/MDL; - V K Nayyar / GM Engineers/MDL; - Abhishek K Srivastava /Consultant; - Bhopal Singh/ Senior Forman/Boiler/MDL; - Krishna Kumar/ Senior Boiler Attendant/MDL; - Sunil Kumar/ Boiler Attendant/MDL - Vinod Kumar/ Local stakeholder - Jaipal/ Local stakeholder

2.4 Site Inspections

LRQA has conducted on-site inspection in order to confirm all physical features of the project activity proposed in the VCS PD are in place.

An on-site assessment was conducted on 27-28/05/2014 as a part of validation activity which involved:

- Implementation of project activity
- Technical detail of project activity
- Statutory clearances
- Sustainability criteria
- Local stakeholders meeting process
- Baseline determination and additionality
- Monitoring plan.

2.5 Resolution of Findings

Based on the site inspection and review of documents and records including the monitoring plan, issues that need to be further elaborated upon, researched or added in order that the project activity meets the VCS Version 3 requirements and can achieve credible emission reductions is identified, discussed and to be resolved by the project proponent.
A Corrective Action Request (CAR) is raised if the VVB identifies a material discrepancy or non-conformance that the project proponent must address.

A Clarification request (CL) is raised if the project reporting lacks transparency and further information is needed to determine if a material discrepancy is present.

On receipt of response and revised PD from the project proponent, the adequacy of compliance with VCS and the methodology requirements is checked. Closure of comments raised occurs only if the response provided and corrections made fully comply with the stated requirements of the VCS Version 3 standard and the methodology applied.

During the course of validation, 12 CLs were raised and closed successfully. The list of CARs/CLs/FARs raised and the response provided, the mean of validation, reasons for their closure, and references to correction in the PD are provided in Appendix B of this report.

2.6 Forward Action Requests

A Forward Action Request (FAR) is issued when certain issues related to project implementation should be reviewed during the first verification. This, however, has no impact upon the completion of the current validation activity.

No FAR has been raised during the validation of the project activity.

3 VALIDATION FINDINGS

3.1 Project Details

Project type, technologies and measures implemented, and eligibility of the project:

According to the VCS version 3.3 Guidelines and the list of Sectoral Scopes of the UNFCCC, the project is applicable under the following activity categories:

According to Annex A of the Kyoto Protocol, the project is applicable under the sectoral scope 1

- Energy Industries (renewable/ non-renewable sources).

The project generates process steam required at the dairy plant (Modern Dairies Limited), by using biomass (rice husk) instead of pet coke, thereby leading to reduction in carbon dioxide emissions by the avoidance of fossil fuel emissions. For this, the project proponent has converted three pet coke fired boilers of 12 TPH, 12 TPH and 3 TPH to rice husk fired boiler of same capacities by retrofitting. The two 12 TPH boilers produce steam at 17.5 kg/cm^2 and the 3 TPH boiler at 10.5 kg/cm^2 and all the three boilers are Fluidised Bed Combustion (FBC) type. One 8 TPH pet coke fired boiler remains as stand by, which was also present in the baseline scenario. The biomass used in the project activity is available locally within a distance of 100 km from the project site.

The commissioning dates of the three project boilers are as follows:

Boiler	**Make**	**Original commissioning date**	**Commissioning date after retrofitting**	**End of life time date (Date $_{baseline\ retrofit}$)**
12 TPH (Boiler 1)	Thermax	13 March 2007	03 Oct 2012	12 March 2032
12 TPH (Boiler 2)	IBL	29 June 1999	03 Jan 2013	28 June 2024
3 TPH (Boiler 3)	Thermax	06 March 2003	28 May 2013	05 March 2028

The technical life time of the boilers is considered as 25 years in accordance with the “Tool to determine the remaining lifetime of equipment” version 01, Annex 15, EB 50.

The proposed project activity is steam generation using renewable biomass, rice husk. The project activity will generate greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from steam generation by fossil fuel fired boilers. The project is also demonstrated to be additional compared with the business as usual scenario, hence the project is anticipated to fulfil VCS conditions.

Project proponent and other entities involved in the project:

Project proponent for this project activity is Modern Dairies Limited (MDL).

Project start date:

The earliest date of commission of the three boilers is 03/10/2012 and hence this is the start date of the project activity.

Project crediting period:

The crediting period of the project activity is for 10 years and this may be renewed at most twice. The 1st crediting period is from 03/10/2012 to 02/10/2022.

Project scale and estimated GHG emission reductions or removals:

The estimated annual emission reductions for the project activity are 50,843 tCO_2e which is less than 300,000 tCO_2e. Hence scale of the project as marked below:

Project Scale	
Project	√
Large project	

Project location:

The project activity is located at Post Box No. 3, 136 KM, GT Road, Karnal district, in the state of Haryana, India. The Geographical co-ordinates of the project activity are: Latitude - 29°46'19.57" N; Longitude - 76°57'43.71" E.

Conditions prior to project initiation:

Prior to the implementation of the project activity, the captive consumption of steam was met by using three numbers of pet coke fired boilers (12 TPH, 12 TPH and 3 TPH).

Project compliance with applicable laws, statutes and other regulatory frameworks:

There is no such compliance requirement with an emission trading program or any binding limits on GHG emissions for the project activity in India as it is a non annex 1 country. The project is a voluntary initiative by the PP and has not been implemented to meet any local / national laws or regulatory compliances.

The project has obtained valid consents to operate the project from the Boiler Inspector under Indian Boiler act and the State Pollution Control Board under Air Act and Water Act.

Ownership and other programs:

Right of use:

PP has demonstrated the ownership of the project activity for Modern Dairies Limited (MDL) and documents showing proof of title and ownership of the emission reductions are as follows:

- Certificate of Incorporation for MDL
- Work order for retrofitting of the Boilers

- Commissioning Certificate of the Retrofitted boilers
- Purchase orders of biomass (rice husk)

Emissions trading programs and other binding limits:

PP has given a declaration that the net GHG emission reductions generated by the project activity will not be used for compliance with any other emissions trading program or to meet binding limits on GHG emissions.

Participation under other GHG programs:

PP has given a declaration that the project activity has not been registered and is not seeking registration under any other GHG emission program to avail carbon benefits during the crediting period of the project activity.

Other forms of environmental credit sought or received:

PP has given a declaration that the project proponent hereby corroborates that the project activity has not created or sought or received any other form of environmental credit.

Rejection by other GHG programs:

PP has given a declaration that the project proponent hereby corroborates that the project activity has not been rejected by any other GHG program

Additional information relevant to the project:

Eligibility criteria for grouped projects:
The project activity is not a grouped project.

Leakage management for AFOLU projects:

As this is a non AFOLU project, leakage management is not applicable for this project activity.

Commercially sensitive information:

PP has stated in the VCS PD section 1.13 that there is no such commercially sensitive information.

Any further information:

In section 1.13 of the VCS PD, PP has explained the sustainable development taking place due to the implementation of the project activity in terms of Environmental, Social, Economic and Technological wellbeing.

