




**Validation report form for renewal of crediting period for
CDM project activities
(Version 03.0)**

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION

Title and UNFCCC reference number of the project activity	Micro Scale Biogas CDM Project of CROSS UNFCCC Ref No : 8784
Number and duration of the next crediting period	Number of crediting period: 2 Duration of Crediting period: 01/01/2021 to 31/12/2027
Version number of the validation report	2
Completion date of the validation report	12/05/2021
Version number of PDD to which this report applies	05.1
Project participants	Community Reconstruction of Social Service (CROSS)
Host Party	India
Applied methodologies and standardized baselines	AMS.I.E. Switch from non-renewable biomass for thermal applications by the user, Version 11
Mandatory sectoral scopes	Sectoral Scope 1: Energy industries (renewable-/non-renewable sources)
Conditional sectoral scopes, if applicable	Sectoral Scope 13: Waste handling and disposal
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next crediting period	15,233 tCO ₂ e
Name and UNFCCC reference number of the DOE	4K Earth Science Private. Limited UNFCCC Ref No. CDM-E-0069
Name, position and signature of the approver of the validation report	S. Jagajothi  Director

SECTION A. Executive summary

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4K Earth Science Private Limited has been contracted by 'Community Reconstruction of Social Service (CROSS)' to perform a validation of the registered Project 'Micro Scale Biogas CDM Project of CROSS' (UNFCCC Ref #8784) in India for renewal of crediting period.

The scope of the validation is defined as an independent and objective review of the revised Project Design Document, project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against the CDM validation and verification standard for project activities (Version 02), CDM project cycle procedure for project activities (Version 02) and CDM project standard for project activities (Version 02), Kyoto Protocol requirements and UNFCCC rules.

The report is based on the assessment of the Project design document (PDD) undertaken through stakeholder consultations, application of standard auditing techniques including but not limited to desk review, follow up actions (e.g., on site visit, electronic (telephone or e-mail) interviews) and also the review of the applicable approved methodological and relevant tools, guidance and CDM decisions.

The project activity is the installation of 5,000 biogas plants (digesters) of 2 m³ capacity each for single households in all the mandals of Chittoor District in Andhra Pradesh State, India. The biogas units are fed by cattle dung generated from the households. The biogas stoves replaces the traditional fire wood stoves used for cooking and heating purposes. The project was registered in UNFCCC on 18/12/2012 and currently applying renewal for second crediting period ie, 01/01/2021 to 31/12/2027.

The review of the project design document and the subsequent follow-up interviews have provided 4KES with sufficient evidence to determine the project's fulfillment of all the stated criteria. In our opinion, the project meets all applicable UNFCCC requirements for the CDM.

☒ The project will be recommended to the CDM Executive Board with a request for renewal of crediting period.

☐ The project is not recommended for renewal of crediting period

SECTION B. Validation team, technical reviewer and approver**B.1. Validation team member**

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader/ Technical Expert/ Local Expert	IR	Indumathi	C	Central Office	x	x	x	x

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Narendra Kumar	R	Central office
2	Approver	IR	Jagajothi	S	Central Office

SECTION C. Means of validation**C.1. Desk/document review**

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The report is based on the assessment of the project design document undertaken through stakeholder consultations, application of standard auditing techniques including but not limited to desk review, follow up actions (e.g., on site visit, electronic (telephone or e-mail) interviews) and also the review of the applicable approved methodological and relevant tools, guidance and CDM decisions.

All the documents used for arriving validation conclusion are listed in Appendix 03 and referenced accordingly in validation report

C.2. On-site inspection

Duration of on-site inspection: 20/02/2021				
No.	Activity performed on-site	Site location	Date	Team member
1.	Opening Meeting	CROSS office	20/02/2021	Indumathi C
2	Visit to beneficiary households & interview	Beneficiary households	20/02/2021	Indumathi C
3	Document review & Closing meeting	CROSS office	20/02/2021	Indumathi C

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Puvvani	Bhupathi	Director, CROSS	20/02/2021	<ul style="list-style-type: none"> - Roles and responsibilities - End user agreement - Technical details - Revised baseline - Revised monitoring requirement - Stakeholder consultation process 	Indumathi C
4	Padmanabha	Sudha	FCN	20/02/2021	<ul style="list-style-type: none"> - Updated Baseline assessment - Issues in the PDD - Application of latest methodology - Revised ER estimation 	Indumathi C
5	A	Chilakamma	End user-3800, Athmakur	20/02/2021	<ul style="list-style-type: none"> - Implementation details - Operational status - CER rights - Grievances - SDG benefits 	Indumathi C
6	N	Rose Meri	End user-3854, Athmakur	20/02/2021		
7	V	Krupa	End user-3799, Athmakur	20/02/2021		
8	K	Rajeswari	End user-4318, Athmakur	20/02/2021		
9	K	Swarnalatha	End user-3104, Athmakur	20/02/2021		

			Manginayanikup pam			
10	N	Nalini	End user-3101, Manginayanikup pam	20/02/2021		
11	O	Dhanalaksh mi	End user-3108, Manginayanikup pam	20/02/2021		
12	G	Jeevitha	End user-3098, Manginayanikup pam	20/02/2021		
13	B	Pushpalatha	End user-5668, Velkur	20/02/2021		
14	I	Geethanjali	End user-5664, Velkur	20/02/2021		
15	I	Rajinikumari	End user-5672, Velkur	20/02/2021		

C.4. Sampling approach

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PP has conducted Kitchen test on sample basis in the non-project households to determine the updated baseline fuel wood consumption.

The Kitchen test results have been conducted in 155 non-project households. The Kitchen Tests are conducted for 3 continuous days in each household. Validation team checked the appropriateness of test results using the following steps:

- The Method of Kitchen test followed by PP is checked and found to be in accordance with established international/national procedures.
- The Kitchen test results have been crosschecked with the respective Kitchen test monitoring sheet and found no error
- The method of Kitchen test is simple and the PP's staffs are found to be capable of doing the test.

Hence, the validation team accepts the Kitchen test result.

No sampling approach is followed in the validation.

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	-	1	-
Application and selection of methodologies and standardized baselines	1	-	-
Validity of original baseline or its update	1	2	-
Estimated emission reductions or net anthropogenic removals	-	-	-
Validity of monitoring plan	-	-	-
Crediting period	-	-	-
Project participants	-	-	-
Post-registration changes	-	-	-
Temporary measures	-	-	1
Total	2	3	1

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	Validation team checked the Project Design Document with latest version of 'Project design document form' in the UNFCCC website (ie, version 11.0)/9/ and "Instructions for completing this form" mentioned as attachment to Project design
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	document form (version 11.0)/8/.
Findings	CAR-01 is raised and closed satisfactorily
Conclusion	Validation team confirms that final PDD is completed using the valid version of the applicable PDD form at the time of submission.

