



VALIDATION OPINION – CREDITING PERIOD RENEWAL

“BAGEPALLI CDM BIOGAS PROGRAMME” IN INDIA

(UNFCCC Registration Ref. No. 121)

REPORT NO. 2013-0491

REVISION NO. 01

DET NORSKE VERITAS



 VALIDATION OPINION – CREDITING PERIOD RENEWAL

Date of first issue: 2013-07-22	ConCert Project No.: PRJC-450491-2013-CCS-IND	DNV CLIMATE CHANGE SERVICES AS Veritasveien 1, 1322 HØVIK, Norway Tel: +47 67 57 99 00 Fax: +47 67 57 99 11 http://www.dnv.com Org. No: NO 994 774 352 MVA
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Summary:

Project Name: Bagepalli CDM Biogas Programme
Registration Ref. No.: 121
Country: India
Methodology: AMS- I. E **Version:** 05.0
GHG reducing Measure/Technology: Renewable energy generation
ER estimate: 18 645 tCO₂e per year (average)
Size
☐ Large Scale ☒ Small Scale
Validation Phases:
☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues
Validation Status
☐ Corrective Actions Requested ☐ Clarifications Requested
☒ Full Approval and request for renewal ☐ Rejected

In summary, it is DNV's opinion that the project activity "Bagepalli CDM Biogas Programme" in India, as described in the PDD, version 05 of 2 Aug 2013, meets all relevant UNFCCC requirements for the renewal of the crediting period. Hence DNV requests the renewal of the crediting period of the project.

Report No.: 2013-0491	Subject Group: Environment	Indexing terms Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism ☒ No distribution without permission from the client or responsible organisational unit ☐ free distribution within DNV after 3 years ☐ Strictly confidential ☐ Unrestricted distribution
Report title: Bagepalli CDM Biogas Programme in India		
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Date of this revision: 6 Aug 2013	Rev. No.: 01	Number of pages: 16

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Abbreviations

ADATS	Agricultural Development and Training Society
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CEF	Certified Emission Reduction(s)
CH ₄	Methane
CL	Clarification request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
FAR	Forward Action Request
FCN	Fair Climate Network
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of approval
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
PP	Project Participants
PS	Clean Development Mechanism Project Standard
tCO ₂ e	Tonnes of CO ₂ equivalents
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard



1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed an assessment of the request by Velcan Energy Ltd. to renew the crediting period of CDM project activity 121 “Bagepalli CDM Biogas Programme” in India. The assessment was performed in accordance with the Validation and Verification Standard (Version 04.0) and the CDM Project Standard (Version 04.0) and included an assessment of:

- (a) An impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant guidance from the Board with regard to renewal of the crediting period at the time of requesting renewal of crediting period;
- (b) The correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the validity of the original baseline and/or its update through an assessment. The project correctly applies the baseline and monitoring methodology AMS- I. E, version 05.0.0 “Switch from Non-Renewable Biomass for Thermal Applications by the User”.

The total emission reductions from the project are estimated to be on the average 18 645 tCO₂e per year over the 2nd renewable crediting period. The emission reduction forecast has been checked, and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring plan provides for the monitoring of the project’s emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design, and it is DNV’s opinion that the project participants are able to implement the monitoring plan.

In summary, it is DNV’s opinion that the CDM project activity 121 “Bagepalli CDM Biogas Programme” in India meets all relevant UNFCCC requirements for the renewal of the crediting period. Hence DNV requests the renewal of the crediting period of the project.

Bangalore and Oslo, 6 Aug 2013

S. Ranganathan
Validator
DNV, India

Hendrik W. Brinks
Approver,
DNV Climate Change Services AS



2 INTRODUCTION

DNV Climate Change Services AS (DNV) was commissioned by Velcan Energy Ltd. to perform an assessment of the request by to renew the crediting period of CDM project activity 121 “Bagepalli CDM Biogas Programme” in India.

The assessment was performed in accordance with the Validation and Verification Standard (Version 04.0) and the CDM Project Standard (Version 04.0) and included an assessment of:

- (a) An impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant guidance from the Board with regard to renewal of the crediting period at the time of requesting renewal of crediting period;
- (b) The correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

3 METHODOLOGY

The validation consisted of the following three phases:

- I document review
- II follow-up actions (e.g. on-site visit and telephone or email interviews)
- III the closing out of validation findings and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Document Review

The following tables list the documentation that was reviewed during the validation.

3.1.1 Documentation provided by the project participants

/1/	Velcan Energy Ltd: <i>CDM-PDD for project activity “Bagepalli CDM Biogas Programme” in India</i> , version 05 dated 2 Aug 2013
/2/	Velcan Energy Ltd: Communication with UNFCCC on the renewal of crediting period- e-mail to UNFCCC 11 February 2013 (along with the PDD).
/3/	UNFCCC secretariat: Confirmation on receipt of notification for renewal of crediting period along with unvalidated PDD, dated 13 February 2013.
/4/	ADATS : Daily log book for monitoring of biogas units maintained by Balakendra teacher for break down details, operational and non operational hours.
/5/	InfoNeeds database at ADATS head office in Bagepalli for complete biogas units monitoring details.
/6/	ADATS: End user agreements between ADATS and biogas unit users.
/7/	ADATS : Store register maintained which has details of biogas stove issued
/8/	Infoneeds : Screen shot of biogas monitoring system



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

/9/	CDM Executive Board: <i>Clean Development Mechanism Validation and Verification Standard</i> , version 04.0
/10/	CDM Executive Board: <i>Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period</i> . Version 03.0.1
/11/	CDM Executive Board: <i>Clean Development Mechanism Project Standard</i> , version 04.0
/12/	CDM Executive Board: <i>Clean Development Mechanism Project Cycle Procedure</i> , version 04.0
/13/	CDM Executive Board: <i>Baseline and monitoring methodology AMS-I C version 05 and AMS- I. E</i> , version 05.0.0
/14/	CDM Executive Board: EB 74 annex-6-Guidelines for sampling and surveys for CDM Project activities and Programme of Activities

