**PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Household Biogas plants installed in rural areas of Maharashtra
Version number of the PDD	03
Completion date of the PDD	19/05/2014
Project participant(s)	AKKPS & VNV Advisory LLP
Host Party(ies)	India
Sectoral scope(s) and selected methodology(ies)	01 and AMS I E- Switch from non-renewable biomass for thermal applications by the user, version 05
Estimated amount of annual average GHG emission reductions	48551 tCO_2/yr

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The aim of the project is to replace the commonly used inefficient wood fired mud stoves technology, with clean, sustainable and efficient biogas. The purpose of the project activity is to bundle 12474 plants installed in rural areas of Maharashtra of varying capacities – 2m3, 3m3, 4m3 and 6m3. All 12474 plants are commissioned in between January 2009- Dec 2011
Each household will utilize the dung of its cows to feed the digester for the production of biogas for cooking purpose and heating water. This leads to reduction of greenhouse gas emissions by displacing conventionally used non renewable biomass with renewable biogas. In addition, the hygienic conditions in the rural areas will be improved by an appropriate disposal of waste. Further, residue from the bio digesters can be used as organic fertilizer and will improve soil conditions in rural areas.

Project activity will contribute towards sustainable development by replacing firewood with biogas generated from the biodigesters.

Pre project Scenario:

Household survey was conducted to assess the baseline fuel and quantity used. As per the Survey, firewood was the main fuel used to suffice domestic needs. It was sourced from nearby forests and open market. Families have to walk 2-5 km to collect this firewood as Maharashtra, like many other regions of India, is a firewood deficit region. Usage of inefficient firewood leads to indoor pollution and land use patterns have been showing a decrease in forest land cover and increase in degraded land. Increasing pressure from human and livestock population and indiscriminate and illegal exploitation of forest resources are among factors that have lead to further intensification of the problem. A trend of forests turning into open scrubs has been observed. Degradation of forest lands has exacerbated the already existing problem of desertification. There is a need to maintain adequate forest cover in the state to mitigate climate change effects.

Project Scenario:

Project activity involves bundling of 12474 plants installed in rural areas of Maharashtra installed between Jan 2009 and December 2011.
The size of the biodigesters varies, depending on the number of people and number of cattles available per household. A detailed breakdown of the plants with the respective installed capacity is given below in Table 1.

Table 1. Breakdown of the plants with the respective installed capacity

Sr. No	Capacity (m^3)	Number of plants
1	2	5229
2	3	7068
3	4	153
4	6	24
Total:		**12474**

Project Contributes the Sustainable Development
Project implementation in rural areas will improve the socio- economic condition of the rural population and reduce GHG emissions. It is expected that this project will contribute to the improvement of the

living standard of the population. A detailed Sustainable Development description of the project activity is given in the Gold Standard passport.

The advantages of the projects are given in brief below:

Environmental well being

- The project utilizes cow dung which in the absence of the project activity would be left to decay and thus leading to substantial methane emissions from anaerobic processes.
- Utilizing biogas as an energy resource contributes to clean environment.
- Transformation of organic wastes into high quality fertilizer.
- Due to the anaerobic processes, the final sludge of the biodigesters has a very high degree of purity, i.e. it contains no parasites. This reduces the danger of parasitic infestations in people and animals
- During fermentation, part of the nitrogen content is changed into the form of ammonium, more easily absorbed by plants. In the direct spreading of unfermented manure, this process takes place in the soil and requires more time. Thus fermented liquid manure can be applied during the growth period of the plants (top dressing): This direct absorption by plants means that the danger of nitrogen seepage is reduced..
- Contribute to the global environment improvement by reducing deforestation and improving biodiversity.
- It will lead to improvement in soil condition by providing high quality manure.

Social – Economic well being

- It leads to improve the economic level of the local community by employing local people during construction of the biogas plant.
- The project will reduce the cooking time, thus providing women to take up other activities. It improves the overall health situation by reducing smoke in the kitchen, thus eliminating health hazards from indoor air pollution.

Technology well being:

- Better biogas digester models, thus improving biogas yield.

A.2. Location of project activity

A.2.1. Host Party(ies)

India

A.2.2. Region/State/Province etc.

Maharashtra

A.2.3. City/Town/Community etc.

The project activity is located in various districts of Maharashtra.