D.2. Application and selection of methodologies and standardized baselines

Means of validation	<p>For the 1st crediting period, the project applied the following methodology</p> <ul style="list-style-type: none"> AMS-I.E. ver. 4 - Switch from non-renewable biomass for thermal applications by the user <p>During this renewal of the crediting period, the latest version of AMS. I.E is used:</p> <ul style="list-style-type: none"> AMS-I.E. ver. 11.0 - Switch from non-renewable biomass for thermal applications by the user <p>The assessment team has validated the documentation referred to in the revised PDD for renewable of crediting period and verified the documentation content for verifying the justification of the applicability of the methodology AMS I.E Version 11/5/ and confirmed that the documentation referred to in the PDD is correctly quoted and interpreted. The applicability of the methodology AMS I.E, version 11 is assessed as below:</p> <ul style="list-style-type: none"> - The project activity is installation of 2 m³ biogas units in the households which generates thermal energy for cooking and hence replaces the non-renewable biomass which otherwise would have used for the cooking needs in the households. Hence the project applies the technology that displaces use of non-renewable biomass by renewable energy. - As verified from the National Sample survey Report, Government of India, 1983, in Andhra Pradesh, 92.01% of the households were using firewood or non-renewable biomass for cooking. Based on the published literature, official reports and statistics, PP has justified the non-renewable biomass has been used in the project region since 31 December 1989. - PP has allotted unique ID number for each biogas unit. The unique ID number is written on each bio-digester on the unit to distinguish it as part of this project activity. The same is checked during the site visit. This will avoid double counting of emission reductions. Also each of the end user's name and the location i.e. District, Mandal, village in which it is constructed along with the Unique ID are recorded in the project database which will be provided in the ER sheet. PP has signed end user agreement with all the biogas users through which end user accepts transfers of the emission reductions generated from the project activity to the PP, CROSS and is not transferable to any other entity. Hence, the double counting of emission reduction between end users, distributors and producers of stoves etc is avoided. The assessment team also checked the end user agreements and found to be valid. The same has been explained in the revised CDM-PDD.
Findings	CL-01 raised and closed satisfactorily
Conclusion	The project fulfils all relevant criteria of the applied methodology "AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user" - Version 11. Hence use of the selected methodology is appropriate for this project activity.

D.3. Validity of original baseline or its update

Means of validation	<p>Validation team checked the registered PDD (applicable for 1st CP) and the revised PDD submitted for the validity of original baseline or its update. Validity of the baseline has been assessed as per the Methodological Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" Version 03.0.1/13/</p> <p>Step 1: Assess the validity of the current baseline for the next crediting period</p> <p>The CDM Project Standard for PA, version 2 requires assessing the impact of new</p>
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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 of the project activity is continued use of the fuel wood for cooking in traditional cook stove that were used before the implementation of the biogas system. There are no relevant national and/or sectoral policies and circumstances ever since the project was registered that have an impact on the baseline. No national and sectoral policies that mandate the PP to invest in the project or prevent village households to use traditional cook stove and fuel wood use.

Thus, the baseline identified during the validation is still compliance with the relevant mandatory national and/or sectoral policies

Step 1.2: Assess the impact of circumstances

The baseline scenario identified during the validation of the project activity was generation of thermal energy for cooking in the households from the fuel wood, of which a large part of it was non-renewable biomass. So, in the absence of the project activity, the project households would have continued using the fuel wood for their cooking. The project is completely a voluntary action by the PP. Hence, without the project, the end-users would have continued to use non-renewable biogas in traditional cook stove for cooking. There is no circumstances that affect rural households prevent from fuel wood use for cooking in the traditional cook stove.

Since, there is no change in the circumstance and hence the circumstance will not have any impact on the current baseline emission.

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

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 traditional cook stoves are mostly three stone cook stove or mud stove which are made locally by the households itself and does not involve any cost for purchase of new stoves or repair. No investment would be required for continuation of baseline equipments even now. Even in the present scenario, fuel wood is the common fuel used for cooking & water heating in the Chittoor district. In the project area, PP has also conducted a survey in non-project households during November 2020. As per the survey results/18/, all the rural households in the project area predominantly uses fuel wood for cooking & water heating in the traditional wood stove (without chimney or grate). As per the Census data/26/, about 73.94% of total population and 85.63% of urban population in Chittoor district uses fuel wood for cooking. As per National Sample Survey-76th Round report/27/¹, about 44.5% households in India and 18.4% of rural households in Andhra Pradesh still use only fire wood for cooking. Based on a national family health survey for Chittoor District, 2015-16, which is the project region, households using clean fuel for cooking accounts for only 47%, thus making 53% of households in rural areas still using solid fuels for cooking. Though LPG is promoted by the government through the Deepam Scheme, easy access to firewood without additional costs significantly contributes to continued use of firewood for cooking. This shows that though LPG has been provided with subsidy to the rural communities, the refill is very expensive and rural households are still using traditional stove for cooking².

¹ http://www.mospi.gov.in/sites/default/files/publication_reports/Report_584_final_0.pdf

² <https://energy.economictimes.indiatimes.com/news/oil-and-gas/indias-ujjwala-scheme-provided-lpg-access-but-failed-to-promote-its-use-study/73580017>

Hence, during the 2nd crediting period also, the baseline traditional cook stoves and use of fuel wood for cooking would have continued in the absence of the project activity

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

As per para 404 of CDM Validation and Verification standard for PA(version 2), validity of the original baseline or its update is assessed as below:

a) As per the PDD, the following are the baseline parameters that are fixed ex-ante:

$BC_{BL,HH,y}$ = Quantity of woody biomass that is substituted or displaced in year y (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 (fraction or %)

$NCV_{biomass}$ = Net calorific value of the non-renewable woody biomass that is substituted

$EF_{projected_fossil}$ = Emission factor of fossil fuels projected to substitute non-renewable woody biomass by similar consumers (tCO_{2e}/TJ)..

The assessment of the validity of the parameters are provided below:

Ex-ante Parameters	Value for the 1 st Crediting period	Validity for 2 nd Crediting period	Assessment
$BC_{BL,HH,y}$	3.97 tonnes/year/family	Not Valid	For the previous crediting period, $BC_{BL,HH,y}$ (depicted as By in previous PDD) s estimated based on sample survey conducted at the time of validation. Since, this is an old data, the value may not be applicable for the 2 nd crediting period.
$f_{NRB,y}$	0.95	Not valid	For the previous crediting period the $f_{NRB,y}$ was calculated based on the report "Forest Survey of India, 2011, Ministry of Environment and Forests, Government of India. Since, the latest data is now available and also the applied methodology requires $f_{NRB,y}$ to be calculated as per the 'Tool 30: Calculation of the fraction of non-renewable biomass'/16/, the old data estimated for the previous crediting period is no more valid.
$NCV_{biomass}$	0.015 TJ/tonne	Valid	As per latest version of applied methodology (AMS I.E, version 11), the NCV of biomass is same. However, the value is provided with four decimal accuracy ie, 0.0156 TJ/tonne

$EF_{projected_fossil}$	81.6 tCO ₂ /TJ	Not Valid	As per the latest version of AMS.I.E methodology, the default emission factor of projected fuel is changed to 64.4 tCO ₂ /TJ for the project region (South Asia). Hence, the emission factor of 81.6 tCO ₂ /TJ is no more valid.
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Step 2: Update the current baseline and the data and parameters

As determined in step 1.4 above, the following fixed parameters need to be updated:

$BC_{BL,HH,y}$ = Average annual consumption of woody biomass per household before the start of the project activity

$f_{NRB,y}$ = Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass (f_{NRB})

$EF_{projected_fossil}$ = Emission factor for the substitution of non-renewable woody biomass by similar consumers.