3.1.3 Documents used by DNV to validate / cross-check the information provided by the project participants

/15/	Det Norske Veritas AS (DNV): Validation Report, (report number: 2005-9058) <i>dated 30 October 2005</i>
/16/	Det Norske Veritas AS (DNV): Validation Opinion for Post registration changes dated <i>23 August 2013</i> . (approved on 27 September 2012)
/17/	Velcan Energy: Registered PDD version 2, 28 October 2005; Revised PDD version 3 dated 22 August 2012 (approved by EB on <i>27 September 2012</i>)
/18/	Williamgodden: Sample size calculator formula adopted for the project activity.
/19/	NSSO 2010: National Sample Survey Organization, Household Consumer Expenditure in India, Ministry of Statistics and Programme Implementation, Government of India.
/20/	Karnataka at a glance, Directorate of Economics and Statistics, Government of Karnataka, 2011
/21/	Ramachandra, T.V., Vamshee Krishna S and Shruthi, B.V. 2005. Decision support system for regional domestic energy planning. <i>Journal of Scientific and Industrial Research</i>
/22/	State of Forest Report. 2011. Forest Survey of India, Ministry of Environment and Forests, Government of India



3.2 Follow-up actions

On 13 and 14 March 2013, DNV visited the project site and performed interviews with project stakeholders.

	Date / Type of interview	Name / Organization	Topic
/23/	13 March 2013 ☒ On-site ☐ Face-to-face at office ☐ Telephone ☐ E-mail	• Dr. Sudha Padmanabha, FCN • Mr. Chethan, FCN • Mr. Abid Pasha, ADATS	• An assessment of the implementation and operation of the registered project activity is as per the PDD for the project activity
/24/	14 March 2013 ☒ On-site ☐ Face-to-face at office ☐ Telephone ☐ E-mail	• Mr. Venkatanarasappa, BCS • Representative of Individual households spread over the 5 Taluks that were visited and interviews conducted.	

3.3 Closing out of validation findings

The objective of this phase of the assessment was to resolve any issues which needed be clarified prior to DNV's positive conclusion on the project's compliance with applicable CDM requirements.

In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of four tables. The different columns in these tables are described in the figure below. The completed validation protocol for the project activity "Bagepalli CDM Biogas Programme" in India is enclosed in Appendix A to this report.

Table 1 of the validation protocol documents the findings of the desk review of the project design documentation and follow-up interviews with project stakeholders. Any findings raised in Table 1 are listed in Table 2 of the protocol, and changes to the description of the project design as a result of these findings will be addressed in Table 2. Table 1 thus may not reflect all aspects of the project as described in the final PDD submitted for registration.

A corrective action request (CAR) is raised if one of the following occurs:



- (a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
- (b) The applicable CDM requirements have not been met;
- (c) There is a risk that emission reductions cannot be monitored or calculated.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration.

The validation identified two CARs. No CLs or FARs have been identified. The CARs were satisfactorily addressed by the project participants by among other revising the PDD (please refer to Table 3 in Appendix A for further details). In addition to the changes made to the PDD as a result of the validation findings, the following changes to the PDD (version 05 dated 2 Aug 2013) were made:

- The revised PDD provided by PP now states the duration of the storage of data for verification which states that “All data will be archived and stored throughout the crediting period and an additional 2 years”



Validation Protocol Table 1: Requirement Checklist				
Checklist question	Reference	Means of verification (MoV)	Assessment by DNV	Draft and/or Final Conclusion
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the CDM-PDD	Gives reference to documents where the answer to the checklist question or item is found.	Means of verification (MoV) are document review (DR) , interview (I) or any other follow-up actions (e.g., on site visit and telephone or email interviews) and cross-checking (CC) with available information relating to projects or technologies similar to the proposed CDM project activity under validation.	The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.	OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A corrective action request (CAR) is raised when project participants have made mistakes, the CDM requirements have not been met or there is a risk that emission reductions cannot be monitored or calculated. A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. A forward action request (FAR) during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.

Validation Protocol Table 2: Resolution of Corrective Action and Clarification Requests			
Corrective action and/or clarification requests	Ref. to checklist question in table 2	Response by project participants	Validation conclusion
The CARs and/ or CLs raised in Table 2 are repeated here.	Reference to the checklist question number in Table 2 where the CAR or CL is explained.	The responses given by the project participants to address the CARs and/or CLs.	The validation team's assessment and final conclusions of the CARs and/or CLs.

Validation Protocol Table 3: Forward Action Requests		
Forward action request	Ref. to checklist question in table 2	Response by project participants
The FARs raised in Table 2 are repeated here.	Reference to the checklist question number in Table 2 where the FAR is explained.	Response by project participants on how forward action request will be addressed prior to first verification.

Figure 1 Validation protocol tables



3.4 Internal quality control

This validation opinion underwent a technical review performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation team

Role	Last Name	First Name	Country	Type of involvement						
				Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA 1.2 competence	Financial expertise
Team leader (Validator)	Ranganathan	Seshan	India	✓	✓	✓	✓			
Validator	Swarnim	Shilpa	India	✓	✓	✓				
Expert	Namboodiri	Krishnan	India	✓	✓	✓			✓	
Technical reviewer	Prabhu	Ravi Kumar	India					✓	✓	

The qualification of each individual validation team member is detailed in Appendix B to this report.

4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The final validation findings relate to the project design as documented and described in the PDD, version 05 dated 2 Aug 2013 /1/.

4.1 Validity of selected baseline and monitoring methodology

The project was originally registered applying small scale methodology AMS-I.C, version 5 "Thermal Energy for the user" /13/. As the applicability criteria of the methodology of the registered PDD /17/ do not apply anymore, so the applicable methodology at time of submission of revised PDD, AMS-I.E (Switch from Non-Renewable Biomass for Thermal Applications by the User), version 05.0 has been applied

The revised CDM-SSC-PDD (version 05 dated 2 Aug 2013) /1/ applies the valid version 05.0 of AMS-I.E /13/, in line with CDM project standard version 04.0 (Section 12.9.1) /11/. This is appropriate as version 05.0 of AMS-I.E was the latest version of the methodology in effect when the CDM-SSC-PDD version 04 was submitted for the revalidation. All PDD sections relating to the baseline, estimated emission reductions and the monitoring plan were updated accordingly to AMS-I.E version 05.0 /13/, as described in the following sections.