The description contained in the VCS PD of the project activity provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation. The project description was verified by LRQA through comparing to the real practice during the on site visit and via checking with the supporting documents listed in section

2.2 above. As a result, LRQA confirms that the project description of the project contained in the VCS PD to be complete and accurate. The VCS PD complies with the relevant forms and guidance for completing the VCS PD.

3.2 Application of Methodology

3.2.1 Title and Reference

CDM approved methodology has been applied for the project activity.
Title: Thermal energy production with or without electricity
Type: I – Renewable energy project
Category I.C: Thermal Energy production with or without electricity; I.C/Version 19[1]
Sectoral Scope: 01

3.2.2 Applicability

Applicability of the applied methodology AMS I.C, version 19.0 is discussed below:

No.	Applicability conditions in the AMS I.C, Version 19.0	Information in the PD	Steps taken to assess PD information	Conclusion
1	This methodology comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.	The proposed project activity at MDL is rice husk (biomass) based thermal energy generation (producing steam) that displaces fossil fuel use. The rice husk being used in the project activity is a waste generated from the rice crop, hence qualifies as renewable biomass residues as per EB 23, Annex-18. This type of project activities is included in the methodology and therefore the proposed project fulfills this requirement.	Validation team confirmed that the project activity involves rice husk (which qualifies as renewable biomass) fired boilers used for steam generation for captive consumption at the dairy plant.	OK

[1] As per UNFCCC web site, Request for registration under version 19 of AMS I.C can be submitted till 26/01/2015 http://cdm.unfccc.int/methodologies/DB/JSEM51TG3UVKADPA25IPUHXJ85HE8A

No.	Applicability conditions in the AMS I.C, Version 19.0	Information in the PD	Steps taken to assess PD information	Conclusion
2	Biomass-based cogeneration systems are included in this category. For the purpose of this methodology "cogeneration" shall mean the simultaneous generation of thermal energy and electrical energy in one process. Project activities that produce heat and power in separate element processes (for example heat from a boiler and electricity from a biogas engine) do not fit under the definition of cogeneration project.	The proposed project activity is generation of steam by using biomass and it is not a biomass based co-generation project. Hence this applicability criterion is not applicable to the project activity.	The project activity does not involve cogeneration.	Not applicable
3	Emission reductions from a biomass cogeneration system can accrue from one of the following activities: a. Electricity supply to a grid; b. Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities; c. Combination of (a) and (b).	The proposed project activity is not a biomass based cogeneration project. Hence the given applicability criterion is not relevant to the project activity.	The project activity does not involve cogeneration.	Not applicable
4	The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal (see paragraph 6 for the applicable limits for cogeneration project activities).	The total installed thermal energy generation capacity of the proposed project activity is only 18.29 MW_{th} thermal energy Thermal energy output capacity for the boiler is not available in the manufacturer's specification in terms of $MW_{thermal}$. Therefore, the capacity is determined by taking the difference between enthalpy of total output leaving the project equipment and	The total thermal capacity of the three boilers is 18.29 MWth which is less than the qualifying limit of 45 MW_{th}. Hence this project qualifies to apply this methodology.	OK

No.	Applicability conditions in the AMS I.C, Version 19.0	Information in the PD	Steps taken to assess PD information	Conclusion
		enthalpy of input feed water (feed water at 85ºC taking into account the condensate return from boiler).The pre-heater also forms the part of boiler assembly and therefore, the temperature is raised to 85°C (please refer Input and small scale limit spreadsheet for calculation details). Thus, the total rated/ installed thermal energy generation capacity of project equipment is 18.29 MW_{th} which is less than 45 MW_{th}. Hence, the applicability criterion is satisfied by the project activity.		
5	For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal (see paragraph 6 for the applicable limits for cogeneration project activities).	Not applicable, as Co-firing (biomass along with Fossil Fuel) is not utilized in the project.	The project will use rice husk as the only fuel. Hence this is not applicable.	Not applicable
6	The following capacity limits apply for biomass cogeneration units: (a) If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the	Not applicable, as cogeneration technology is not utilized in the project.	The project activity does not involve cogeneration.	Not applicable

No.	Applicability conditions in the AMS I.C, Version 19.0	Information in the PD	Steps taken to assess PD information	Conclusion
	purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (b) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; (c) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.			

No.	Applicability conditions in the AMS I.C, Version 19.0	Information in the PD	Steps taken to assess PD information	Conclusion
7	The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 4 to 6, and should be physically distinct from the existing units.	The proposed project activity doesn't involve the addition of renewable energy units at the existing renewable facility. The proposed activity involves retrofitting of old boilers (12 TPH, 12 TPH and 3 TPH) for fuel change from Pet coke to rice husk. The rated thermal energy capacity of this project activity is 18.29 $MW_{thermal}$ which is less than 45 $MW_{thermal}$. Hence, the project activity satisfies the applicability criterion.	After retrofitting the old pet coke fired three boilers, the total thermal capacity of the three boilers together is 18.29 MWth. Hence this condition is satisfied.	OK
8	Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	Proposed project is a retrofit in the existing facility. The proposed activity involves retrofitting of old boilers (12 TPH, 12 TPH and 3 TPH) for fuel change from Pet coke to rice husk. Thus, the project activity satisfies this applicability criterion.	The project involves retrofitting of old boilers and hence this condition is applicable and satisfied.	OK
9	New Facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC CDM methodologies".	Not applicable as the project activity is a retrofit in the existing facility.	The project is not a Greenfield and is a retrofit activity. Hence this is not applicable.	Not applicable

No.	Applicability conditions in the AMS I.C, Version 19.0	Information in the PD	Steps taken to assess PD information	Conclusion
10	If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in the emissions reduction calculation.	The project activity is generation of steam by using rice husk in boiler which is a renewable biomass. It does not involve the use of any solid biomass fuel. Hence, this applicability criterion is not applicable to the project activity.	The project does not involve firing of solid biomass fuel but rice husk. Hence this is not applicable.	Not applicable
11	Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	As discussed in Para 10 above, the project activity doesn't involve processed solid biomass fuel. Hence the project does not require any manufacturing of solid biomass fuel (briquette). Therefore, this criterion is not applicable to the project activity.	The project does not involve firing of solid biomass fuel but rice husk. Hence this is not applicable.	Not applicable
12	If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	Not applicable, as the thermal energy generated by the project activity will be utilized for captive consumption at the MDL facility and will not be delivered to any third party.	Steam produced by the project is utilised for captive consumption by the dairy plant. Hence this is not applicable.	Not applicable

No.	Applicability conditions in the AMS I.C, Version 19.0	Information in the PD	Steps taken to assess PD information	Conclusion
13	If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a standalone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions.	The project activity doesn't involve utilization of biogas for heat/power production. Hence this criterion is not applicable to the project activity.	The project activity does not utilize biogas. Hence this is not applicable.	Not applicable
14	Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources provided: (a) Charcoal is produced in kilns equipped with methane recovery and destruction facility; or (b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. These emissions shall be calculated as per the procedures defined in the approved methodology AMS-III.K. Alternatively, conservative emission factor values from peer reviewed literature or from a registered CDM project activity can be used, provided that it can be demonstrated that the parameters from these are comparable e.g. source of biomass, characteristics of	The project activity involves generation of steam using biomass (rice husk) in the boilers. It is not a charcoal based energy generation project. Hence this applicability criterion is not applicable to the project activity.	The project activity does not fire charcoal as fuel but used rice husk. Hence this is not applicable.	Not applicable

No.	Applicability conditions in the AMS I.C, Version 19.0	Information in the PD	Steps taken to assess PD information	Conclusion
	biomass such as moisture, carbon content, type of kiln, operating conditions such as ambient temperature.			