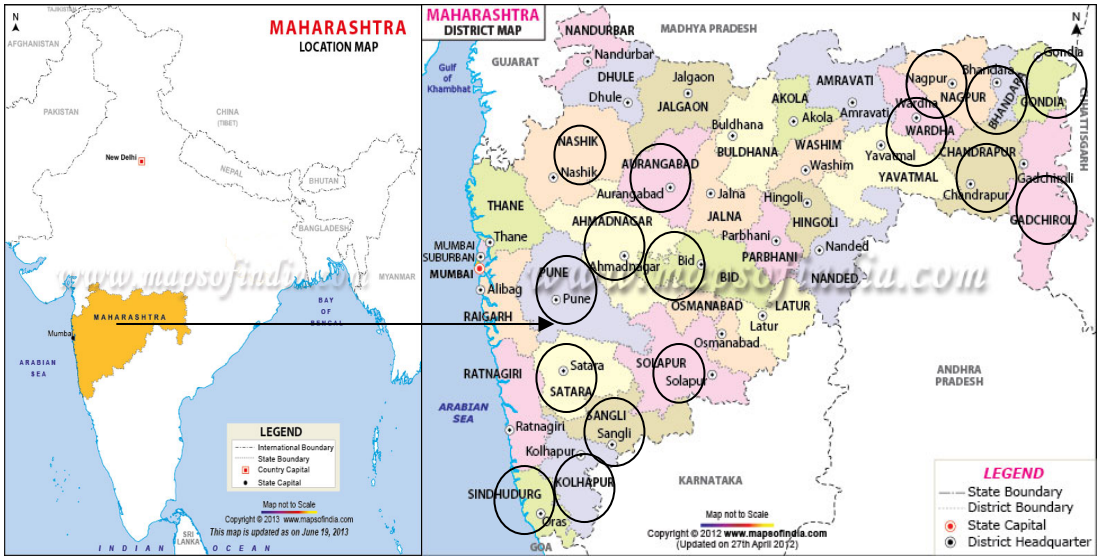
A.2.4. Physical/ Geographical location

The project activity is located in Maharashtra and geo coordinates of the districts are given below.

Various districts are given below:

Table 2: Project location

S.No	Districts	Geo coordinates
1	Ahmadnagar	18° 02' N -19° 09' N & 73°90'E -75°50'E
2	Aurangabad	24° 09' N -25° 70' N & 84°00'E -85°50'E
3	Beed	18° 28' N -18° 29' N & 74°57'E -76°57'E
4	Bhandra	20° 39' N -21° 38' N & 79°27'E -80°42'E
5	Chandrapur	18° 04' N -20° 05' N & 78°50'E -80°60'E
6	Gadchiroli	18° 43' N -21° 50' N & 79°45'E -80°53'E
7	Gondiya	20° 39' N -21° 38' N & 79°27'E -80°42'E
8	Kolhapur	16° 42' N -16° 69' N & 74°16'E -74°24'E
9	Nagpur	21° 91' N -21° 92' N & 79°45'E -79°49'E
10	Nasik	20° 00' N -20° 08' N & 73°47'E -73°79'E
11	Pune	18° 31' N -18° 52' N & 73°51'E -73°85'E
12	Sangli	16° 51' N -16° 85' N & 74°33'E -74°56'E
13	Satara	17° 36' N -17° 60' N & 74°24'E -74°40'E
14	Sindhu durg	16° 10' N -16° 18' N & 73°44'E -73°74'E
15	Solapur	17° 40' N -17° 68' N & 75°55'E -75°92'E
16	Wardha	20° 44' N -20° 74' N & 78°36'E -78°60'E



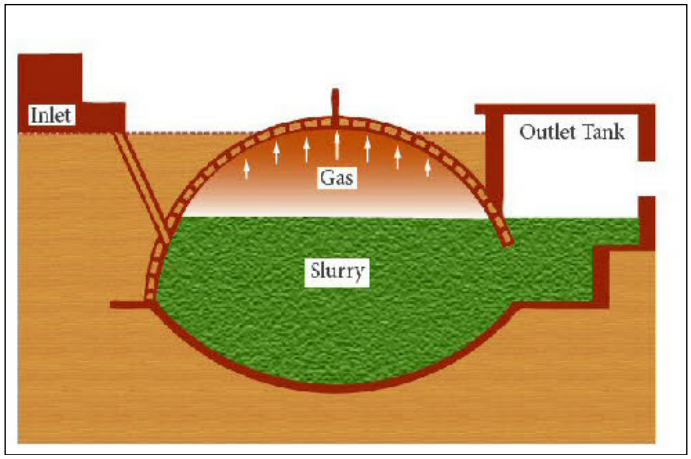
Technologies and/or measures

As described above project activity involves bundling of household bio-digesters with Fixed –Dome Digester technology installed in rural areas of Maharashtra