The first crediting period for the project activity was from 01 September 2006 to 31 August 2013. As per the relevant requirements /12/, the project proponent has sent the notification,



along with the draft PDD to UNFCCC for request for renewal of crediting period on 11 February 2013 /2/ and UNFCCC secretariat confirmed receipt of notification vide its mail dated 13 February 2013 /3/.

4.2 Application of selected baseline and monitoring methodology

The assessment of the project's compliance with the applicability criteria of AMS- I. E (version 05.0.0) /13/ are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

The project activity involved installation and operation of 5 500 digesters in phases, at individual households and use of biogas produced in biogas stoves for cooking purpose and heating of hot water, replacing the commonly used inefficient wood fired mud stoves technology, thus avoiding the use of non-renewable biomass like the fuel wood from forests. in the baseline scenario. In accordance with the chosen methodology, AMS-I.E. version 05.0 /13/ in the absence of the project activity, the baseline scenario would be the use of fuel wood for meeting similar thermal energy needs.

As stated in the PDD /17/, prior to the implementation of the project activity, the source of thermal energy in the households was mainly non-renewable biomass (wood). The implementation of the project activity has resulted in reduction of the consumption of non-renewable biomass in individual household where the biogas plants have been installed.

DNV is able to confirm that the monitoring plan contained in the revised PDD (version 05 dated 2 Aug 2013) /1/ is in accordance with the approved methodology applied by the project activity, i.e. AMS-I.E (version 05.0) /13/.

The PDD for the renewal crediting period has been revised as per the approved methodology, AMS-I.E, version 05.0.0. The application of AMS-I.E version 05.0.0/13/ for the project activity is justified as:

- The project activity comprises of biogas units that will displace the use of non-renewable biomass by introducing new renewable end-user technology, the biogas units.
- The communities are using non-renewable biomass since 31 December 1989 as could be confirmed from the official reports or statistics by the Forest Survey of India, Government of India.
- The capacity of the project activity is approximately 6MW_{th} and will remain under this limit during every year of the crediting period.

All the applicability conditions have been assessed and found to be adequately addressed by the project activity. The boundary of the project activity is each household where the biogas stove is installed and the physical, geographic site of the use of biomass covering the taluks of Bagepalli, Chikkaballapur, Chintamani, Gudibanda and Sidlaghatta in Chikkaballapur district in the state of Karnataka.

Thus, in line with CDM VVS /9/, version 04.0, DNV confirms that the applied methodology AMS-I.E version 05.0.0 /13/ is applicable to the project activity.



4.3 Validity of the original baseline or its update

Validity of the baseline has been assessed as per the Methodological Tool “Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period” Annex 20, EB 65, Version 03.0.1 /10/.

Step 1: Assess the validity of the current baseline for the next crediting period

The CDM Project Standard /11/ requires assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline. The validity of the current baseline is assessed in the following sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario identified at the validation of the project activity was thermal energy from fuel wood, of which a large part of it was non-renewable for domestic cooking and water heating. This project activity replaced equivalent amount of thermal energy from renewable source, the biogas. Thus, the continued operation of the project activity would continue to replace thermal energy from fuel wood, hence the same baseline as identified in the previous crediting period is still valid for the project. The fuel wood is replaced with the renewable biogas and the users are avoiding greenhouse gas emissions in the baseline case.

There are no new relevant national and/or sectoral policies and circumstances ever since the project was registered that have an impact on the baseline.

Thus, it is concluded that the baseline for the project activity remains same and is in line with the relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances

The project activity was registered on 10 December 2005. It was observed during validation and registration that the rural households of the Chickballapur district, the project area, are primarily dependent on fuel wood for cooking and heating water, and accordingly the baseline scenario identified was thermal energy from fuel used for wood for domestic cooking and water heating. This scenario is again reflected in study carried out by National Sample Survey Organization in 2010 /19/ and in report of Directorate of Economics and Statistics, 2011 /20/ which highlights that this region is scarce of biomass and nearly 77.67% of the rural population in Chickballapur District use fuel wood for cooking. Hence, the new circumstances do not have an impact on the baseline emission. The conditions used to determine the baseline emissions in the previous crediting period are valid even now. In the absence of the project activity, the baseline scenario in the project boundary is the use of non-renewable biomass for cooking and heating water on traditional cook stoves with low efficiencies.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

As detailed above, the baseline scenario identified was thermal energy from fuel used for wood for domestic cooking and water heating. In the absence of the project activity, the baseline scenario in the project boundary is the use of non-renewable biomass for cooking and



heating water on traditional cook stoves with low efficiencies. Therefore this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

The project was originally registered applying small scale methodology AMS-I.C, version 5 “Thermal Energy for the user”. Since the applicability criteria of the methodology of the registered PDD /17/ do not apply anymore, hence the applicable methodology at time of submission of revised PDD /1/, AMS-I.E, version 05.0.0 (Switch from Non-Renewable Biomass for Thermal Applications by the User), /13/, has been applied.

The default values for net calorific value for woody biomass (NCV - 0.015 TJ/tonne) and emission factor of substituted non-renewable woody biomass (EF - 81.6 tCO₂/TJ) as per the applied methodology AMS-I.E, Version 5 /13/ has been adopted for emission reduction calculations. The quantity of woody biomass than has been substituted or displaced (B_y- 3.0733 tonnes/family/year) and fraction of woody biomass used in the absence of the project activity that is non-renewable (f_{NRB} - 0.95) has also been updated.

Thus, the data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore and the applied parameters for calculating emission reductions has been updated for the subsequent crediting period.

Conclusion on step 1

Application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is still valid for the subsequent crediting period. The data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore and have been updated in accordance with applied methodology AMS-I.E, version 05.0.0 /13/. The relevant update in the data and the source used has been described in the following section of this report

Step 2: Update the current baseline and the data and parameters

As detailed above in step 1.4, the current baseline is still valid for the subsequent crediting period. The data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore and have been updated in accordance with applied methodology AMS-I.E, version 05.0.0 /13/.