3.2.3 Project Boundary

The project activity involves production of steam in three numbers of biomass (rice husk) fired boilers and utilise for captive consumption in the dairy plant.

As per § 15 of the applied methodology AM- I. C., Version 19, the spatial extent of the project boundary encompasses:

Methodology condition	Applicability for project activity
(a) *All plants generating power and/or heat located at the project site, whether fired with biomass, fossil fuels or a combination of both;*	Applicable for project activity and the project boilers are included in the project boundary diagram in the PD. During the project site visit, it was confirmed that the boilers were correctly included; there were no power generating equipment.
(b) *All power plants connected physically to the electricity system (grid) that the project plant is connected to;*	Applicable as the project used grid electricity for auxiliary power consumption for boiler. This was confirmed during the on site visit
(c) *Industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment affected by the project activity;*	Applicable This was confirmed during the on site visit
(d) *The processing plant of biomass residues, for project activities using solid biomass fuel (e.g. briquette), unless all associated emissions are accounted for as leakage emissions;*	Not applicable as the project does not involve processing of biomass and used rice husk directly. Based on the sectoral expertise of the team and on site assessment team confirmed that no processing of biomass was required.
(e) *The transportation itineraries, if the biomass is transported over distances greater than 200 kilometres, unless all associated emissions are accounted for as leakage emissions;*	Not applicable as the biomass transported for the project activity is not over 200 km. This was confirmed from the surplus biomass availability report and also during the on site visit.
(f) *The site of the anaerobic digester in the case of project activity that recovers and utilizes biogas for power/heat production and applies this methodology on a stand alone basis i.e. without using a Type III component of a SSC methodology.*	Not applicable. Based on the onsite assessment, team confirmed that the project does not involve recovery and utilisation of biogas.

Thus, project boundary includes biomass storage, three biomass fired boilers, steam generation and auxiliary electricity consumption from grid. Project boundary has been correctly defined in the PD section 2.3. This was also confirmed during the on site visit interview and document review as stated in section 2.2 above.

Validation team confirms that each GHG source, sink and reservoir, as described in the applied methodology, has been justified in the table above. Relevant GHG source, sink and reservoirs have been correctly considered in accordance with the applied methodology.

3.2.4 Baseline Scenario

The baseline scenario has been identified in accordance with the approved applied methodology i.e. AMS - I.C., Version 19. As per paragraph 16 of applied methodology, baseline scenario for renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is "*the fuel consumption of the technologies that would have been used in the absence of the project activity, times an emission factor for the fossil fuel displaced*".

The total steam requirement of the dairy plant before the implementation of the project activity was on an average 26.5 TPH which was confirmed during the on site visit. In the pre project scenario there were 3 (two of 12 TPH and one of 3 TPH) numbers of pet coke fired boilers running to meet the captive steam requirement. One 8 TPH pet coke fired boiler was kept as standby. Details of the four boilers are provided below:

Boiler Capacity	**Pressure**	**Fuel**	**Make**	**Original Commissioning date**	**End of life time date (Date $_{baseline\ retrofit}$)**
8 TPH	17.5 kg/cm^2	Pet Coke	Thermax	1992	-
12 TPH	17.5 kg/cm^2	Pet Coke	IBL	1999	12 March 2032
12 TPH	17.5 kg/cm^2	Pet Coke	Thermax	2007	28 June 2024
3 TPH	10.5 kg/cm^2	Pet Coke	Thermax	2003	05 March 2028

In the project scenario, out of the above four boilers, except the 8 TPH one, all the other three boilers are retrofitted to rice husk fired boilers and the 8 TPH boiler is still running on pet coke as and when required as stand by. The total combined capacity of the three retrofitted boilers is 27 TPH. Since steam generating capacity of the three retrofitted biomass fired boilers is of comparable capacity (=service level) as in the baseline scenario, in absence of the project activity the existing boilers would been continued in operation and thus become the baseline for the project activity, which fulfils the stipulation made under § 16 of AMS I.C, version 19 which defines the baseline as the technologies that would have been used in the absence of the project activity as described above. Also remaining technical life time of the three pet coke fired boilers is estimated to be beyond the end date of crediting period (please refer to Date $_{baseline\ retrofit}$ in section 3.1 of the report above), thereby proving that the existing boilers would have continued to cater the steam requirement of MDL in absence of proposed project activity. Hence continuation of the existing pet coke fired boilers is the identified baseline scenario for the project activity. It is worthwhile to mention here that out of the existing four boilers, the 8 TPH boiler has not been retrofitted and still continues to run on pet coke as and when required (i.e. continuation of the baseline situation). PP is going to claim emission reductions only for the three boilers which have

been retrofitted and converted to rice husk fuel. Emission reductions will be based on the quantity of steam (and hence enthalpy) generated by the three retrofitted boilers fired with rice husk as fuel.

Validation team based on the on-site visit interview and review of technical specification and Chartered Engineer certificates of the existing and project activity retrofitted boilers confirms that the baseline scenario is correctly identified as §16 of AMS I.C, version 19 which states "*For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission factor for the fossil fuel displaced*".

3.2.5 Additionality

The additionality of the project activity is explained on the basis of barrier analysis mentioned in "Guidelines on the Demonstration of Additionality of Small Scale Project activities" Version 09.0.

The project proponent has stated the start date of the project activity as 03-October-2012 and submitted the commissioning certificate which is checked by the assessment team and found correct. The same is in line with VCS guideline and thus accepted by the assessment team. Assessment team checked the Board resolution and found that a resolution is passed on 30th June 2012 regarding the implementation of the project activity and thus confirms that the project proponent was aware of VCS benefits before the investment decision was taken and benefits were the decisive factor in going ahead with the project activity. As per the requirement of VCS the project needs to be intimated to the VCS board before the start of the validation process. The project entitled "*Biomass based Renewable Energy Generation at Karnal*" is listed in the VCS Project Database. The same is checked by the assessment team and found correct on the VCS web site: https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Pipeline&a=3&i=1303&lat=29%2E772102&lon=76%2E962141&bp=1 having Project Id as PL1303.