 $BC_{BL,HH,y}$

To check the updated $BC_{BL,HH,y}$ value, PP has conducted the Kitchen test in the non-project households in the project area.

Based on the survey conducted during validation, and the mean (3.58 kg/capita/day) and standard deviation of fuel wood use for the project region (0.73 kg/capita/day), the sample size is determined based on the 90/10 confidence/precision level using the below formula:

$$n = \frac{1.645^2 V}{0.1^2}; \text{ where } V = \left(\frac{SD}{mean} \right)^2$$

The sample size at 90/10 confidence/precision level and @80% response rate for infinite sample population it is calculated to be 14 households.

However, to get the more accurate results, PP has conducted Kitchen test in 155 non-project households. The Kitchen Tests are conducted for 3 continuous days in each sample household. Average fuel wood consumption for each family is determined from Kitchen Test and per capita fuel wood consumption for each household is estimated based on the respective family size. As per the survey result, average per capita fuel wood consumption is 2.695 kg/capita/day and average household size is 5.65.

Also from the survey results, it is found that the precision level achieved in the survey for per capita fuel wood consumption is 5.66% and precision level achieved for family size is 4.02% which are within the required precision level ie, 10%. Hence, the validation team finds the sample size considered for the kitchen test is adequate.

PP determined household average the fuel wood consumption using the per capita fuel wood consumption determined through sample survey and the actual household size of the project households as per the project database (ie, 3.77) which is more appropriate and conservative compared to the household size determined through sample survey. It is also observed that the project household size considered for calculation is also conservative compared to the average household size of Chittoor district as per the Handbook of Statistics, Chittoor District is 4.26. Hence, the average fuel wood consumption per household per year is estimated to

be 3.71 tonnes/year/household. validation team checked the appropriateness of test results using the following steps:

- The Method of Kitchen test followed by PP is checked and found to be in accordance with established procedures in the host country.
- The Kitchen test results have been crosschecked with the respective Kitchen test monitoring sheet and found no error
- The method of Kitchen test is simple and the PP's staffs are found to be capable of doing the test.

Hence, the validation team accepts the $BC_{BL,HH,y}$ value determined through Kitchen test.

f_{NRB}

In the updated PDD, the $f_{NRB,y}$ is calculated based on the data provided in the FSI report 2019/22/ as per the procedure given in the 'Tool 30: Calculation of the fraction of non-renewable biomass', version 3. The assessment of the same is provided below:

The f_{NRB} is calculated using the below formula

$$f_{NRB} = \frac{NRB}{NRB + RB}$$

Where

f_{NRB} = Fraction of non-renewable biomass in the country/region or project area

NRB = Quantity of non-renewable biomass (t/yr) in the country/region or project area

RB = Quantity of renewable biomass in the country/region or project area

NRB is calculated as below:

$$NRB = H - RB$$

Where

H - Total annual consumption of wood in the absence of the project activity in the country/region/project area (t/year)

H is calculated as below:

$$H = HW_{region} \times N_{region} + TI_{region}$$

HW_{region} - Average household wood fuel consumption, including fuelwood and charcoal in the country or region (t/yr/household)

N_{region} - Number of households consuming wood fuel for thermal applications within the country/region (households)

TI_{region} - Non-domestic woody biomass consumption for energy applications (e.g. commercial, industrial or institutional uses of wood in ovens, boilers etc.) and all woody biomass consumption for non-energy applications (e.g. construction, furniture) that are extracted from forests or land areas in the country/region for which the estimate of f_{NRB} is to be made (t/yr)

RB is calculated as below:

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other}))$$

$MAI_{forest,i}$ - Mean Annual Increment of woody biomass growth per hectare in

$MAI_{other,i}$	subcategory i of forest areas (t/ha/yr) Mean Annual Increment of woody biomass growth per hectare in subcategory i of other wooded land areas (t/ha/yr)
$F_{forest,i}$	Extent of forest in sub-category i (ha)
$F_{other,i}$	Extent of other wooded land in sub-category i (ha)
P_{forest}	Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas (ha)
P_{other}	Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other wooded land areas (ha)
i	Sub-category i of forest areas and other wooded land areas

Determination of H

Parameter	Value	Assessment
$HW_{region} \times N_{region}$	23.73 Million tonnes	As per the report 'Wood is Good' published by Centre of Science & Environment, 2017 /24/ (page 23), (which is again taken from FSI 2011 data), the fuel wood consumption in Andhra Pradesh (which includes present Telangana) is 24.30 million tonnes. Since, the latest fuel consumption data for Andhra Pradesh is not available, PP has extrapolated 2019 fuel wood consumption using the historical trend which is estimated using FAO data. As per the 2015 FAO report, the round wood consumption (including timber & wood fuel) in India for the year 2011 is 364,626,000 m ³ and as per the 2019 FAO report, the fuel wood consumption in India for the year 356,004,000 m ³ which is 2.36% less than the 2011 data. Using this, PP extrapolated the 2019 fuel wood consumption of Andhra Pradesh (including Telangana) from 2011 data. The value calculated to be 23.73 million tonnes. The data and calculation is verified to be correct Since, the total value for wood fuel consumption for Andhra Pradesh (including Telangana) is directly available the same is taken for fNRB calculation.
TI_{region}	22.06 Million Tonnes	As per the report 'Wood is Good' published by Centre of Science & Environment, 2017 /24/ (page 24) (which is again taken from FSI 2011 data), the round wood consumption in Andhra Pradesh (which includes present Telangana) is 28.6 million tonnes. Since, the timber consumption data for Andhra Pradesh is not available, PP has extrapolated 2019 timber consumption using the historical trend which is estimated using FAO data. As per the 2015 FAO report, the round wood consumption (including timber & wood fuel) in India for the year 2011 is 364,626,000 m ³ and as per the 2019 FAO report, the fuel wood consumption in India for the year 356,004,000 m ³ which