Step 2.1: Update the current baseline

Without reassessing the baseline scenario, the baseline emissions has been updated for the subsequent crediting period based on the latest methodology i.e. AMS-I.E, version 05.0.0 /13/ now applicable to the project activity.

The approved baseline methodology has been correctly applied to identify a complete list of realistic and credible baseline scenarios, and the identified baseline scenario most reasonably represents what would occur in the absence of the proposed CDM project activity.



It can be concluded that the baseline scenario of the project activity has not changed and the required data and parameter has been updated. The baseline of the project activity has not changed in the renewal crediting period and there has been no impact of national and/or sectoral policies. All the assumption and data used by the project participants are listed in the PDD /1/.

Step 2.2: Update the data and parameters

The data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore and have been updated in accordance with applied methodology AMS-I.E, version 05.0.0 /13/.

In accordance with applied methodology AMS-I.E, version 05.0.0 /13/, Emission reductions are calculated as:

$$ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel}$$

Where:

ER_y	Emission reductions during the year y in tCO ₂ e
B_y	Quantity of woody biomass that is substituted or displaced in tonnes
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods or government data or approved default country specific fraction of non-renewable woody biomass (f_{NRB}) values available on the CDM website
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted
$EF_{projected_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers

The default values for net calorific value for woody biomass ($NCV = 0.015$ TJ/tonne) and emission factor for substituted non-renewable woody biomass ($EF = 81.6$ tCO₂/TJ) as per the applied methodology AMS-I.E, Version 05.0 has been adopted for emission reduction calculations. The quantity of woody biomass than has been substituted or displaced ($B_y - 3.0733$ t/family/yr) and fraction of woody biomass used in the absence of the project activity that is non-renewable ($f_{NRB} - 0.95$) has also been updated.

All the assumption and data used by the project participants are listed in the revised PDD /1/.



4.4 Validity of monitoring plan

The project monitoring plan is in compliance with the monitoring methodology AMS- I. E (version 05.0.0) /13/. The project was originally registered applying small scale methodology AMS-I.C, version 5 “Thermal Energy for the user”. Since the applicability criteria of the methodology of the registered PDD /17/ do not apply anymore, hence the applicable methodology at time of submission of revised PDD /1/, AMS-I.E (Switch from Non-Renewable Biomass for Thermal Applications by the User), version 05.0 /13/, has been applied and the monitoring plan of the same has been adopted.

The monitoring plan will give opportunity for real measurements of achieved emission reductions. It is DNV’s opinion, that the project participant is able to implement the monitoring plan.

4.4.1 Parameters determined ex-ante

In accordance with applied methodology, AMS- I. E (version 05.0.0) /13/, the data and parameters fixed *ex ante* are Quantity of woody biomass that is substituted or displaced in tonnes (By), Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass ($f_{NRB, y}$), Net Calorific Value of Biomass ($NCV_{biomass}$), Emission Factor of substituted non-renewable woody biomass ($EF_{projected_fossilfuel}$) and Diversion of non-renewable biomass saved under the project activity by non-project households.

It was assessed that the data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore and are now updated in accordance with applied methodology, AMS- I. E (version 05.0.0) /13/.

The default values for net calorific value for woody biomass ($NCV = 0.015$ TJ/tonne) and emission factor of substituted non-renewable woody biomass ($EF = 81.6$ tCO₂/TJ) given in the applied methodology AMS- I. E (version 05.0.0) /13/ has been adopted for emission reduction calculations. The quantity of woody biomass that has been substituted or displaced (By- 3.0733 t/family/yr) and fraction of woody biomass used in the absence of the project activity that is non-renewable ($f_{NRB} = 0.95$) has also been updated. The diversion of non-renewable biomass saved under the project activity by non-project households is 0.15 tonne per family per year /1/.

The updated parameters are fixed *ex-ante* for the entire second renewable crediting period of 7 years. The calculations and assumptions have been verified and found to be correct by DNV.

4.4.2 Parameters monitored ex-post

The parameter monitored ex-post is number of installed 2 m³ systems constructed, number of biogas plants operating, confirmation that non-renewable biomass has been substituted and Non-usage days of installed and operational biogas plants. All the stated parameters are monitored for all the biogas plants constructed and in operation except for confirmation that non-renewable biomass has been substituted, which is based on sample survey.

In order to assess the above, the project participant has chosen stratified random sampling for the project area wherein each five taluks of Chickballapur District covered by the project area is a stratum. The total sample size is calculated as per the equation given in the “Guidelines



for sampling and surveys for CDM project activities and programme of activities” /14/ assuming a constant proportion value for biogas days operational (0.75) across all five taluks. This is deemed appropriate as the biogas users under the project activity are from rural region having similar socio-economic strata and cooking habits.

Sample size has been estimated by the project participant with a 90% confidence and $\pm 10\%$ precision as per the “Guidelines for sampling and surveys for CDM project activities and programme of activities” /14/. This gives a sample size of 110 households, on an expected response rate from the sampled households to be only 80%. The sample will be drawn at random from the sampling frame using random number tables or using the random number generator of appropriate software. The number of households sampled will be apportioned accordingly to the 5 taluks of Chickballapur District. DNV verified the formula adopted for sample size calculation along with the data considered and confirm that the calculations are correct and comply with the requirements of the EB guideline /14/ and the applied methodology AMS- I. E (version 05.0.0) /13/.

The parameters are monitored continuously and recorded on a daily basis by the representatives of project proponent /4//5/. ADATS is in charge of construction, service and maintenance, and data collection for preparation of monitoring reports.

The monitoring plan is in accordance with the monitoring methodology /13/ and will give opportunity for real measurements of achieved emission reductions. DNV confirm that the project participant has the capacity to implement the monitoring plan.

4.4.3 Management system and quality assurance

Details of data to be collected and frequency of data recording are described in the PDD /1/.