Project Alternatives:

Considering the case of the project activity, the dairy plant requires steam for its operation. The best option for the project proponent would be to continue with the existing pet coke fired boilers to fulfil the steam requirements. Thus, the options considered for further analysis are:

Alternative 1: Continuation of the Pet coke fired boilers to meet the steam requirement of the dairy plant

Alternative 2: Retrofitting of the boilers to rice husk based fired boilers to meet the steam requirement of the dairy plant

Both the alternatives are in compliance with all applicable legal and regulatory requirements. However, of the two alternatives identified, alternative (2) cannot be considered realistic as further analysis in the following paragraph reveals that it faces investment barriers. Hence, alternative (1) alone could be justified as realistic, credible and plausible alternative to the PP.

The validation team has checked the calculation of unit cost of steam generation and verified the input parameters (fuel price, NCV etc.) against the source used viz. Feasibility study report,

actual Invoices as well NCV test report of fuels, Chartered Engineer Certificate and found the calculation to be appropriate. All the input parameters for the investment analysis have been taken at the time of investment decision making.

Considering the option available of continuing the pet coke fired boilers, the project proponent has chosen a more expensive option of running biomass based boilers. So the barrier faced by PP by investing in retrofitting the pet coke fired boilers to rice husk fired boilers is demonstrated by estimating the unit cost of generation of steam in the two alternatives. The unit cost of generation of steam from pet coke was calculated as INR 0.28 per MJ and from rice husk as INR 0.37 per MJ. Thus from the cost comparison analysis, it is explained that the cost of steam generation from the rice husk was much higher than while using pet coke.

Critical parameters which may affect the addtionality are provided below. However, sensitivity analysis shows that even with practically possible variation of values of these parameters are not going to affect additionality and conclusion remains same.

Parameter	**Value**	**Unit**	**Justification of sources**
Pet coke calorific value	7,770	kCal/kg	This value is sourced from feasibility study which was based on lab test report dated 23 June 2012. Both the sources were present at the time of investment decision. NCV test has been conducted by Haryana Test House which is a NABL accredited laboratory. The value was verified from the laboratory report. Also the NCV of pet coke was cross checked from the IPCC web site and found to be in range and hence it was acceptable. http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Biomass calorific value	2,800	kCal/kg	This value is sourced from feasibility study which was based on lab test report dated 23 June 2012. Both the sources were present at the time of investment decision. NCV test has been conducted by Haryana Test House which is a NABL accredited laboratory. The value was verified from the laboratory report.
Pet coke Price	7,400	INR/Tonne	This value is sourced from feasibility study which was based on actual invoice dated 10 June 2012 from Indian Oil Corporation Limited, available at the time of investment decision.
Biomass Price	3,200	INR/Tonne	This value is sourced from feasibility study which was based on quotation received from rice husk suppliers dated 20 June 2012 and 21 June 2012. All the sources were present at the time of investment decision. This value is cross checked with actual

Parameter	Value	Unit	Justification of sources
			invoices which show high prices of rice husk which further affirms the conservativeness of rice husk price.
Efficiency of pet coke based boiler	80	%	This is originally sourced from the feasibility study which was the basis of investment decision. The same was crosschecked with the Chartered Engineer certificate and found to be correct.
Efficiency of rice husk based boiler	74	%	This is originally sourced from the feasibility study which was the basis of investment decision. The same was crosschecked with the Chartered Engineer certificate and found to be correct.

Sensitivity Analysis:
In order to see the robustness of the above justification, sensitivity analysis was carried out with +/-10% variation in boiler efficiency, calorific value of fuel and fuel cost and found that in all the cases unit cost of heat generation was lower with pet coke fired boiler. the result is presented below:
From the sensitivity analysis it is also determined that at what percentage variation, the unit cost of both the cases will be same and render the project as non additional as discussed below:

1. **Other parameters remaining same, rice husk prices are reduced by 25% :** This is highly unlikely situation as rice husk prices are increasing. This was confirmed during the on site visit.
2. **Other parameters remaining same, pet coke prices are increased by 30% :** Since last two years it is observed that the price of pet coke have increased only by 6%. Hence it is very unlikely that the pet coke prices will increase by more than 30% and rice husk prices will remain same.
3. **Other parameters remaining same, calorific value of rice husk increases by 30% :** This account to calorific value of 3,640 kcal/kg. Calorific value is inherent property of rice husk and this does not change drastically with time. Having calorific value of 3,640 kcal/kg of rice husk is not technically foreseen and thus impossible.
4. **Other parameters remaining same, calorific value of pet coke decreases by 24%:** This account to calorific value of 5,905 kcal/kg. Calorific value is inherent property of pet coke and this does not change drastically with time. Having calorific value of 5,905 kcal/kg of pet coke is not technically foreseen and thus impossible.
5. **Other parameters remaining same, efficiency of biomass boiler increases by 30% i.e. to efficiency value of 96%:** It is most unlikely that the efficiency of rice husk fired boiler is more than pet coke fired boiler and hence this is ruled out.
6. **Other parameters remaining same, efficiency of pet coke boiler decreases by 24% i.e. to efficiency value of 61% :** It is most unlikely that the efficiency of pet coke fired boiler is less than biomass fired boiler and hence this is ruled out.

From the above analysis it is seen that the unit cost of energy remains higher for rice husk in all the scenarios. Hence the project activity is considered to be additional.

3.2.6 Quantification of GHG Emission Reductions and Removals

Baseline emissions (BEy):

The baseline emissions have been calculated according to § 16 and 22 of AMS I.C, version 19, which states: "*For steam/heat produced using fossil fuels the baseline emissions are calculated as follows*:

$$BE_{thermal,CO_2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO_2}$$ (Equation 2 of the methodology)

Where:

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the project activity during the year *y* (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the project activity during the year *y* (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2/TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity

Accordingly the baseline emission is estimated by applying above equation of the methodology. The ex-ante estimation of the steam/heat displaced by the project activity during the year "y" is estimated based on the saturated steam (at 17.5 kg/cm^2 (g) pressure for the two 12 TPH boilers and 10.5 kg/cm^2 (g) pressure for the 3 TPH boiler) and feed water characteristics (at 85^0C) as per the boiler specification / operating conditions. Operating days in a year has been considered as 330 days based on the input from MDL and validation deemed it appropriate based on sector expertise considering regular boiler maintenance. Moreover, actual emission reductions will be based on the monitored quality of steam produced. The Emission Factor of the baseline fuel i.e. pet coke is based on the IPCC 2006 default value, IPCC selection is deemed to be appropriate as there is no national data available. The efficiency of the plant (using fossil fuel that would have been used in the absence of the project activity) has been considered as 100% by the PP. Consideration of 100% efficiency is deemed to be conservative as well as in line with § 30 of the applied meth, as data and information for the option (a) and (b) is not available with the PP.

Project emissions (PEy):

In accordance with § 45 of the AMS-I.C., version 19 Project Emissions include:

1. CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of .Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion.;

The project activity is a rice husk based steam generation and does not involve any fossil fuel combustion. Hence this is not applicable.

2. CO_2 emissions from electricity consumption by the project activity using the latest version of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption."