			is 2.36% less than the 2011 data. Using this, PP extrapolated the 2019 non domestic wood consumption of Andhra Pradesh (including Telangana) from 2011 data. The value calculated to be 22.06 million tonnes. The data and calculation is verified to be correct.
	H	45.79 Million Tonnes	Calculated using the below formula $H = HW_{\text{region}} \times N_{\text{region}} + TI_{\text{region}}$ The calculation is verified and found to be correct
	Determination of RB		
	Parameter	Value	Assessment
	MAI _{forest}	0.763 t/ha/yr	This is based on the report 'Phytomass carbon pool of trees and forests in India' by Meenakshi Kaul · G. M. J. Mohren · V. K. Dadhwa/23/ (page 9). The mean average increment of for the Andhra Pradesh forests is provided in this report. The value is verified with the report and found to be correct
	F _{forest,i}	6,158,959ha	This is based on Forest Survey of India, 2019 report/22/ (Chapter 11.1, Page 4 for Andhra Pradesh & Chapter 11.26, Page 3. For Telangana). The total forest area in Andhra Pradesh + Telangana is provided in this report. The value is verified with the report and found to be correct
	P _{forest,i}	1,100,800ha	This is based on Forest Survey of India, 2019 report/22/ (Chapter 11.1, Page 3 for Andhra Pradesh & Chapter 11.26, Page 2 for Telangana). The total protected forest area in Andhra Pradesh + Telangana is provided in this report. The value is verified with the report and found to be correct
	$MAI_{\text{forest},i} \times (F_{\text{forest},i} - P_{\text{forest},i})$	3.86 million tonnes	This is calculated. The calculation is verified and found to be correct
	$(MAI_{\text{other},i} \times (F_{\text{other},i} - P_{\text{other},i}))$	2.16 million tonnes	Since the MAI for trees outside forest is not available, PP has calculated the value based on the Von Mantel Method ³ : $t = 2GS/R$ where GS is growing stock and R is rotation. This approach is found to be appropriate. GS for trees outside forest in Andhra Pradesh is 67.68 million cum and in Telangana is 41.45 million cum which are based on the Forest Survey of India, 2019 report/22/ (Chapter 11.1,

Page 10 for Andhra Pradesh and Chapter 11.26, Page 8 for Telangana). The same is verified and found to be correct.

R is considered as 80 years. PP has determined rotation period based on the relative abundance of dominant species (long term trees) in Andhra Pradesh & Telangana provide in Forest Survey of India, 2019 report/22/ (page 130) and rotation period respective species. The calculation/28/ is verified and found that average rotation period for the species in Andhra Pradesh & Telangana is 130 years. However PP considered 80 years as rotation period which is found to be conservative.

From the above formula mean annual increment of trees outside the forest volume is estimated to be 1.69 million cum. By considering wood density of 0.79 tonne/cum (Kaul et al, 2008), the mean annual increment of trees outside the forest mass is 1.34 million tonnes.

RB

6.01 million tonnes

Calculated as below:

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other}))$$

The calculation is checked and found to be correct.

Calculation of NRB

Parameter	Value	Assessment
NRB	39.83	This is calculated as below: NRB = H-RB The calculation is checked and found to be correct.

Calculation of f_{NRB}

Parameter	Value	Assessment
f_{NRB}	0.86	This is calculated as below: $f_{NRB} = \frac{NRB}{NRB + RB}$ The calculation is checked and found to be correct.

EF_{projected fossil fuel}

The projected fossil fuel is now taken as per the applied methodology (AMS I.E, v11). As per the Table 2 of the methodology, the emission factor of projected fossil fuel for south Asia 64.4 t CO₂e/TJ and the same is considered in the PDD. Hence Ok.

All the above updated parameters takes into consideration the impact of:

	<ul style="list-style-type: none"> All the new relevant mandatory national and/or sectoral policies on Renewable Energy Sector; and Any changes in circumstances or conditions, for example, change in market characteristics, the availability of fuels for power generation or raw materials for developing new power generation capacity as well as the impact of electricity or fuel prices.
Findings	CL-02, CAR-02 & CAR-03 are raised and closed satisfactorily
Conclusion	Validity of the baseline has been correctly assessed and the parameters are updated as per the Methodological Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" Version 03.0.1 in the PDD submitted for the renewal of crediting period.

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	<p>The validation team checked whether the equations and parameters used to calculate GHG emission reductions or net anthropogenic GHG removals for project activity are in accordance with applied methodology.</p> <p>Validation team checked section B.6.1 & B.6.3 of the PDD to confirm whether all formulae to calculate baseline emissions, project emission and leakage have been applied in line with the underlying methodology.</p> <p>Baseline Emission: The baseline emission of the project activity is estimated in accordance with applied methodology AMS-I.E (Version 11) as follows:</p> $BE_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil_fuel}$ <table border="1"> <thead> <tr> <th>Parameter</th><th>Assessment</th></tr> </thead> <tbody> <tr> <td>B_y - Quantity of woody biomass that is substituted or displaced in tonnes</td><td> <p>The quantity of woody biomass substituted will be estimated based the option (a) given in the methodology as below:</p> $B_y = N_{HH} \times (BC_{BL,HH,y} - BC_{PJ,HH,y})$ <p>The parameter N_{HH} (Number of households in the project activity in year y) is fixed ex-ante. The number of households where the biodigesters proposed are 5,000 and hence the same value is considered for ex-ante calculation</p> <p>The parameter $BC_{BL,HH,y}$ (Average annual consumption of woody biomass per household before the start of the project activity, tonnes/household/year) is fixed ex-ante. , PP has conducted the Kitchen test in the non-project households in the project area. Please refer the assessment in section D.3 above. Hence, the value considered for this parameter (ie,3.71 tonnes/hh/yr) is correct.</p> <p>The parameter $BC_{PJ,HH,y}$ (If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per household in the pre-project devices during the project activity tonnes/household/year) is monitored ex-post.</p> </td></tr> </tbody> </table>	Parameter	Assessment	B_y - Quantity of woody biomass that is substituted or displaced in tonnes	<p>The quantity of woody biomass substituted will be estimated based the option (a) given in the methodology as below:</p> $B_y = N_{HH} \times (BC_{BL,HH,y} - BC_{PJ,HH,y})$ <p>The parameter N_{HH} (Number of households in the project activity in year y) is fixed ex-ante. The number of households where the biodigesters proposed are 5,000 and hence the same value is considered for ex-ante calculation</p> <p>The parameter $BC_{BL,HH,y}$ (Average annual consumption of woody biomass per household before the start of the project activity, tonnes/household/year) is fixed ex-ante. , PP has conducted the Kitchen test in the non-project households in the project area. Please refer the assessment in section D.3 above. Hence, the value considered for this parameter (ie,3.71 tonnes/hh/yr) is correct.</p> <p>The parameter $BC_{PJ,HH,y}$ (If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per household in the pre-project devices during the project activity tonnes/household/year) is monitored ex-post.</p>
Parameter	Assessment				
B_y - Quantity of woody biomass that is substituted or displaced in tonnes	<p>The quantity of woody biomass substituted will be estimated based the option (a) given in the methodology as below:</p> $B_y = N_{HH} \times (BC_{BL,HH,y} - BC_{PJ,HH,y})$ <p>The parameter N_{HH} (Number of households in the project activity in year y) is fixed ex-ante. The number of households where the biodigesters proposed are 5,000 and hence the same value is considered for ex-ante calculation</p> <p>The parameter $BC_{BL,HH,y}$ (Average annual consumption of woody biomass per household before the start of the project activity, tonnes/household/year) is fixed ex-ante. , PP has conducted the Kitchen test in the non-project households in the project area. Please refer the assessment in section D.3 above. Hence, the value considered for this parameter (ie,3.71 tonnes/hh/yr) is correct.</p> <p>The parameter $BC_{PJ,HH,y}$ (If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per household in the pre-project devices during the project activity tonnes/household/year) is monitored ex-post.</p>				