All data will be kept for two years after the end of the last crediting period. ADATS is responsible for the operation and maintenance of the project, the monitoring equipment and data collection. The management system for the project has been verified to be in place by DNV on site. The organization structure with the responsibilities, personnel competencies, monitoring procedure and monitoring management have been properly identified and put into operation.

The procedures cover management responsibilities, data monitoring procedures, training procedures, periodical internal audits, management reviews and corrective actions in case of any deviations effectively.

DNV confirms that the responsibilities and authorities in the management and operational system for monitoring and reporting are in accordance with the responsibilities and authorities stated in the registered PDD and monitoring plan /17/.

4.5 Algorithms and/or formulae used to determine emission reductions

As per PDD/1/ the emission reductions resulting from the project activity during the above mentioned period , in accordance with applied methodology AMS-I.E (Version 05) /13/ have been calculated as follows-

$$ER_y = B_y * f_{NRB,y} * NCV_{Biomass} * EF_{projected_fossilfuel}$$

Where:



ER_y	= Emission reductions during the year y in tCO ₂ e
B_y	= Quantity of biomass that is substituted or displaced in tonnes
$f_{NRB,y}$	= Fraction of biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods.
$NCV_{Biomass}$	= Net calorific value of the non-renewable biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne).
$EF_{\text{projected_fossilfuel}}$	= Emission factor of substituted non-renewable woody biomass is taken as 81.6 tCO ₂ /TJ..

B_y is calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of biomass per appliance (tonnes/year). As per the PDD /1/ based on published literature at validation, the annual consumption of biomass per appliance i.e. per family is fixed ex-ante as 3.0733 tonne/year.

There was no transfer of equipment being currently utilized transferred from outside the project boundary to the project boundary. All the biogas units were constructed at site. Thus leakage from equipment transfer need not be monitored.

Leakage relating to non-renewable biomass B_y will be addressed by multiplying net to gross adjustment factor of 0.95 to account for leakages, in which case surveys will not be required as per the methodology AMS-I.E (Version 05.0) /13/.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average *ex-ante* estimation of emission reduction conservatively calculated to be 18 645 t CO₂e per year for the selected crediting period.

All assumptions and data used by the project participants are listed in the PDD/1/, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD /1/. All values used in the PDD /1/ are considered reasonable in the context of the proposed CDM project activity. The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD /1/.

4.6 Estimation of GHG emissions

The calculation formulae as provided in the approved baseline and monitoring methodology AMS-I.E (Version 05.0) /13/, have been applied. All aspects related to the direct and indirect GHG emissions as relevant to the project activity have been addressed and are presented in a transparent manner, in line with the approved methodology.



4.6.1: Baseline emission:

Baseline Emissions: The applied methodology AMS- I. E (version 05.0.0), does not mention equations for individual calculations of baseline emissions, project emissions or leakage but provide direct emission reductions calculations.

The emission reductions are calculated as:

$$ER_y = B_y * f_{NRB,y} * NCV_{Biomass} * EF_{projected_fossilfuel}$$

Where:

ER_y = Emission reductions during the year y in tCO₂e

B_y = Quantity of biomass that is substituted or displaced in tonnes

$f_{NRB,y}$ = Fraction of biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods.

$NCV_{Biomass}$ = Net calorific value of the non-renewable biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne).

$EF_{projected_fossilfuel}$ = Emission factor of substituted non-renewable woody biomass is taken as 81.6 tCO₂/TJ.

For the calculation of emissions reductions from displacement of Non-renewable biomass by biogas is considered as 3.0733 tonnes per year and fraction of woody biomass used in the absence of the project activity in year y ($f_{NRB,y}$) as 0.95 .

According to Methodology, considering the default values for NCV Biomass (0.015 TJ/tonne) the emission reduction due to substitution of biomass is calculated to be 19 635 tCO₂ per year which is derived as product of Quantity of Biomass that is substituted (t/yr), Fraction of NRB and NCV Biomass (TJ/t)

4.6.2 Leakage

PP has accounted for leakages as per latest version 5 of AMS-I.E methodology /13/ for the quantity of biomass that is substituted or displaced by multiplying with a net to gross adjustment factor of 0.95 as per latest version 5 of AMS-I.E methodology /13/ to account for leakages

B_y is considered as $3.0733 \times 0.95 = 2.92$ tonne per family per year taking into account leakage factor.

Thus, emission reduction calculations from AMS I.E. Switch from Non-Renewable Biomass for thermal applications by the User is 18 645 tCO₂/year for 5 500 households.

There will not be any transfer of equipment being currently utilized transferred from outside the project boundary to the project boundary. All the biogas units are constructed at site. Thus leakage from equipment transfer need not be monitored.

The biogas plants will be monitored continuously for non-usage. The emission reduction will be calculated only for usage days of all the constructed and operational units. The emission reduction ex-post will be as follows:



$$ER_y = \sum_{n=1}^{5500} \left(\frac{B_{y(\text{adjusted for leakage})}}{365} * N_{\text{days}} \right) * f_{\text{NRB},y} * NCV_{\text{biomass}} * EF_{\text{projected_fossilfuel}}$$

Where:

N_{days} = operational days of installed biogas units for the monitoring period

n = biogas units installed

DNV has verified the calculation and the values adopted and confirm that the values have been applied appropriately and the calculations are correct.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average ex-ante estimation of emission reduction conservatively calculated to be 18 645 tCO₂e per year for the second crediting period.

All assumptions and data used by the project participants are listed in the PDD /1/ and/or supporting documents, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD. All values used in the PDD are considered reasonable in the context of the proposed CDM project activity. The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD /1/.