Electricity is imported by the project activity from the grid for auxiliary power consumption of the boiler equipment. Project emissions due to grid electricity consumption for boiler auxiliary consumption are considered as per latest version of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" as below:

$$PE_{EC,\,y} = \Sigma EC_{PJ,i,y} \times FE_{EL,j,y} \times (1+TDL_{j,y})^{2}$$

Where:

$PE_{EC,y}$	:	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	:	Quantity of electricity consumed by the project electricity consumption source j in year y (obtained from the monitored values by energy meters at plant site in MWh)
$EF_{EL,j,y}$	:	Emission factor for electricity generation for source j in year y (tCO_2/MWh) – Grid emission factor is obtained using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 1. The combined margin value is taken from the CO_2 Baseline Emission Factor for Indian Power Sector, Version 09 (latest available version) for NEWNE grid (because the project is connected to NEWNE grid) issued by the Central Electricity Authority (CEA). This value is fixed ex-ante for the crediting period
$TDL_{j,y}$	:	Average technical transmission and distribution losses for providing electricity to source j in year y (default value of 0.2 taken as per the methodological tool)

For ex-ante estimation of project emissions, grid electricity consumption is considered nil and hence the project emissions are considered as 0. Actual project emissions will be calculated based on electricity consumption monitored ex-post.

3. Any other significant emissions associated with project activity within the project boundary;

There are no other significant emissions from the project activity. All the emissions associated with the project activity are already discussed.

4. For geothermal project activities, project participants shall account for the following emission sources, where applicable: fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam; and, carbon dioxide emissions resulting from combustion of fossil fuels related to the operation of the geothermal power plant.

The project activity is not a geothermal project activity. Hence this is not applicable.

[3] http://envfor.nic.in/legis/eia/so195.pdf

Leakage emissions (LEy):

In accordance with section 1.1.3 of VCS PD, project proponent confirms that the project activity does not involve renewable energy technology transfer from another activity. Hence, no leakage calculation is required. Also, the project activity procures and utilizes biomass (rice husk) available within a 100 km radius from project sites. Hence leakage is considered to be zero.

Net GHG Emission Reductions and Removals

$ER_y = BE_y – PE_y – LE_y$

$= 50{,}843\ tCO_2 - 0 - 0$

$= 50{,}843\ tCO_2/\ yr$

The validation team did not find any additional uncertainty associated with the calculation of emission reductions other than those inherent with the applied methodology and default emission factors used.

Validation team confirms that:

- All relevant assumptions and data are listed in the project description, including their references and sources.
- All data and parameter values used in the project description are considered reasonable in the context of the project.
- All estimates of the baseline emissions can be replicated using the data and parameter values provided in the project description.

Validation team is able to confirm that the methodology and relevant tools have been applied correctly to calculate baseline emissions, project emissions, leakage and net GHG emission reductions and removals.

3.2.7 Methodology Deviations

The project does not seek any methodology deviations.

3.2.8 Monitoring Plan

The project activity has correctly applied the Approved Monitoring Methodology AMS I.C., version 19 titled “Thermal energy production with or without electricity”. The monitoring plan provides detailed information related to the collection and archiving of all relevant data needed to:

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

The monitoring plan as per AMS I.C, version 19 has been clearly described in section 4 of the VCS PD. It covers all the monitoring parameters required to monitor the enthalpy supplied by the project boilers and emission reductions due to the project activity accurately. In order to

determine baseline emissions, the quantity of steam generation by the three project boilers along with its pressure and temperature conditions and temperature of the boiler feed water will be monitored. For determining project emissions, quantity of grid electricity consumed by the project boilers will be monitored.

The monitoring plan/procedure followed to measure the emission reduction is applied accurately and with a conservative approach.

Parameters Determined ex-ante

The following parameters are determined ex-ante and mentioned in section 4.1 of the PD:

- The efficiency of the baseline, pet coke based boiler, "$\eta_{BL, thermal}$"
- Average technical transmission and distribution losses for providing electricity to the source j in year y "$TDL_{i,y}$"
- Combined margin emission factor for the NEWNE grid "$EF_{grid,CM,y}$"

Parameters Monitored ex-post

Monitoring of the project activity involves all the parameters necessary for calculation of GHG emission reduction by the proposed project activity. These parameters are mentioned in section 4.2 of the PD. The parameters, which are to be monitored include:

- Net calorific Value of biomass residues, "$NCV_{biomass}$"
  The CO_2 emission factor per unit of energy of pet coke that would have been used in the baseline plant in absence of the project activity, "$EF_{FF,CO2}$"
- Quantity of steam generated from project activity biomass fired boiler, "Q_{steam}"
- Temperature of steam generated, "T_{steam}"
- Pressure of steam generated, "P_{steam}"
- Temperature of the feed water in the boiler, "T_{FW}"
- Net quantity of thermal energy supplied by the project activity during the year Y, "$EG_{thermal,y}$"
- Quantity of rice husk consumed annually, "$Q_{biomass,i,y}$"
- Quantity of Electricity consumed by the project activity in the year y "$EC_{PJi,y}$"

The various monitoring equipment used for monitoring the parameters on the project site, including accuracy class and calibration frequency are given below:

- Q_{steam} – Steam flow meter; Accuracy class – +/-0.5%; Calibrated once in three years by external competent agency

- T_{steam} – Temperature gauge; Accuracy class – +/-0.2%; Calibrated once in three years by external accredited agency

- P_{steam} – Pressure gauge; Accuracy class – +/-0.5%; Calibrated once in three years by external accredited agency

- T_{FW} – Temperature gauge; Accuracy class – +/-0.5%; Calibrated once in three years by external accredited agency

- $Q_{biomass,i,y}$ – Weigh bridge; Accuracy class – +/-1%; Calibrated annually by Govt. agency

- $EC_{PJi,y}$ – Energy meter: Accuracy class – 0.5s; Calibrated once in three years by external accredited agency

The validation team based on local and sectoral expertise deemed acceptable the relevant monitoring equipment along with their accuracy class and calibration frequency.

Detailed responsibilities and authorities for project management, monitoring procedures, calibration procedures and QA/QC procedures have been presented and were verified during follow up interviews. The detailed monitoring practice is considered appropriate and the implementation of these will enable subsequent verification of the project's emission reductions.

3.3 Non-performance Risk Analysis

The Project is not an AFOLU (Agriculture, Forestry and Other Land Use) project. Not applicable.

3.4 Environmental Impact

As per notification S.O.1533, 14/09/2006 and S.O.195 (E) 3 dated 19/01/2009 of Ministry of Environment and Forests (MoEF), Government of India, under the environment impact Assessment Notification this project activity is not required to carry out EIA study.

3.5 Comments by stakeholders

Stakeholders had been directly asked to comment on the project through an open meeting among local stakeholders, project proponent and local authorities on 9th November 2013 at the project site. MDL had invited stakeholders like own employees, local populace, statutory bodies and vendors to provide their feedback on the project activity including its effect on the environment and its socio-economic effect. The invitation was given by an advertisement in a local news paper on 30th October 2013. The attendees have signed the attendance register and the same was checked by the validation team and found to be appropriate. All comments are positive in nature. No adverse comments were received and this is addressed in the PD. This was also confirmed by the validation team during the on site visit interview.