The major feed cow dung and human excreta material is mixed with water and fed into the plant through the inlet chamber of the plant. This waste is converted into biogas with the help of a special type of anaerobic bacteria. The digested material, which comes out of the plant, is enriched manure.

The main feature of a Deenbandhu biogas plant is the fixed underground digester chamber, constructed with a layer of bricks and an additional layer of cement mortar forming the roof above. Connected to the underground chamber is an inlet tank , through which manure is fed into the plant. The manure then ferments separating the slurry from the methane gas which rises and collects at the top of the digester tank, and is released through the gas outlet pipe. The slurry passes into the outlet tank where it is ejected from the plant and can be used as fertilizer on the field

Figure1: Deenbandhu type Biogas plant



A.3. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India(host country)	Aadivasi Khadi & Krishi Prasikshan Sansthan (AKKPS)	No
Government of India(host country)	VNV Advisory Service LLP	No

A.4. Public funding of project activity

No public funding from parties included in Annex I to the UNFCCC, is available to the project. Also, non use of Official Development Assistance declaration is provided in GS passport.

A.5. Debundling for project activity

This proposed small-scale project activity is not a de-bundled component of a large project activity as there is no registered small-scale GS VER project activity or a request for registration by another small scale project activity:

- By the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closet point

Project activity cannot be considered as a de bundled component of large project activity as this is the first GS VER project activity by the project participant before this project activity project participant project participant has not registered any other CDM /VER project activity. So none of the parameters given above is applicable to the project activity hence cannot be considered as de bundled component.

SECTION B. Application of selected approved baseline and monitoring methodology
B.1. Reference of methodology

The relevant project type and category is: Type I. RENEWABLE ENERGY PROJECTS, Category I.E. - Switch from non-renewable biomass for thermal applications by the user (Version 05).

B.2. Project activity eligibility

Justification for the choice of methodology is given below table:

Criterion	Conditions	Applicability
1	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).	Project activity involves installation of biodigesters and biogas thus produced will displace the use of non renewable biomass to major extent. Use of non renewable biomass in the project activity will be monitored as per methodology requirement and will be considered in emission reductions calculations.
2	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.	Survey was conducted to check since when villagers were using firewood. It is evident from the survey that all villagers have been using firewood as a cooking fuel since 31 December 1989.

As per "General Guidelines to SSC CDM methodologies" version 17, for thermal applications of biomass, biofuels or biogas (e.g. the cookstoves), the limit of 45 MWth is the installed/rated capacity of the thermal application equipment or device/s (e.g. biogas stoves).

As per the below calculation total installed capacity of the project activity is 29.85 MWth. Thus fulfils the criterion.

Activity Data	Value	Unit	Ref
$E = \eta . H_b . V_b$			
Where:			
E = Energy available from a biogas digester			
η= combustion efficiency of burners	**60%**		Report by SNV
H_b = heat of combustion per unit volume of biogas	**22.1**	**MJ/m3**	Biogas Technology, B.T. Nijaguna. 2001
V_b = Volume of the biogas	**32418**	**m3/day**	
E =	**429862.68**	**MJ/day**	Calculated
E =	**119406.30**	**kWh/day**	
E =	**29851.58**	**kW thermal Capacity**	Calculated(4 hours usage/day/HH)
E =	**29.85**	**MW, thermal**	
1 megajoule =0.277777778 kilowatt hours			