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APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Requirements checklist

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
A General description of project activity					
A.1 Title of the project activity (PS § 31, VVS § 62-63)					
Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/1/	DR	☒ Clearly identifiable title of the project activity ☒ Version number of the PDD is included ☒ Date of the PDD is included.	OK	
Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	☒ Yes	OK	
B Application of a baseline and monitoring methodology					
B.1 Methodology applied (VVS para 70-133 and VVS § 150-153 for small-scale project activities, as applicable)					
Does the project apply an approved methodology and the correct version thereof? <i>If during the course of validation the originally applied version of the methodology expires, a CAR shall be raised in Table 3 of the validation protocol. Any new requirements of the revised version of the methodology not yet validated in Table 2 of the validation protocol shall be validated in Table 3 as part of the assessment of the CAR raised.</i>	/1// 13/	DR	The registered CDM project activity was registered under AMS-I.C version 5. The applicability criteria of the methodology of the registered PDD do not apply anymore. So the applicable methodology at time of submission of revised PDD, AMS-I.E version 05.0 has been applied.	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
B.2 Applicability of methodology (and tools) (VVS § 73-77) <i>Insert a row for each applicability criteria of the applied methodology (and tools)</i>					
How was it validated that project complies with the following applicability criteria: insert applicability criteria 1? <i>This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include, but are not limited to biogas stoves, solar cookers, passive solar homes, renewable energy based drinking water treatment technologies (e.g. sand filters followed by solar water disinfection; water boiling using renewable biomass).</i>	/1/ /13/	DR	The project activity comprises of biogas units that will displace the use of non-renewable biomass by introducing new biogas units.	OK	
How was it validated that project complies with the following applicability criteria: insert applicability criteria 2? <i>Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.</i>	/1/ /13/	DR	PP has referred to the official report by the Forest Survey of India, Government of India which states that the communities are using non-renewable biomass since 31st December 1989. However, PP needs to provide the referred report as documentary proof for the same.	CAR-1	OK
B.3 Project boundary (VVS § 82-87)					
What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/	DR	In accordance with the applied methodology. the project boundary is the physical, geographical site of the use of biomass or the renewable energy and includes emission of CO ₂ emitted from the identified sources.	OK	
Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the	/1/	DR	CO ₂ has been identified as GHG source for the project. Yes, identified boundary covers all possible sources. It	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
project activity? Give reference to documents considered to arrive at this conclusion.			covers Emissions from burning non-renewable wood for Baseline and Emissions from use of non-renewable wood by non-project household/users that previously used renewable energy from project activity.		
Do the system boundaries for the project as described in the PDD fully comply with the system boundaries stipulated by the applied baseline methodology?	/1/	DR	Yes, boundaries for the project as described in the PDD is in accordance with applied methodology, AMS- I E version 05.0.	OK	
Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/1/	DR	Other identified GHG are not major sources and hence are excluded.	OK	
B.4 Baseline scenario determination and description (VVS § 88-95 / Identification of alternatives to the project activity (VVS § 113-116) <i>Ensure that the evaluation of all alternatives provided in the PDD and required by the methodology and also possible alternatives/offshoots of alternatives are discussed. Check that all alternatives required to be considered by the methodology are included in the final PDD. If baseline alternatives required to be considered by the methodology are considered not applicable, please assess the justification for this.</i>					
Which baseline scenarios have been identified? Is the list of baseline scenarios complete? Does the list include as one of the options that the project activity is undertaken without being registered as a proposed project activity? Does the list contains all plausible alternatives which are viable means of supplying the comparable outputs or services that are to be supplied by the proposed project activity?	/1/ /13/	DR	In accordance with baseline methodology, in the absence of the project activity, the baseline scenario in the project boundary is the use of non-renewable biomass for cooking and heating water on traditional cook stoves with low efficiencies. The baseline scenario identified at the validation of the project activity was thermal energy from fuel wood, of which a large part of it was non-renewable for domestic	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
			cooking and water heating and the same baseline as identified in the previous crediting period is still valid for the project. As per the applied methodology there are no alternative baseline scenarios other than use of fossil fuels for meeting similar thermal energy needs		
Could the project activity in absence of the CDM or other baseline alternatives also be implemented by other entities than the CDM project participants? If so, has this also been included in the list of baseline scenarios?	/1/ /13/	DR	In the absence of the project activity, the baseline scenario in the project boundary is the use of non-renewable biomass for cooking and heating water on traditional cook stoves with low efficiencies. As per the applied methodology there are no alternative baseline scenarios other than use of fossil fuels for meeting similar thermal energy needs	OK	
How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/ /13/	DR	Not applicable	OK	
What is the baseline scenario?	/1/ /13/	DR	The baseline scenario is the use of non-renewable biomass for cooking and heating water on traditional cook stoves with low efficiencies.	OK	
Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/ /13/	DR	Yes, the identified baseline scenario is in accordance with the guidance in the methodology, AMS I.E version 05.0 which states that “in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs”.	OK	
Has the baseline scenario been determined using conservative assumptions where possible?	/1/ /13/	DR	Yes	OK	
Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies? Does the baseline scenario comply with all applicable and enforced legislation?	/1/ /13/	DR	There are no relevant national and/or sectoral policies and circumstances ever since the project was registered that have an impact on the baseline however, ministry has been supporting installation of biogas in rural areas but	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	implementation rate is very low. Yes, suitable literature has been cited for determination of baseline scenario. However PP to provide Ramachandra, T.V., Vamshee Krishna S and Shruthi, B.V. 2005. Decision support system for regional domestic energy planning. Journal of Scientific and Industrial Research as documentary evidence to assess the quantity of fuelwood that is used for cooking and water heating in the district	CAR ±	
Is the baseline determination adequately documented in the PDD? - All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. - All documentation is relevant as well as correctly quoted and interpreted. - Assumptions and data can be deemed reasonable - Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. - The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/	DR	Yes, baseline determination adequately documented in the PDD and addressed the identified points.	OK	
B.5 Calculations of GHG emission reductions					
Data and parameters that are available at validation and that are not monitored (VVS § 96-100)					
How was the insert parameter available at validation verified? 1. Quantity of woody biomass that is substituted or displaced in tonnes	/1/	DR	The value for Quantity of woody biomass that is substituted or displaced in tonnes is considered as 3.0733 tonnes/year/family and 16 903 tonnes/year for 5 500 families and is based on Based on a third party study	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
			conducted by Ramachandra, 2005.		
How was the insert parameter available at validation verified? 2. Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass	/1/ /13/	DR	The value for the same is considered as 0.95 and is verified against Assessment of Non Renewable Biomass based on data provided by Forest Survey of India, 2011, Ministry of Environment and Forests, Govt of India. This data is assessed at the state level. Thus the f_{NRB} for Karnataka is applied for the project activity.	OK	
How was the insert parameter available at validation verified? 3. Net Calorific Value of Biomass	/1/ /13/	DR	The value considered for the same is 0.015 TJ/tonne and is default value referred from applied methodology AMS-I E version 05.0	OK	
4. Diversion of non-renewable biomass saved under the project activity by non-project households	/1/ /13/	DR	According to I.E, Version 05.0, B_y can be multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. $3.0733 \times 0.95 = 2.92$ t/Household/yr. Thus the diversion is $3.0733 - 2.92 = 0.15$ t/family/yr or 845 t/yr for 5500 families. In terms of leakage of emissions, $3.57 - 0.18 = 3.39$ tCO ₂ /family/yr and $0.18 \times 5,500 = 990$ tCO ₂ /year.	OK	
How was the insert parameter available at validation verified? 5. Emission Factor for fossil fuel. Emission factor for substitution of non-renewable woody biomass by similar consumers.	/1/ /13/	DR	The value considered is 81.6 tCO ₂ /TJ and is sourced from applied methodology.	OK	
Baseline emissions (VVS § 96-100)					
Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /13/	DR	Yes, the calculations is according to the approved methodology and is listed in a complete and transparent manner. Emission reductions would be calculated as: $ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel}$ (1) Where:	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
			ER_y Emission reductions during the year y in tCO_2e B_y Quantity of woody biomass that is substituted or displaced in tonnes $f_{NRB,y}$ Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods or government data or approved default country specific fraction of non-renewable woody biomass (f_{NRB}) values available on the CDM website $NCV_{biomass}$ Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne) $EF_{projected_fo}$ Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO_2/TJ		
Have conservative assumptions been used when calculating the baseline emissions?	/1/ /13/	DR	Yes	OK	
Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	Yes	OK	
Project emissions (VVS § 96-100)					
Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /13/	DR	According to the methodology, there are no project emissions. According to the methodology, Para 4, the specific equations for calculations of Baseline emissions and Project emissions is not provided, but only for Emissions Reductions as follows: $ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel}$	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Not Applicable	OK	
Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Not Applicable	OK	
Leakage (VVS § 96-100)					
Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /13/	DR	Yes, Leakage from use of non-renewable woody biomass by non- project households/ users that previously used renewable energy is a source according to AMS I.E, Version 5. Leakage relating to non-renewable biomass B_y is addressed by multiplying net to gross adjustment factor of 0.95.	OK	
Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	Yes	OK	
Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	Yes	OK	
Emission Reductions (VVS § 96-100)					
Algorithms and/or formulae used to determine emission reductions: - All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced - All documentation is correctly quoted and interpreted. - All values used can be deemed reasonable in the context of the project activity - The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and	/1/	DR	Yes,	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
supporting files to be submitted for registration.					
B.6 Monitoring plan (VVS § 131-133)					
Data and parameters monitored					
Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/	DR	Yes, Monitoring consists of checking of all appliances or a representative sample frequently to ensure that they are still operating or are replaced by an equivalent in service appliance and is in accordance with applied methodology.	OK	
Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1//	DR	Yes, monitoring plan consists of monitoring of below listed parameters. 1. Number of installed 2 m³ systems 2. Number of biogas plants operating 3. Confirmation that non-renewable biomass has been substituted 4. Non-usage days of installed and operational biogas plants	OK	
In case parameters are measured, is the measurement equipment described? Describe each relevant parameter. Number of installed 2 m ³ systems Number of biogas plants operating Confirmation that non-renewable biomass has been substituted Non-usage days of installed and operational biogas plants	/1/	DR	Yes, The monitoring parameters and monitoring plan is clearly detailed in PDD under section B.7.1 and is found to be adequate. As the project activity is installation of biogas stoves, there are no measuring instruments used for the monitored parameters except for manual counting of the systems installed and its operational and non operational hours .	OK	
In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	The monitoring parameters and monitoring plan is clearly detailed in PDD under section B.7.1. This is not applicable as there are no measured parameters.	OK	
In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/1/	DR	The monitoring parameters and monitoring plan is clearly detailed in PDD under section B.7.1. This is not applicable as there are no measured parameters.	OK	
Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Yes, The monitoring parameters and monitoring plan is clearly detailed in PDD under section B.7.1. The	OK	