	<p>For the ex-ante estimation it is assumed as zero as it is assumed that the project will completely replace the NRB in the baseline stove. This is found to be acceptable.</p> <p>Hence, the B_y is estimated ex-ante as 18559.52 t/year is verified to be correct.</p>						
$f_{NRB,y}$ - Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass	The value is fixed ex-ante. It is calculated from the FSI 2019- State of Forest Report/22/, Forest Survey of India, Ministry of Environment and Forests, Government of India, Please refer the assessment in the above section D.3. The calculated f_{NRB} value of 0.86 is verified to be correct.						
$NCV_{biomass}$ - Net calorific value of the non-renewable woody biomass that is substituted	This is fixed ex-ante. PP considered IPCC default value of 0.0156 TJ/ton as given in methodology/6/ and hence acceptable						
$EF_{projected_fossil\ fuel}$ - Emission factor for the substitution of non-renewable woody biomass by similar consumers.	This is fixed ex-ante. The projected fossil fuel is taken as per the applied methodology (AMS I.E, v11). As per the Table 2 of the methodology, the emission factor of projected fossil fuel for south Asia 64.4 t CO ₂ e/TJ and the same is considered for the emission reduction calculation. Hence Ok.						
<p>Based on the above values, the baseline emission is estimated as 16,035 tCO₂/year for the ex-ante calculation.</p> <p>Project emission:</p> <p>The project does not involve any cultivation of biomass. Hence, the project emission (PE_y) considered zero. Hence $PE_y = 0$ tCO₂e</p> <p>Leakage:</p> <p>As per Tool 16: Project and leakage emissions from biomass v4, there are two leakage emission applicable:</p> <p>$LE_y = LE_{BC,y} + LE_{BR,y}$</p> <table border="1"> <thead> <tr> <th>Parameter</th><th>Assessment</th></tr> </thead> <tbody> <tr> <td>$LE_{BC,y}$ - Leakage emissions due to shift of pre-project activities resulting from cultivation of biomass in a dedicated plantation, in year y</td><td>Not applicable as the project does not involve any cultivation of biomass</td></tr> <tr> <td>$LE_{BR,y}$ - Leakage emissions due to diversion of biomass residues from other applications, in year y</td><td> <p>As per 39 of the applied methodology, Leakage emissions related to the non-renewable woody biomass saved by the project activity shall be assessed based on ex post surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). Alternatively, B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.</p> <p>PP decided to use leakage adjustment factor. Hence, the leakage is 5% of the</p> </td></tr> </tbody> </table>		Parameter	Assessment	$LE_{BC,y}$ - Leakage emissions due to shift of pre-project activities resulting from cultivation of biomass in a dedicated plantation, in year y	Not applicable as the project does not involve any cultivation of biomass	$LE_{BR,y}$ - Leakage emissions due to diversion of biomass residues from other applications, in year y	<p>As per 39 of the applied methodology, Leakage emissions related to the non-renewable woody biomass saved by the project activity shall be assessed based on ex post surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). Alternatively, B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.</p> <p>PP decided to use leakage adjustment factor. Hence, the leakage is 5% of the</p>
Parameter	Assessment						
$LE_{BC,y}$ - Leakage emissions due to shift of pre-project activities resulting from cultivation of biomass in a dedicated plantation, in year y	Not applicable as the project does not involve any cultivation of biomass						
$LE_{BR,y}$ - Leakage emissions due to diversion of biomass residues from other applications, in year y	<p>As per 39 of the applied methodology, Leakage emissions related to the non-renewable woody biomass saved by the project activity shall be assessed based on ex post surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). Alternatively, B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.</p> <p>PP decided to use leakage adjustment factor. Hence, the leakage is 5% of the</p>						

	<p>baseline emission which is estimated to be 802 tCO₂/year. The same is verified to be correct.</p> <p>Hence, the total leakage emission calculated to be 802 tCO₂/year.</p> <p>Emission reduction:</p> <p>As per the methodology emission reduction (ER_y) is calculated as below:</p> $ER_y = BE_y - PE_y - LE_y$ $= 16,035 - 0 - 802 = 15,233 \text{ tCO}_2\text{e/year}$ <p>PP has submitted the ex-ante emission reduction estimation in a excel sheet/2/. The excel sheet is clear, viewable, non-protected and the calculated values in the sheet are reproducible. Hence the ex-ante emission reduction calculated for this project is correct.</p>
Findings	No finding
Conclusion	<p>Validation team confirm that the algorithms and formulae proposed to calculate project emissions, baseline emissions, leakage and emission reductions in the PDD is in line with the requirements of the selected methodology AMS I.E, version 11.</p> <p>For ex-ante calculation, the assessment team confirms that</p> <ul style="list-style-type: none"> • All assumptions and data used by the project participants are listed in the PDD, including their references and sources; • All documentation used by 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 project. • The applied formula and methods for calculating ER are in accordance with the applied methodology and • All calculations are complete and without any omissions.

D.5. Validity of monitoring plan

Means of validation	<p>Validation team checked whether existing monitoring plan followed during the 1st crediting period monitoring the plan is still valid for the 2nd crediting period or not. Validation team checked the monitoring plan provided in the revised DD and crosschecked with the monitoring plan provided in the PDD of 2nd crediting period.</p> <p>Validation team also checked whether the monitoring plan provided in the revised PDD is in consistent with requirements of the applied methodology (AMS I.E, version 11).</p> <p>The information provided in the PDD has been found in compliance with the information evaluated during the site visit, while interviewing with the concerned people and the same was re-affirmed through the documentary evidence.</p> <p>The monitoring plan described in the PDD is in compliance with the applied methodology. The assessment team has reviewed all the parameters in the monitoring plan against the requirements of the applied methodology and confirmed that monitoring parameters are applied in line with the requirement of the methodology and relevant in the context of the project. The procedures have been reviewed by the assessment team through document review and interviews with the respective department's personnel. The information provided has allowed the assessment team to confirm that the proposed monitoring plan is feasible within the project design. The relevant points of monitoring plan have been discussed with the PP. Specifically, these points include the monitoring methodology, data management, and the quality assurance and quality control procedures to be implemented in the context of the project. Therefore, the PP will be able to implement the monitoring plan and the achieved emission reductions can be reported ex-post and verified.</p>
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The parameters that are fixed ex-ante are:

Parameter	Value	Source & Assessment
Rating Biogas - Thermal capacity of a digester	1.69	The thermal capacity digester is based on the technical specification of the biogas stove. The calculation is verified and found to be correct.
$BC_{BL,HH,y}$ - Average annual consumption of woody biomass per household before the start of the project activity	3.71	It is calculated determined though the following: 1. Kitchen Test conducted in the project area/17/ Please refer assessment Section D.3 above.
$f_{NRB,y}$ - Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass	0.86	Calculated based on following sources of data: 1. State of Forest Report, Forest Survey of India, 2019./22/ 2. Kaul, M., Mohren, G.M.J., and Dadhwal, V.K., Phytomass carbon pool of trees and forests in India, Climatic Change, DOI 10.1007/s10584-010-9986-3, 2011/23/ 3. Wood is Good, Is India doing enough to meet its present and future needs? A status report by Centre for Science and Environment, CSE, 2017./24/ 4. FAO database of round wood consumption. Please refer assessment Section D.3 above.
$NCV_{biomass}$ - Net calorific value of the non-renewable woody biomass	0.0156	This is IPCC default value as per AMS I.E Methodology/5/. Hence OK.
$EF_{projected\ fossil\ fuel}$ - Emission factor for the substitution of non-renewable woody biomass by similar consumers.	64.4	This is default value as per AMS I.E methodology/5/ for the South Asia. Hence appropriate.
Determination of Leakage	0.19 for household fuelwood use of 3.71 t/HH/Yr. Determined by net to gross adjustment factor of 0.95 to account for leakage	This is estimated based on the default value as per AMS I.E. Methodology/5/ for leakage. Hence appropriate.