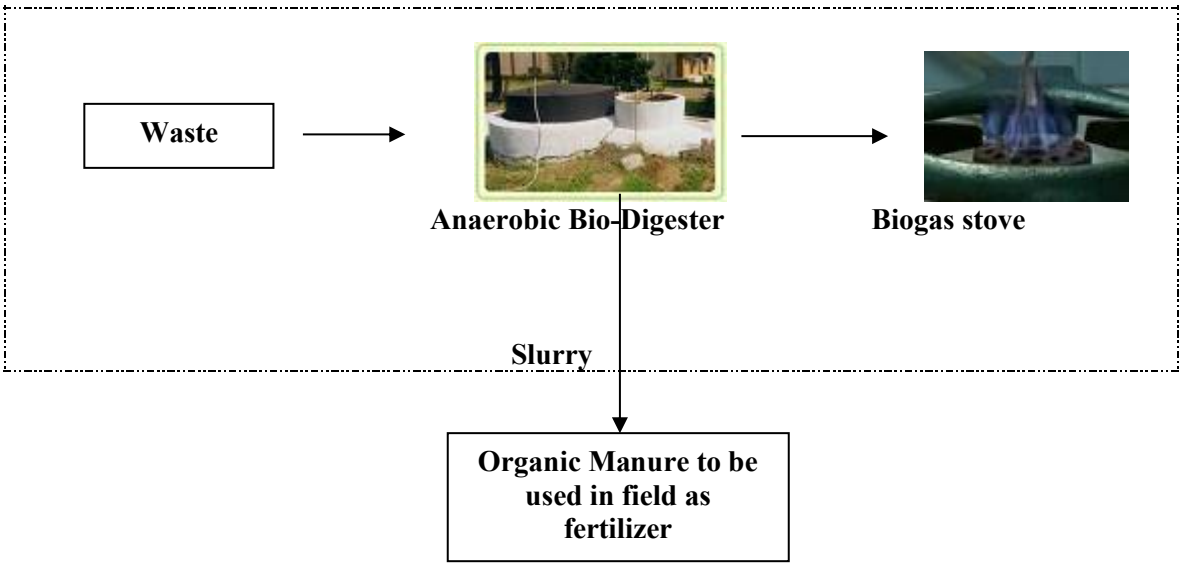
*On an average biogas is used for 4 hours in a day per household.

B.3. Project boundary

As per ***"AMS I.E-Switch from non-renewable biomass for thermal applications by the user"*** methodology the project boundary is:

The project boundary is the physical, geographical site of the use of biomass or the renewable energy.

Therefore, the project boundary encompasses the sum of all the 12474 physical geographical sites of all individual biogas plants (digester system, pipe leading to the stove and the stove itself) realized by the project activity. However, the baseline emissions from methane avoidance have been excluded to be conservative.



The greenhouse gases included in or excluded from the project boundary are shown in table below:

	Source	Gas	Included?	Justification / Explanation
Baseline	Thermal energy need	CO_2	Yes	The major source of emissions in the baseline due to burning of firewood
		CH_4	No	Excluded for simplification, this is conservative.
		N_2O	No	Not applicable for the project activity
	Animal waste handling and storage	CO_2	No	Not Availed, as baseline emissions from "feed" are not considered
		CH_4	No	Not Availed, as baseline emissions from "feed" are not considered
		N_2O	No	Not Availed, as baseline emissions from "feed" are not considered
Project activity	Direct emissions from the biodigester	CO_2	No	Excluded as CO_2 emissions from biogas incineration are CO_2 neutral
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
Leakage	The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users	CO_2	Yes	Source of leakages due to diversion of firewood saved under project activity.

B.4. Establishment and description of baseline scenario

As per "***AMS I.E- Switch from non-renewable biomass for thermal applications by the user, Version 05"***

A baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs.

The proposed project activity involves the installation of anaerobic biodigesters for the production of biogas which will replace non renewable biomass, used as a fuel for household cooking purposes.
As per baseline survey 100% of the households were using firewood and 3 stone fire as pre project scenario.

Emission reductions will be determined with the help of formula given below:

$$ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$$

Where:

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 (fNRB) values available on the CDM website[1]

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

$EF_{projected\_fossilfuel}$ = Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO2/TJ[2]

B_y is determined by using the following option:

- Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year); This can be derived from historical data or estimated using survey methods

Fossil fuel use was determined through surveys at the household, which were held in the sample of total population. Survey was done in Bhandara, Chandrapur, Gadchiroli, Gondiya and Nagpur as these districts were having, size of plants ranging from 1 m^3 to 6 m^3.