[3] http://envfor.nic.in/legis/eia/so195.pdf

4 VALIDATION CONCLUSION

The Modern Dairies Limited has commissioned the Lloyd's Register Quality Assurance Limited to validate the project: "Biomass based Renewable Energy Generation at Karnal" with regard to VCS Version 3 requirements and the information provided by the project proponent related to the project design, operation, monitoring and reporting.

LRQA has reviewed the project description documents and subsequently carried out site visit interviews to confirm the fulfilment of stated criteria. The project intends to reduce GHG emissions by displacing fossil fuels (for the heat generated to meet captive requirements). A risk based approach has been followed to perform this validation. In the course of the draft validation 12 Clarification Requests (CLs) were raised and successfully closed.

The project activity has applied the baseline and monitoring methodology, AMS I.C, version 19.0: "Thermal energy production with or without electricity", which is an approved methodology under the CDM programme and is acceptable under VCS Version 3. The baseline has been determined in accordance with the stated approved baseline methodology.

Analysis of the proposed project activity reveals that the emission reductions resulting from the project activity are real, measurable and give long term benefits and are additional to what would have occurred in the absence of the project activity. The total emission reductions from the project activity are estimated to be 50,483 tCO_2e per annum over the selected 10 years crediting period. The emission reductions forecast has been checked and is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring plan makes sufficient provision for monitoring relevant project and baseline emission indicators. Responsibilities and authorities for project management, monitoring and reporting and QA/QC procedures have also been addressed.

Based on the information provided by the project developer, it is LRQA's opinion that the "Biomass based Renewable Energy Generation at Karnal" in India as described in the VCS PD, Version 04 dated 26 September 2014, meets all relevant VCS Version 3 requirement and correctly applied approved CDM simplified baseline and monitoring methodology AMS I.C, version 19.0.

LRQA's validation opinion is purely based on the information made available to us by the project proponent during the course of validation and hence LRQA cannot guarantee the accuracy or correctness of the information. Keeping this in mind, no party can hold LRQA liable for any decisions made or not made in this report.

Decision Maker

Prabodha C Acharya

General Manager, Climate Change Services, South Asia

27/09/2014

APPENDIX A : Abbreviations

BE	Baseline emissions
CAR	Corrective action request
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Certified Emission Reduction
CL	Clarification request
DOE	Designated Operational Entity
ERs	Emission reductions
FAR	Forward action request
FBC	Fluidised bed combustion
GHG	Greenhouse gas
HPCB	Haryana Pollution Control Board
IPCC	Intergovernmental Panel on Climate change
Kg-f	Kilogram-force
kW	Kilo Watt
kWh	Kilo Watt hour
LR	Lloyd's Register
LRQA	Lloyd's Register Quality Assurance Limited
MDL	Modern Dairies Limited
MP	Monitoring plan
MR	Monitoring Report
MW	Mega Watt
MWh	Mega Watt hour
NA	Not applicable
NABL	The National Accreditation Board for Testing and Calibration Laboratories
NATCOM	India's Initial National Communication
NEWNE	Northern, Eastern, Western, and North-Eastern Grid
NCV	Net Calorific Value
PD	Project Description
PP	Project proponent
PS	Project Standard
QA/QC	Quality Assurance / Quality Control
tCO_2e	Tonne of carbon dioxide equivalent
TPH	Tonnes per Hour
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCSA	VCS Association
VCU	Verified Carbon Unit
VVM	Validation and Verification Manual
VVS	Validation and Verification Standard

APPENDIX B : Findings Log[4]

1. Grade / Ref:	CL 01 / PD section 1.1	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		VCS Project Description Template, Version 3.2 Paragraph 64 of CDM VVS, version 06.0			
5. Nature of the Issue Raised:					
During the on-site visit interview it was found that in the pre project scenario there were four numbers of pet coke fired boilers. Out of these four boilers, the 8 TPH is still running after the implementation of the project. VCS PD, version 01 is silent on this.					
6. Nature of responses provided by the project participants:					
The section 1.1 of the VCS PD has been appropriately revised to include the fourth boiler i.e. the 8TPH boiler in the project description. Furthermore, it is to be noted that the 8 TPH boiler has not been retrofitted and the same is used as a standby in case of emergencies at the project site.					
7. Assessment of such responses:					
In the revised VCS PD, it has been clarified about the 4th boiler of 8 TPH capacity will remain as standby boiler. Hence the CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Section 1.1					

[4] Explanation of the Findings Log structure:
1. Grading and Sequential Number of the finding 2. Date of Original Finding 3. New, Open, Closed 4. Requirement (VVS, PDD-CDM, etc) 5. Reference to Workbook
6. Details of PP's response 7. Evaluation from the Validation team 8. List of changes made as a result of the finding

1. Grade / Ref:	CL 02 / PD section 1.5	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		VCS Project Description Template, Version 3.2			
5. Nature of the Issue Raised:					
The commissioning dates for all the boilers have not been provided in the VCS PD, version 01. Also during on the on-site visit interview it was confirmed that commissioning date of the first boiler (project start date) is 03/10/2012 whereas in the PD it has been stated as 30/09/2012. PP is requested to provide proper evidence for this.					
6. Nature of responses provided by the project participants:					
The commissioning dates for all the boilers involved in the project activity have now been provided in section 1.5 of the revised PD. Furthermore, the project start date has been corrected to 3rd October, 2012 in accordance with the commissioning certificate. The commissioning certificates of all the three boilers have been submitted with this response.					
7. Assessment of such responses:					
PP has stated commissioning dates of all the three retrofitted project boilers and the commissioning date of the first boiler has been corrected to 03/10/2012. This was verified with the commissioning certificates provided by the PP. Hence the CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Section 1.5					

1. Grade / Ref:	CL 03 / PD section 1.7	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		VCS Project Description Template, Version 3.2 VCS Standard 3			
5. Nature of the Issue Raised:					
In section 1.7 of the VCS PD, version 01, the reason for the project activity falling under “Project” category has been stated because the project activity has less than 1,000,000 tCO_2e per year which is not in accordance with VCS Standard 3.					
6. Nature of responses provided by the project participants:					
Section 1.7 of the VCS PD, has been appropriately revised in accordance with section 3.9.1 of the VCS Standard, version 3. The same now states that the scale of the project activity is categorized under “Project” as the emission reductions resulting from the project activity are below 300,000 tCO_2e per year.					
7. Assessment of such responses:					
Section 1.7 of the VCS PD has been revised stating the emission reduction from the project activity to be below 300,000 tCO_2e per year which is in accordance with the VCS Standard. Hence the CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Section 1.7					