The parameters that are to be monitored ex-post are:

Parameter	Monitoring Details
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	Date of commissioning of biogas units - Actual date of commissioning of the project device.	The construction processes were monitored on a day to day basis and database maintained from its initiation to completion dates for each of the biogas unit in first crediting period of the project activity. Thus the start date of each of the unit installed in fixed for each of the unit.
	N_{HH} - Number of households in the project activity in year y	The construction processes were monitored on a day to day basis and database maintained from its initiation to completion dates for each of the biogas unit. Thus the start date of each of the unit installed in fixed for each of the unit. In case of replacement of any unit due to demolition will be recorded and the loss days accounted for. This could be for the same user or new users, in which case the baseline is the users were using fuel wood. A new end user agreement will be signed with them and recorded.
	Number of biogas plants operating - Number of plants operating in year	In every village, the women Volunteer monitors the biogas units that are non-operational. The days other than that non-operational will determine the biogas units which are operational. For the monitoring period, the operational days of installed biogas units will be calculated by subtracting the non-usage days. The emission reduction will be estimated only for operational days
	BC_{PJ,HH,y} - Average annual consumption of woody biomass per household in the pre-project devices during the project activity, if it is found that pre-project devices were not completely displaced but continue to be used to some extent	1. As and when biogas units are not functional, the beneficiaries report to the village level women volunteer, who in turn reports to the Case Worker of the project for the repair of the unit. A log book is maintained for the reason of non-function and days under repair. The data is entered into the monitoring solution for each of the unit. The appropriate fuelwood use for non-operational days of biogas units will be accounted. 2. For parallel use of pre-project devices, monitoring shall consist of estimation of a representative sample thereof, at least once every two years (biennial) at 95/10 confidence/precision. A statistically determined sample size will be sampled to determine the quantity of fuelwood used on pre project devices. A household level questionnaire survey will be conducted.
	Confirmation that non-renewable biomass has been substituted	A household level sample survey will be conducted biennially at 95/10 confidence/precision level to confirm that non-renewable biomass has been substituted.
<p>The monitoring plan content has been checked in the PDD and compared against the requirements of the monitoring methodology</p> <p>All means of implementing the monitoring plan are in line with the applied and monitoring methodology. The validation team has no doubts that the monitoring arrangements as it is already implemented during the first crediting period itself as</p>		

	<p>described in the PDD.</p> <p>Sampling plan: As mentioned above, the following parameters will be determined using biennial sample survey:</p> <ul style="list-style-type: none"> (i) Confirmation that non-renewable biomass has been substituted (ii) Average annual consumption of woody biomass per household in the pre-project devices during the project activity, used in parallel. <p>The PDD indicates a sampling plan as per the recommendation outlined in 'Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 04/10/' (which also has normative reference to Sampling Standard, version 08) has been referred.</p> <p>Assessment team confirms that the sampling method (simple random sampling) is clearly described and is in line with the description of the population. The sampling plan transparently describes how the samples will be selected. PP also demonstrates how simple random sampling is suitable for the project. The PP also provided formula for sample size calculation and reliability requirements in line with the sampling guidelines.</p> <p>Hence, the sampling plan provided in the PDD is found to be appropriate and in line with the sampling guideline.</p>
Findings	No finding
Conclusion	The validation team confirms that the monitoring plan based on the approved monitoring methodology is included in the PDD and is correctly applied to the project. The monitoring plan has been found to be in compliance with the requirements of the applied methodology. The monitoring plan will give opportunity for real measurements of achieved emission reductions. The validation team considers that monitoring arrangements described in the monitoring plan is feasible within the project design.

D.6. Crediting period

Means of validation	<p>The validation team checked whether the PP specified the Start date & duration of the 2nd crediting period which is in accordance with the applicable requirements in the VVS for PA and the PS for PA.</p> <p>The details provided in the PDD are:</p> <ul style="list-style-type: none"> • Start date of crediting period: 01/01/2021 to 31/12/2027 • Length of crediting period: 7 years <p>The end date of the 1st crediting period is 31/12/2020 and the renewal of crediting period is submitted within 1 year from the end of 1st crediting period. Hence, considering the start date of 2nd crediting period for the project is appropriate.</p> <p>The length of the crediting period is as per the para 87(a) of PS for PA, v2 requirements</p>
Findings	No finding
Conclusion	The start date and the crediting period type & length have been validated and found to be in accordance with 'CDM project standard for project activities', version 2

D.7. Project participants

Means of validation	<p>As per the Section A.4 of the PDD, the project participants of the project activity are:</p> <table border="1"> <thead> <tr> <th>Party</th><th>Project participant</th></tr> </thead> <tbody> <tr> <td>India</td><td>Community Reconstruction of Social Service (CROSS)</td></tr> </tbody> </table> <p>The names of the CME and project participants are checked and found to be in consistent with the in the latest version of the MoC statement/29/ available in the UNFCCC website.</p>	Party	Project participant	India	Community Reconstruction of Social Service (CROSS)
Party	Project participant				
India	Community Reconstruction of Social Service (CROSS)				
Findings	No finding				
Conclusion	The names of Project Participant mentioned in the PDD are in consistent with the				

	latest version of MoC available in the UNFCCC website. Hence, it is in line with the requirements of para 288 of the 'CDM project standard for project activities', version 2
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D.8. Post-registration changes

Type of post-registration changes (PRCs)	Confirmation (Y/N)	Validation report for PRCs	
		Version	Completion date
Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents ⁴	N	NA	NA
Corrections	N	NA	NA
Change to the start date of the crediting period	N	NA	NA
Inclusion of a monitoring plan	N	NA	NA
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	N	NA	NA
Changes to the project design	N	NA	NA
Changes specific to afforestation and reforestation project activities	NA	NA	NA

SECTION E. Internal quality control

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The validation report prepared by team leader is reviewed by an independent technical reviewer (having competence of relevant technical area himself/herself or through an independent technical area expert) to confirm the internal procedures established by 4KES are duly followed and the validation report/opinion is reached in an objective manner and complies with the applicable CDM requirements.