Leakage:

The potential leakages as set out in the methodology are assessed regarding their risk:

Leakage from	Estimate of risk	Justification
a) The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of nonrenewable woody biomass used by the non-project households/users that is attributable to the project activity then B y is adjusted to account for the quantified leakage. 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.	Negligible	As per the survey conducted in non project households, their requirement is same after the installation of the project activity as it was before. They are not utilizing any extra firewood. Therefore, leakage is not considered.
b) If the equipment currently being utilized is transferred from outside the boundary to the project boundary, leakage is to be considered.	No	Project equipment is not transferred outside the project boundary and therefore, leakage is not considered.

[1] Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/DNA/fNRB/index.html>.

[2] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 tCO_2/TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO_2/TJ for kerosene and 63.0 tCO_2/TJ for liquefied petroleum gas (LPG).

As per attachment C to Appendix B of simplified baseline and monitoring methodologies for selected small scale CDM project activity categories - version 3:
Since in the baseline firewood was used as fuel before the project activity, competing use of biomass have been considered and demonstrated:

Biomass type	Activity / source	Shift of pre-project activities	Emissions from biomass generation / cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	x
	New forests	x	x	-
Biomass from croplands or grasslands (woody or non-woody)	In the absence of the project the land would be used as cropland / wetland	x	x	-
	In the absence of the project the land would be abandoned	-	x	-
Biomass residues or wastes	Biomass residues or wastes are collected and used	-	-	x

As per the attachment C to appendix B:

In some cases, the biomass used in the project activity could be used for other purposes in the absence of the project. For example, biomass residues from existing forests could have been used as fuel wood or agricultural biomass residues could have been used as fertilizers or for energy generation. Competing uses for biomass are not relevant, where the biomass is generated as part of the project activity (new forests or cultivations).”

Project proponent has selected a sample of non targeted population and will monitor their firewood consumption pattern before and after the project activity. It is evident from the survey conducted by EEMG that firewood usage of non targeted population remains the same before and after the survey. Therefore, leakage is not considered.

The project participant shall evaluate ex ante if there is a surplus of the biomass in the region of the project activity, which is not utilized. If it is demonstrated (e.g., using published literature, official reports, surveys etc.) at the beginning of each crediting period that the quantity of available biomass in the region (e.g., 50 km radius), is at least 25% larger than the quantity of biomass that is utilized including the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions

Project activity doesn’t utilize biomass as fuel to suffice domestic needs. In project activity, cow dung and human excreta waste are being used for generating biogas which is used as fuel for the domestic needs.
Therefore, leakages are not considered.. However, survey would be conducted to monitor this parameter and accordingly leakages will be adjusted from emissions reductions.

B.5. Demonstration of additionality

As per EB 68, Annex 27, ***GUIDELINES ON THE DEMONSTRATION OF ADDITIONALITY OF SMALL-SCALE PROJECT ACTIVITIES***, Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

The alternatives to the project activity are given below:

- Continued usage of firewood for cooking
- Usage of Kerosene
- Usage of LPG
- Continuation of the project activity without VER revenues

There are no legal regulations for households to use renewable energy sources for their cooking needs or to capture methane from manure and organic waste. Therefore all the above alternatives are consistent with existing laws and regulations. Similarly there are no legal regulations that prohibit any of the alternative scenarios.

Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

Continued usage of firewood for cooking:

The usage of traditional wood stove represents the pre project situation in the local area. Baseline survey conducted by Energy and Environment Management Group, Bhopal (EEMG) also states firewood is the baseline fuel. [3]
The traditional cook stove is fabricated in situ by housewives using locally available mud or clay. Traditional cookstove is usually installed and maintained at zero cost. There is no operation and maintenance cost associated with its usage. As per the survey report conducted, the demand for firewood was partially met from the local forests and partially from buying on the local market.
In rural India, firewood is used as principle source of energy for cooking by 76.3% of the households. [4] In Maharashtra, 78.2% households are reliant on firewood. [5]
This shows firewood is the dominant fuel in the project area. Thus there is no investment barrier to the continued use of traditional cook stoves and non renewable firewood for cooking.

Usage of Kerosene:

Kerosene is another alternative for cooking purposes in the rural household. A 'typical' amount of kerosene when used as the primary cooking fuel is around 15 litres per month[6]. Kerosene can be used as a fuel for cooking but the cost of kerosene ranges from Rs. 14.44 to Rs.16.00 per litre. Only 2 litres per month is distributed through Public distribution system (PDS) and additional requirement has to be fulfilled through open market. In Open market cost of kerosene is around INR 40/litre which is not affordable by the targeted families in the project activity.