Checklist Question	Ref	Mo V	Assessment by DNV	Draft Concl.	Final Concl.
Number of installed 2 m ³ systems Number of biogas plants operating Confirmation that non-renewable biomass has been substituted Non-usage days of installed and operational biogas plants			parameters are monitored regularly and meet the requirements of methodology.		
Is the recording frequency adequate for all monitoring parameters? Describe each parameter. Number of installed 2 m ³ systems Number of biogas plants operating Confirmation that non-renewable biomass has been substituted Non-usage days of installed and operational biogas plants	/1/	DR	Yes, The monitoring parameters and monitoring plan is clearly detailed in PDD under section B.7.1. The parameters are recorded on a daily basis.	OK	
Ability of project participants to implement monitoring plan					
How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR	It has been assessed during site visit that ADATS is in charge of construction, service and maintenance, and data collection for preparation of monitoring reports and will provide support in the villages through the Bagepalli Coolie Sangha Units and coordinate for training of users.	OK	
Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/1/	DR	Yes, it has been mentioned in PDD that all information is recorded on paper and electronically. Once a year all reported information will be compiled for the detailed annual monitoring report	OK	
Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/1/	DR	Yes, ADATS is the project implementing agency and manufacturers of the biogas plants. It was verified from the site visit interviews and records that there is a robust data management system to enable verification of the emission reductions achieved.	OK	
Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR	PP to mention in PDD that monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later	CAR 2	OK