1. Grade / Ref:	CL 04 / PD section 1.5 / 1.8	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		AMS I.C, version 19			
5. Nature of the Issue Raised:					
In section 1.5 and 1.8 of the VCS PD, version 01, the project lifetime has been stated to be 25 years and this has been supported with Annex 15 of CDM EB 50. PP is requested to clarify how this is applicable to this project activity considering the boilers to be retrofit boilers and not new boilers.					
6. Nature of responses provided by the project participants:					
The duration of the Project Activity is mentioned as 25 years based on the "Tool to determine the remaining lifetime of the equipment, Version 1, EB 50, Annex 15. The said tool applies to both new as well as retrofit equipment. As stated therein on Page 3, under option (a) of the said tool, the original technical lifetime of the boiler has been applied as provided by the boiler manufacturer at the time of boiler installation. Furthermore, the three boilers involved in the project activity have different installation dates. Hence, the same will cease to be a part of the project activity once their individual lifetime is exhausted. Original commissioning dates along with $Date_{baselineretrofit}$ is now mentioned in the revised PD					
7. Assessment of such responses:					
PP has revised the VCS PD in which the technical lifetime of the retrofitted project boilers have been taken 25 years from the original dates of commissioning. As per "Tool to determine the remaining lifetime of the equipment", Version 1, EB 50, Annex 15: *"Option (c): Use default values:* *In this option, project participants may use the following default values for the technical lifetime and determine the remaining lifetime as the difference of the technical lifetime and the operational time. This option can only be applied if:* *(i) The project participants can demonstrate that the equipment has been operated and maintained according to the recommendations of the equipment supplier;* *(ii) There are no periodic replacement schedules or scheduled replacement practices specific to the industrial facility, that require early replacement of equipment before the expiry of the technical lifetime; and* *(iii) The equipment has no design fault or defect and did not have any industrial accident due to which the equipment cannot operate at rated performance levels.* *Documentation supporting these conditions should be provided, for example information on the operational history of the equipment".* Accordingly PP has submitted a certificate from Chartered Engineer stating the boilers' efficiency as 80% which demonstrates that the boilers					

were operated and maintained under normal operating conditions. This is deemed acceptable. Hence the CL is closed.	
8. References to resulting changes in the monitoring report or supporting annexes:	
VCS PD, Sections 1.5 and 1.8	

1. Grade / Ref:	CL 05 / PD section 1.13	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		VCS Project Description Template, Version 3.2 VCS Standard 3			
5. Nature of the Issue Raised:					
PP needs to clarify the leakage management as stated in section 1.13 of the VCS PD, version 01 considering that the project is not an AFOLU project.					
6. Nature of responses provided by the project participants:					
Considering that the said section 1.13 is for the AFOLU project, the section is now left blank.					
7. Assessment of such responses:					
VCS PD has been revised by removing the leakage management considering this project is non AFOLU. Hence the CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Section 1.13					

1. Grade / Ref:	CL 06 / PD section 2.3	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		Paragraph 82 of CDM VVS, Version 06.0			
5. Nature of the Issue Raised:					
Grid electricity is used for the auxiliary equipment of the boilers. Hence PP is requested to clarify how project emissions due to electricity consumption are excluded.					
6. Nature of responses provided by the project participants:					
Project emissions due to the import of electricity by the project activity are being taken into account while computation of emission reduction achieved. Hence, project emissions due to electricity consumption cannot be excluded. The table in section 2.3 of the VCS PD has been revised appropriately to include the same.					
7. Assessment of such responses:					
Project emissions due to grid electricity consumption for the project boilers have been taken into account. PD has been revised accordingly. Hence the CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Section 2.3					

1. Grade / Ref:	CL 07 / PD section 2.4	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		Paragraph 88 of CDM VVS, Version 06.0			
5. Nature of the Issue Raised:					
In section 2.4 of the VCS PD, version 01, for Baseline Scenario, PP has referred to "General Guidelines to SSC CDM methodologies" Version 17 which is not the latest one. Also PP needs to clarify how the baseline scenario has been selected using this tool steps as this is not a Greenfield project.					
6. Nature of responses provided by the project participants:					
Section 2.4 of the VCS PD has been appropriately revised in accordance with the applied approved methodology i.e. AMS-I.C., Version 19. The reference to "General Guidelines to SSC CDM methodologies" has also been deleted as the same is not applicable for the said project activity.					
7. Assessment of such responses:					
In the pre project scenario of the project activity, pet coke was being fired in the boilers to generate steam for captive consumption. Paragraph 16 of the applied methodology AMS I.C, version 19 states "*For renewable technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity, times an emission factor for the fossil fuel displaced*". PP has appropriately adopted the baseline scenario for the project activity in accordance with the applied methodology and the VCS PD has been revised accordingly. Hence the CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Section 2.4					

1. Grade / Ref:	CL 08 / PD section 2.5	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		Paragraph 102 VVS, Version 06.0			
5. Nature of the Issue Raised:					
PP needs to clarify whether any prior consideration for VCUs was considered before the implementation of the project activity. PP is also requested to clarify the time period when all the parameters related to additionality demonstration where considered with proper evidences.					
6. Nature of responses provided by the project participants:					
A prior consideration for the VCUs was considered before the implementation of the project activity. A feasibility study for the project proponent i.e. Modern Dairies Limited was conducted by Enen Management Group on the 25th of June 2012 which was followed by a management meeting on 30 June 2012 to decide on the retrofit of the boilers and participation in the VCS Programme. The feasibility report (which was the basis for decision making) as well as the minutes of the Board Meeting has been provided with this response. The time period when the parameters related to additionality demonstration have now been mentioned in the revised excel spreadsheet and the documentary evidence i.e. board resolution for the same has been provided with this response.					
7. Assessment of such responses:					
Decision for the project implementation with carbon credit benefits was taken in the company's board meeting held on 30/06/2012. All the parameters related to additionality of the project were available at the time of decision making of the project activity. The CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Section 2.5					

1. Grade / Ref:	CL 09 / PD section 3.1/3/3	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		AMS I.C, version 19			
5. Nature of the Issue Raised:					
PP needs to clarify what is the source for consideration of baseline efficiency for the determination of baseline plant. Also PP needs to clarify leakage emissions in accordance with the methodology.					
6. Nature of responses provided by the project participants:					
The baseline efficiency of the boiler used in the computation of the baseline emissions of the project is as per paragraph 30 (c) of applied methodology. Option c has been chosen because this value is the most conservative value among all the options. The same is ex-ante fixed parameter and is provided in section 4.1 of the VCS PD. Furthermore, section 3.3 of the VCS PD has been appropriately revised to provide justification on the leakage emissions that are considered to be zero in accordance with the applied methodology.					
7. Assessment of such responses:					
PP has considered the baseline efficiency from the methodology paragraph 30 (c). Also leakage emissions have been described in accordance with the applied methodology in the revised MR. Hence the CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Sections 3.1 and 3.3					

1. Grade / Ref:	CL 10 / PD section 3.4	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		VCS Project Description Template, Version 3.2			
5. Nature of the Issue Raised:					
PP has not provided the detailed calculations of the ex-ante calculation of emission reductions in section 3.4 of the VCS PD, version 01.					
6. Nature of responses provided by the project participants:					
The detailed ex-ante emission reduction calculation has now been provided in section 3.4 of the revised VCS PD.					
7. Assessment of such responses:					
Calculation of the ex-ante emission reductions have been provided in section 3.4 of the revised VCS PD. Hence the CL is closed.					
8. References to resulting changes in the monitoring report or supporting annexes:					
VCS PD, Section 3.4					