This proves to be at high cost as compared to traditional wood stoves and kerosene is not financially viable option to completely replace firewood. Thus the poor continue to rely on firewood to suffice their domestic needs.

Usage of LPG

[3] Baseline survey report
[4] Energy Sources of Indian Households for Cooking and Lighting-NSS 66 Round
[5] Energy Sources of Indian Households for Cooking and Lighting-NSS 66 Round
[6] Household Fuel and Energy Use In Developing Countries- A Multi country Study by Rasmus Heltberg Oil and Gas Policy Division, The World Bank, page #23

LPG is another alternative which can be used as a fuel for domestic purposes but this is more expensive compare to firewood and kerosene. The lump sum initial investment required for LPG installation (including security deposit, regulator, gas pipe, cylinder and stove) is Rs 2800[7]. A 14.2kg cylinder cost around INR 399[8] which usually last for one month for meeting cooking needs. Targeted population in the project activity cannot afford such high upfront and fuel cost to meet their domestic needs. Further, there is lack of infrastructure support (lack of facilities for refilling the cylinders) and hence this further prohibits widespread of LPG in rural context.
Being costlier, it still remains far from the reach of rural households.

Continuation of the project activity without VER revenues

The proposed project activity is having high investments compared to alternatives and pre projectscenarios. Cost of biogas plant construction is having high investment costs compared to LPG connection / kerosene utilization for cooking.

Sr. No	Type of Application	Cost
1.	Biogas Thermal Systems (Average cost of a 2 cum capacity Deenbandhu biogas plant)	Rs. 22,145 (Capital cost). Afterwards negligible operation costs[9]
2.	LPG Stove	Rs, 2800 (Capital cost) and then Rs.399 as monthly filling of cylinder
3.	Kerosene Stove	Rs, 550 (Capital cost) and then Rs. 549 as monthly cost of kerosene(2litres @ Rs14.4/l and 13 litres@ Rs 40/l)
4.	Wood Stove	0

Biogas based thermal energy generation is clean than other alternatives. The targeted families did not have access to the capital cost and moreover banks are not ready to provide loans as targeted population do not have sufficient assets for obtaining the loan. [10]This can be proven by the lower penetration of family type biogas plants in India[11].

The cost of different biogas plants is mentioned below:

Sr. No	Model	Size of bio gas plants	Estimated cost of bio digester(INR)[12]
1	Deenbandhu Model	$2m^3$	22145
2	Deenbandhu Model	$3m^3$	28385
3	Deenbandhu Model	$4m^3$	38330
4	Deenbandhu Model	$6m^3$	42000

[7] http://www.iocl.com/Products/LiquefiedPetroleumGasFAQ.aspx (shows the investment cost and gas pipe is around INR 2400 and stove costs 1200)
[8] http://www.business-standard.com/article/economy-policy/maharashtra-ncp-questions-the-financial-implication-of-subsidised-lpg-cylinders-112092302018_1.html
[9] AKKPS will take care of the operation and maintenance of the plant
[10] http://www.indiaenvironmentportal.org.in/files/BioenergyIndia.pdf (Page#10)
http://www.irjcjournals.org/ijmssr/Apr2013/2.pdf (Page #12)
[11] http://www.ecology.kee.hu/pdf/0604_015027.pdf
[12] Purchase receipts

The cost of family type biogas plant is comparatively higher than the available alternatives and the same is not affordable to the target population. The target population is having a huge number of farmers with limited monthly income.
In addition to the initial investment to make plant functional proper operation and maintenance is required. Operation and maintenance of the plant is an integral part of the project activity. [13] For proper O& M training of the local staffs are required.
There are nine biogas training centres across the country. These centres conduct four types of training programmes for masons, turnkey workers, staff engaged in biogas development and the users but a major chunk of the amount, over two third, goes towards salary and contingency of staff engaged in biogas activities and with a little amount left for training and R&D, the training centres find it difficult to make it successful[14].
In the baseline, households are handling normal "*chulahs*" or *wood stove chulahs* in which no maintenance is required. However for the subject project activity, trained persons are required for the proper operation and maintenance of the anaerobic biodigester.
As per Evaluation study on National Project on Biogas Development, the main reasons for plants becoming non-functional are structural and operational problems, easy availability of other convenient fuels, chocking of inlet/outlet, corrosion/leakage in pipeline, scum formation in digester slurry and water accumulation in gas pipe. Some of the problems can be rectified by the beneficiaries themselves, provided they are trained properly about preventive maintenance.