The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope the project activity relates to. All team members of technical review team are independent of the validation team. The independent technical reviewer(s) may approve or reject the draft validation report. The findings may be identified even at this stage, which needs to be satisfactorily resolved, before submit final report to UNFCCC. The final approval decision is taken by the Head of the DOE/Director.

The final decision is authorized by the Director, 4KES, once the report is finalized by the Head of the DOE/DOE Manager.

SECTION F. Validation opinion

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4K Earth Science Private Limited has been contracted by 'Community Reconstruction of Social Service (CROSS)' to undertake validation of renewal of crediting period of the CDM registered project 'Micro Scale Biogas CDM Project of CROSS' (UNFCCC Ref #8784) in India for renewal of project activities period.

The validation was performed in accordance with the UNFCCC criteria for the Clean Development Mechanism, latest version of Validation and Verification Standard and related Standards/Guidance and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting. In our opinion, the project meets all relevant UNFCCC, CDM criteria and all relevant host country criteria.

The review of the final PDD and the subsequently performed follow-up interviews with representatives of the project participant has provided the validation team with sufficient evidence to determine the validity of the original baseline and/or its update of the project. The PDD correctly applies small scale methodology AMS-I.E. Version 11. It is demonstrated that the project baseline scenario is not changed and also all necessary parameters are updated correctly for the 2nd crediting period.

⁴ Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

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

The revised ex-ante emission reduction from the PDD is estimated to be 15,233 tCO₂ per year or 106,631 tCO₂ for the entire crediting period of 7 years.

In summary, it is validation team's opinion that the project 'Micro Scale Biogas CDM Project of CROSS' (UNFCCC Ref #8784) in India meets all relevant UNFCCC requirements for the renewal of crediting period. Hence 4KES requests the renewal of the crediting period of the project.

Appendix 1. Abbreviations

Abbreviations	Full texts
4KES	4K Earth Science Private Limited
AMS	Approved Methodology for Small-scale
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CL	Clarification request
CME	Coordinating/ Managing Entity
COP	Conference of Parties
CROSS	Community Reconstruction of Social Service
DOE	Designated Operational Entity
DNA	Designated National Authority
DR	Document Review
EB	Executive Board
EF	Emission Factor
ERs	Emission Reductions
FAR	Forward Action Request
FCN	Fair Climate Network
FSI	Forest Survey of India
GHG	Greenhouse gas(es)
HCA	Host Country Approval
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
LSC	Local Stakeholder Consultation
LE	Leakage Emissions
LoA	Letter of Approval/Authorization
ISO	International Organization for Standardization
MNRE	Ministry of New & Renewable Energy
MOP	Meeting of Parties
MoC	Modalities of Communication
MoV	Means of Verification
MP	Monitoring Plan
NCV	Net Calorific Value
NRB	Non-Renewable Biomass
ODA	Official Development Assistance
PA	Project Activity
PDD	Project Design Document
PE	Project Emissions
PP	Project Participant
PS	Project Standard
PCP	Project Cycle Procedure
QA/QC	Quality Assurance/Quality Control
RCP	Renewal of Crediting period
SDG	Sustainable Development Goal
SSC	Small Scale
T&C	Technical & Certification
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation & Verification Standard

Appendix 2. Competence of team members and technical reviewers

<u>Certificate of Competence</u>						
Name	<input type="checkbox"/> Mr. <input checked="" type="checkbox"/> Ms.	Indumathi .C				
Qualification Procedure	Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.					
Appointed to work as:						
	CDM Validator/Verifier	Team Leader	Team Member	Technical Expert	Technical Reviewer	Financial Expert
Appointed	Yes	Yes	Yes	Yes	Yes	No
Appointed Date	29-07-2019					
Authorized to work as Technical Expert for:						
Authorized Technical Area	Sectoral Scope		TA Code	Technical Area within the scope		
	Energy industries (renewable - / non-renewable sources)		1.1	Thermal energy generation		
	Energy industries (renewable - / non-renewable sources)		1.2	Renewables		
	Energy demand		3.1	Energy demand		
	Waste handling and disposal		13.1	Solid waste and wastewater		
Authorized to work as Local Expert for:						
Country/Countries	India					
Compliance check by: Anand S. R.						

<u>Certificate of Competence</u>						
Name	<input checked="" type="checkbox"/> Mr. <input type="checkbox"/> Ms.	Narendra Kumar .R				
Qualification Procedure	Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.					
Appointed to work as:						
	CDM Validator/Verifier	Team Leader	Team Member	Technical Expert	Technical Reviewer	Financial Expert
Appointed	Yes	Yes	Yes	Yes	Yes	No
Appointed Date	29-07-2019					
Authorized to work as Technical Expert for:						
Authorized Technical Area	Sectoral Scope		TA Code	Technical Area within the scope		
	Energy industries (renewable - / non-renewable sources)		1.1	Thermal energy generation		
	Energy industries (renewable - / non-renewable sources)		1.2	Renewables		
	Energy demand		3.1	Energy demand		
	Waste handling and disposal		13.1	Solid waste and wastewater		
Authorized to work as Local Expert for:						
Country/Countries	India					
Compliance check by: Anand S. R.						

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	CROSS	Updated Project Design Document	Version 04, dated 31/01/2021	CROSS
	CROSS	Updated Project Design Document	Version 05, dated 25/02/2021	CROSS
	CROSS	Updated Project Design Document	Version 05.1, dated 08/05/2021	CROSS
2	CROSS	Revised ER Estimation sheet	Applicable to Version 4 of PDD	CROSS
	CROSS	Revised ER Estimation sheet	Applicable to Version 5 of PDD	CROSS
	CROSS	Revised ER Estimation sheet	Applicable to Version 5.1 of PDD	CROSS
3	CROSS	Registered PDD (applicable for 1 st crediting period)	Version 3, dated 12/07/2017	Publicly available
4	TUV Rheinland	Validation Report	Version 02, dated 10/12/2012	Publicly available
5	UNFCCC	AMS.I.E – “Switch from non-renewable biomass for thermal applications by the user”	Version 11	Publicly available
6	IPCC	1. 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book 2. 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book	Web Link	Publicly available
7	UNFCCC	Kyoto Protocol (1997)	Web Link	Publicly available
8	UNFCCC	Project design document form	Version 11	Publicly available
9	UNFCCC	CDM Project Standard for project activities	Version 02	Publicly available
10	UNFCCC	Standard: Sampling and surveys for CDM project activities and programme of activities	Version 08	Publicly available
	UNFCCC	Guidelines for sampling and surveys for CDM project activities and programme of activities	Version 04	Publicly available
11	UNFCCC	CDM Validation and Verification Standard for project activities	Version 02	Publicly available
12	UNFCCC	Glossary “CDM terms”	Version 10	Publicly available
13	UNFCCC	TOOL11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period	Version 3.0.1	Publicly available
14	UNFCCC	CDM project cycle procedure for project activities	Version 02	Publicly available
15	UNFCCC	Tool 16: Project and leakage emissions from biomass	Version 04	Publicly available
16	UNFCCC	Tool 30: Calculation of the fraction of non-renewable biomass	Version 03	Publicly available
17	CROSS	Kitchen Performance Test Documents: <ul style="list-style-type: none"> KT monitoring survey sheets Survey result summary excel sheet 	-	CROSS
18	CROSS	Sample survey sheets	-	CROSS
19	CROSS	Project database	-	CROSS
20	CROSS	End user agreements	-	CROSS
21	CROSS	Online monitoring solution	-	CROSS
22	Forest Survey of India, MoEF & CC	State of Forest Report	Year 2019	Publicly available
23	Meenakshi	Research Paper: Phytomass carbon pool of	-	CROSS