1. Grade / Ref:	CL 11 / PD section 4.1	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		VCS Project Description Template, Version 3.2 AMS I.C, version 19			
5. Nature of the Issue Raised:					
Regarding the "Data and Parameters Available at Validation", following issues are identified: 1. PP is requested to clarify how "$EF_{EF,CO2}$" can be fixed ex-ante as per the applied methodological tool? 2. PP is requested to clarify the utility of the parameters "$\eta_{BL,\ thermal}$" "$\eta_{BL,\ Biomass}$". And also are both these two parameters "The efficiency of the project activity biomass based boiler"? 3. PP is requested to clarify why the parameter "$TDL_{i,y}$" has not been stated in section 4.1 of the PD although it has been stated in section 3.2 of the PD. 4. It is not clear from the PD about the ex-ante survey of surplus availability of biomass.					
6. Nature of responses provided by the project participants:					
1. The parameter "$EF_{EF,CO2}$" is used in the computation of the baseline emissions of the project activity. The same has been mentioned in accordance with § 22 of AMS-I.C., Version 19. 2. The "purpose of data" for the parameter "$\eta_{BL,\ Biomass}$" has been appropriately removed in the revised VCS PD. Furthermore, for the parameter "$\eta_{BL,\ thermal}$" the "purpose of data" as well as "Description" has been mentioned in section 4.1 of the revised VCS PD. 3. In accordance with the applied approved methodology AMS-I.C., version 19 and the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 1, the parameters "$TDL_{i,y}$" and "$EF_{grid,CM,y}$" have now been included in section 4.1 of the revised VCS PD. 4. Section 3.3 of the revised VCS PD mentions about the surplus availability of biomass in the region around the project site and the same is arrived at on the basis of the biomass survey conducted. The Biomass Availability Assessment Report prepared by True Biomass International Certification for Modern Dairies Limited has been provided with this response.					
7. Assessment of such responses:					
1. The parameter "$EF_{EF,CO2}$" has been shifted to section 4.2 (i.e. monitoring section) which is in accordance with the applied methodological tool. 2. Purpose of data for the parameter "$\eta_{BL,\ Biomass}$" has been deleted in the revised PD. 5. In the revised PD, PP has provided the parameters "$TDL_{i,y}$" and "$EF_{grid,CM,y}$" in section 4.1 which are used for the calculation of project emissions due to grid electricity consumption for the boiler auxiliary. 3. The revised PD states the surplus availability of biomass within a distance of 100 km from the project site.					

The CL is closed.	
8. References to resulting changes in the monitoring report or supporting annexes:	
VCS PD, Sections 3.3 and 4.1	

1. Grade / Ref:	CL 12 / PD section 4.2	**2. Date:**	16/06/2014	**3. Status:**	Closed
4. Requirement		VCS Project Description Template, Version 3.2 AMS I.C, version 19			
5. Nature of the Issue Raised:					

Regarding the "Data and Parameters Monitored", following issues are identified:

1. For the parameter "NCV biomass", it has been stated that it will be used for calculation of baseline emissions. PP to clarify how?
2. It is not clear from the PD, whether there are separate instruments for the monitoring of steam related parameters for the three boilers.
3. During the on site visit interview it was found that the steam flow meters for the boilers are not functioning properly throughout. PP is requested how steam quantity is monitored and reported?
4. Monitoring and recording frequency for the monitoring parameters have not been stated in accordance with the methodology.
5. In the VCS PD it has been stated that the temperature gauge is calibrated by external NABL accredited agency. But during the on-site visit interview it was found that it is being calibrated internally. PP to clarify.
6. Under the parameter "$EG_{thermal,y}$" it is not clear how this parameter is calculated.
7. For the parameter "$Q_{biomass,i,y}$" it has been stated that "the screw feeder will be calibrated by the external NABL accredited agency". But during the on site visit interview it was found that the biomass consumption will be monitored by inventory stocks and the incoming biomass from the purchasers will be measured by the weigh bridge which is calibrated by weights and measures department (Govt agency). PP to clarify.
8. PP to clarify how the grid emission factor for project emissions calculation will be determined.

6. Nature of responses provided by the project participants:

1. VCS PD has been revised suitably.
2. The parameter box for "**Q_{steam}**" has been appropriately modified in the revised VCS PD to illustrate that each of the boiler has a separate steam flow meter.
3. In case of any fault in steam flow meters, the emission reduction will be calculated adopting most conservative procedure or for the faulty period no emission reductions will be claimed.
4. The monitoring and recording frequency for all the parameters stated in section 4.2 of the VCS PD has now been revised in accordance with the stipulations in the applied methodology.

5. The QA/QC procedures for the parameter "T_{steam}" have been appropriately revised in accordance with the actual calibration procedure followed onsite for the temperature gauges used. 6. The calculation procedure has been adequately elaborated for the parameter "$EG_{thermal,y}$" in the revised VCS PD. 7. For the parameter "$Q_{biomass,i,y}$", the "Measurement methods" have been appropriately revised to include the actual procedure followed onsite. 8. The Grid emission factor utilized in the computation of the project emissions has now been provided in section 4.1 of the revised VCS PD as an ex-ante fixed parameter. The same is arrived at using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 1. Furthermore, the value applied is provided by the CO_2 Baseline Emission Factor for Indian Power Sector, Version 09 issued by the Central Electricity Authority (CEA).
7. Assessment of such responses:
1. PD has been revised wherein purpose of $NCV_{biomass}$ for determination of baseline emissions has been deleted. 2. Revised PD shows that the steam measurement will be done separately for the three project boilers. 3. PP will either use the most conservative approach or is not going to claim any emission reductions for the period when the steam flow meter is not functional. This approach and deemed acceptable. 4. Monitoring and recording frequency for the monitoring parameters have been stated in accordance with the methodology in the revised PD. 5. In the revised PD it has been stated that the temperature gauge will be calibrated by internally against the master gauge which is traceable to national standard. 6. Calculation procedure has been explained for the parameter "$EG_{thermal,y}$" in the revised PD. 7. Biomass quantity will be monitored by inventory method. This has been stated in the revised PD. 8. Grid emission factor has been derived from the latest version of CEA data base for NEWNE grid which is in accordance with the methodological tool. As all the points of the CL are appropriately addressed, the CL is closed.
8. References to resulting changes in the monitoring report or supporting annexes:
VCS PD, Section 4.2

APPENDIX C : Certificate of appointment

Validation of "Biomass based Renewable Energy Generation at Karnal"

We hereby certify that the following personnel have been engaged in the validation process that has fully satisfied the competence requirements of the validation of the VCS project activity.

Name of Person	Assigned Roles
Sanjay Kumar Agarwalla	Team Leader and Sector expert
Ankush Jain	Technical Reviewer
Archak Pattanaik	Sector expert to Technical Reviewer
Prabodha C Acharya	Decision Maker

Signed by

Decision Maker

Prabodha C Acharya

General Manager, Climate Change Services, South Asia

27/09/2014