Table 2 Resolution of corrective action requests and clarification requests

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 1 PP to provide supporting documents for the baseline scenario established	B.2 B.4	Kindly find enclosed the supporting documents for the baseline scenario established, which are the follows: - Ramachandra, T.V., Vamshee Krishna S and Shruthi, B.V. 2005. Decision support system for regional domestic energy planning. Journal of Scientific and Industrial Research. Vol 64, pp 163-174. - Karnataka at a glance, Directorate of Economics and Statistics, Government of Karnataka, 2011(Page no 155)	The supporting documents used for assessing baseline scenario have been now provided by PP. The provided documents and report has been verified by DNV /20//21/ and it is found that in the baseline scenario fire wood is used for cooking. OK Accepted CAR 1 Closed
CAR 2 PP has not mentioned the duration of the storage of data for verification	B.6	All data will be archived and stored throughout the crediting period and an additional 2 years. This is added in the revised PDD. Kindly find enclosed the revised PDD with the changes.	The revised PDD provided by PP now duration of the storage of date for verification which is states that “All data will be archived and stored throughout the crediting period and an additional 2 years” DNV had reviewed revised PDD, version 05 of 2 Aug 2013 and found it to be in order. OK Accepted CAR 2 Closed

Table 3 Forward action requests

Forward action request	Reference to Table 1	Response by project participants
No FAR has been identified during the validation		

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APPENDIX B

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

Seshan Ranganathan, holds a Bachelor's Degree in Chemical Engineering and has done diploma course in Management and completed the graduate ship course in Industrial Engineering and has an overall working experience of around twenty nine years. Prior to joining DNV has around twenty four years' experience in Chemical process industry (fertilizer & petrochemical manufacturing) covering production, technical services including energy audits and efficiency studies, waste heat recovery, efficiency studies of boilers ,power plants , safety audits and pollution control activities including waste water treatment, project management, corporate planning, sales, logistics in fertilizer & petrochemical industry . With respect to the thermal power plant the job assignment included the monitoring of flue gas exit temperatures, excess air used efficiency of fuel additives, condition of boiler refractory, insulation of steam lines etc. The experience also includes 5 years in process design & engineering for chemical process industry.

He is qualified validator and verifier for CDM projects and is carrying out the same for the past five years. He has completed the EMS lead auditor course. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in areas of (a) 1.1 Thermal energy generation from fossil fuels and Biomass including thermal electricity from solar (b) 1.2 Energy generation from renewable energy sources (c) 2.2 Heat distribution (d) 5.1/11.1/12.1 Chemical Processes Industries and (e) 13.1 Waste handling and disposal.

Shilpa Swarnim holds a Master's degree in Science with major in Biotechnology. She has been previously associated with Indian Institute of Science, Bangalore as Research Assistant. She has also worked as Lecturer in Bangalore University affiliated college and her subjects of interest were Environmental Science and Climate change.

With total experience of approx. 7 years into Research and Academics her topic of research centers around issues related to Forestry, Environment, Climate change impact on forest ecosystems, studying the climate impact modeling for future predictions of climatic and vegetation dynamics.

She has completed ISO 14001:2004 - Environmental Management System Auditor / Lead Auditor Program, certified by IRCA along with DNV Training Programme on Corporate GHG Inventory.

Currently working in DNV AS, Bangalore unit, as Project manager, she is involved in the Validation and Verification of CDM projects pertaining to various sectors.

Krishnan Namboodiri. Holds graduate degree in chemical engineering and has done a short term diploma course in Management. Prior to joining DNV in 2008, has had 24 years of direct work experience in the fertilizer and chemicals industry. Work experience covers 5 years in process design & engineering for chemical industry; 7 years in technical services including environment management activities, 7 years in project management and 5 years in training & corporate planning in fertilizer & petrochemical manufacturing units. Has been actively involved in Management System Audits as per ISO 14001 for more than 8 years.

The above work experience includes-(a) experience in steam system optimization & trouble shooting , development of improvement schemes in large fertilizer & caprolactam complex (b) Design and engineering, efficiency studies and development of efficiency improvement

schemes for fossil fuel fired steam & power generation plants (c) Implementation of energy saving measures in Ammonia plants , sulfuric acid plant etc (d)Monitoring, trouble shooting and development & implementation of improvement schemes for pollution control facilities (chemical, aerobic & anaerobic treatment systems) in Fertilizer and petrochemical complex. Development & implementation of landfill facilities for solid and hazardous wastes from fertilizer & caprolactam manufacturing complex.

He has received extensive training in the CDM validation and verification process. He is an appointed GHG auditor for the CDM validation and verification program of DNV and has performed validation & verification of several CDM projects and other 3rd party validation/verification services.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in (1) Thermal energy generation from fossil fuels as well as thermal electricity from solar (2) waste handling and disposal (iii) Energy demand (iv)Household end use energy efficiency and (v) Chemical process industries.

Ravi Kumar Prabhu holds Bachelor's Degree in Chemical Engineering and has done Post Graduate Diploma course in Management and has an overall working experience of around twenty eight years. Prior to joining DNV has around twenty three years of experience in Chemical process industry (fertilizer & petrochemical manufacturing) in the areas of production, technical services, energy audits and efficiency studies, waste heat recovery, efficiency studies of boilers, power plants, safety audits, pollution control activities and waste water treatment. Also conducted various studies in captive thermal power plant such as optimization of flue gas stack temperatures, excess air, efficiency of fuel additives, condition of boiler refractory and insulation of steam lines, residual life assessment of boilers and generators etc.

While working in technical services department of the Fertilizers & Chemicals Travancore Ltd (FACT), was involved in optimizing the energy consumption of the chemical complex, from conducting feasibility studies, preparing the project design documents, procurement, coordinating the installation and commissioning. Some of the projects implemented are: optimization of instrument air system, installation of variable speed drives for electric motors, retrofit of cooling towers to reduce the cooling water temperature, installation of steam turbines to utilize the surplus steam, installation of burner management system in fertilizer dryer etc. His experience also includes 7 years in the Process design of fertilizer & petrochemical plants, wherein he was involved in the development of process flow diagrams, development of P&IDs, equipment design, HAZOP studies, procurement and commissioning activities.

His qualification, industrial experience and experience in CDM projects demonstrate sufficient sectoral competence in Chemical Process Industries (TA 5.1), Thermal Energy Generation from fossil fuels(TA1.1), Heat distribution(TA 2.2), Energy generation from Renewable Energy sources(TA 1.2) and Waste handling and disposal (TA 13.1).