	Kaul · G. M. J. Mohren · V. K. Dadhwai	trees and forests in India		
24	Centre for Science and Environment	Status Report: Wood is Good. But is India doing Enough to meet Its present and future needs?	-	Publically available
25	Ratnam, J., Chengappa, S. K., Siddarth, J., Machado, Nandita Nataraj, Anand M. Osuri and Mahesh Sankaran.	<i>Functional Traits of Trees From Dry Deciduous Forests of Southern India Suggest Seasonal Drought and Fire Are Important Drivers. Frontiers in Ecology and Evolution. Brief Research Report, 2019, doi: 10.3389/fevo.2019.00008</i>	-	Publically available
26	Directorate Of Census Operations	District Census Handbook- Chittoor	-	Publically available
27	Ministry of Statistics and Programme Implementatio n	<i>NSS Report: Drinking water, sanitation, hygiene and housing condition in India,</i>	76 th Round	Publically available
28	CROSS	<i>Excel sheet for calculation of rotation period of dominant species in Andhra Pradesh</i>	-	CROSS
29	CROSS	<i>Latest MOC</i>	<i>Dated 04/07/2013</i>	Publically available

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CL from this validation

CL ID	01	Section no.	D.2	Date:	24/02/2021
Description of CL					
As per the applied methodology AMS I.E, version 11, the baseline emission also includes the non-CO2 emission. However as per section B.3 of the PDD, the CH ₄ & N ₂ O are excluded from baseline emission.					
Also the project boundary diagram includes avoidance of methane from manure management.					
Clarify					
Project participant response					Date: 25/02/2021
<i>The section B.3. is corrected to include non-CO2 emissions CH4 and NO2 as baseline emissions which considers emission factor of fossil fuels substituted for non-renewable biomass in the emission reduction calculations. The project boundary is corrected to not include avoidance of methane from manure management</i>					
Documentation provided by project participant					
Revised PDD dated 25/02/2021					
DOE assessment					Date: 02/03/2021
The CH ₄ & N ₂ O that were excluded from baseline emission are also now included in the baseline scenario.					
Also the project boundary diagram is corrected that does not include the methane avoidance from manure management.					
CL is closed.					

CL ID	02	Section no.	D.3	Date:	24/02/2021
Description of CL					
In NRB Calculation:					
1. PP shall clarify the appropriateness of the conversion factors used in biomass conversion (ie, from cum to tonnes)					
2. PP shall provide supporting document for the rotation years considered in the calculation					
Project participant response					Date: 25/02/2021
<i>1. The conversion of cum to tonnes is for Andhra Pradesh, as determined in the scientific paper, Kaul et al, 2008. The excel sheet with the dominant species and the rotation period for these species is provided. As can be seen, the average rotation age is 98 years, but conservatively, a value of 80 is considered.</i>					
Documentation provided by project participant					
<i>1. Paper by Kaul, M., Mohren, G.M.J., and Dadhwal, V.K., Phytomass carbon pool of trees and forests in India, Climatic Change, DOI 10.1007/s10584-010-9986-3, 2011, Table 4, Page 9.</i>					
<i>2. Excel sheet with the rotation age of dominant species for Andhra Pradesh.</i>					
DOE assessment					Date: 02/03/2021
1. PP has provided the report, Kaul et al, 2008. The assessment team checked the report and found that the density of wood considered for the calculation is correct.					
2. The excel sheet provided for the calculation of rotation period is checked. The sources and calculation provided in the excel sheet are verified and found to be correct. Also PP considered conservative rotation period for the calculation of fNRB. Hence OK.					
CL is closed					

Table 2. CAR from this validation

CAR ID	01	Section no.	D.1	Date:	24/02/2021
Description of CAR					
The following details are not included in the section A.1 of the PDD:					
<ul style="list-style-type: none"> Explanation on how the baseline emission occur. The estimates of annual average and total GHG emission reductions for the chosen crediting period 					
Project participant response					Date: 25/02/2021

<i>The explanation of occurrence of baseline emissions and annual and total GHG emission reductions are included in section A.1</i>	
Documentation provided by project participant	
<i>Revised PDD dated 25/02/2021</i>	
DOE assessment	Date: 02/03/2021
The details are now included in the section A.1 of the PDD. CAR is closed	

CAR ID	02	Section no.	D.3	Date: 24/02/2021
Description of CAR				
In section B.6.3 of PDD, the family size mentioned is not consistent with the family size considered in the ER sheet.				
Project participant response				Date: 25/02/2021
<i>It was a typographic error. The section B.6.3 is made consistent with the ER calculations sheet.</i>				
Documentation provided by project participant				
<i>Revised PDD</i>				
DOE assessment				Date: 02/03/2021
The family size in section B.6.3 of PDD is corrected now. CAR is closed				

CAR ID	03	Section no.	D.3	Date: 24/02/2021
Description of CAR				
PP shall submit the following documents:				
<ul style="list-style-type: none"> • Sample survey/KPT sheets • All documents/reports referenced in the PDD 				
Project participant response				Date: 25/02/2021
<i>The sample survey/KPT excel sheet is submitted. The URLs to all the references in the PDD is provided.</i>				
Documentation provided by project participant				
<i>Sample survey/KPT excel sheet and revised PDD.</i>				
DOE assessment				Date: 02/03/2021
PP submitted the Sample survey/KPT sheets and provided the reference URL for all the reports referred in the PDD.				
CAR is closed.				

Table 3. FAR from this validation

FAR ID	01	Section no.	-	Date: 02/03/2021
Description of FAR				
Since the project crediting period is starting on 1 January 2021, as mentioned in para 7 of EB 108 report, the project participants shall:				
(i) apply any GWP values that may be adopted by the CMP for the period from 1 January 2021 in their monitoring reports and relevant forms for any emission reductions achieved on or after 1 January 2021 by the activity as it may be applicable; and				
(ii) Update their project design document in accordance with any requirements of the CMP guidance.				
Project participant response				Date: DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				Date: DD/MM/YYYY

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: <ul style="list-style-type: none">• Ensure consistency with version 02.0 of the “CDM validation and verification standard for project activities” (CDM-EB93-A05-STAN) and version 02.0 of the “CDM project cycle procedure for project activities” (CDM-EB93-A06-PROC);• Make editorial improvements.
02.0	31 October 2017	Revision to align with the requirements of the “CDM validation and verification standard for project activities” (version 01.0).
01.0	23 March 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Renewal of crediting period Keywords: crediting period, project activities, validation report		