Considering all above points it can be concluded that training is an integral part of the successful operation of the anaerobic biodigesters. Since local people have no prior experience to operate and maintain the anaerobic biodigesters this involves a huge risk in the successful operation of the plant.

AKKPS being grass root NGO has access to limited funds and proper training & maintenance of the plants require sufficient funds which in turn will lead to successful operation of the plant. Carbon revenue will act as support and catalyst for sustained operation of the plant. AKKPS will conduct various training programmes for masons, local technical staff in state NGOs and will be engaged in setting up of service centre at state level to provide free of cost service to the end users of biogas plant throughout the crediting period. Therefore, it will help increasing penetration of the technology in the rural India.

Thus, it can be concluded that the lack of investment funds and operational problems are foremost barriers with biogas projects implementation & operation. In absence of the project activity these barriers would automatically, forced the farmers to continuation of the technology with higher emissions through sustained utilization of firewood in the pre project scenario.

Chronology of events:

S.No	Event	Date	Reference
1	Board Resolution of AKKPS confirming consideration of carbon revenues for the project	November 2008	Copy of Board Resolution
2	Discussion with consultant	Dec 2008	Email copy
3	Commissioning of First Bio digester	January 2009	Commissioning certificate

[13] Evaluation study on National Project on Biogas Development by Planning commission
[14] Evaluation study on National Project on Biogas Development, 2002(page #8)

4	Discussion with local RETs for development of project under Gold Standard	Feb 2010	Emails copy
5	Discussion with GIZ for development of the project	June 2010	Copy of Board minutes
6	Discussion with consultant	January 2011	Email Copy
7	Finalization of consultant	September 2012	Email copy
8	Discussion with VNV	24th April 2013	Email copy
9	Agreement with VNV	July, 2013	Agreement copy
10	DoE Appointment	August 2013	Signed Validation Contract
11	MoU signing with GS for fast track PFA	21th October 2013	MoU copy
12	Conference call with GS	07th November 2013	Minutes of meeting by GS
13	Validation site visit	03rd Dec,2013	
14	Stakeholder feedback round	03rd Dec,2013	

B.6. Emission reductions
B.6.1. Explanation of methodological choices

As per "***AMS I.E- Switch from non-renewable biomass for thermal applications by the user, Version 05"***

A baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs.

The proposed project activity involves the installation of anaerobic biodigesters for the production of biogas which will replace non renewable biomass, used as a fuel for household cooking purposes.
As per baseline survey 100% of the households were using firewood and 3 stone fire as pre project scenario.

Determination of B_y:

A third party survey was conducted by Environment and Energy Management Group, Bhopal to quantify the non renewable biomass used by the families. Under the 3rd party survey the quantity of firewood that is used for cooking was assessed in various districts of the project area.

As per AMS I.E- Switch from non-renewable biomass for thermal applications by the user, Version 05, "***When biennial inspection is chosen a 95% confidence interval and a 10% margin of error requirement shall be achieved for the sampling parameter. On the other hand when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters."***

As per methodology, 251 plants are required to be monitored[15] for first retroactive period considering 95% confidence level and there after sample will be calculated considering 90% confidence level. Third party survey was conducted in nine districts which are Ahmednagar, Bhandara, Chandrapur, Gadchiroli, Gondiya, Kolhapur, Nagpur, Satara and Solapur comprising of each capacity as these districts were having all types of plants.

[15] CDM sampling guidelines,EB69,Annex-5 & VER calculation sheet

The details of the survey from the study are as follows:

S. No.	No. of Plants Surveyed	Capacity of Biogas plant(m3)	Firewood usage before installation of Biogas plant (kg/month)	Firewood usage after installation of Biogas plant (kg/month)	Net Saving of firewood (kg/month)	No. of cattles	Whether included in any other CDM project activity
1	133	2	230	4	226	2	No
2	76	3	334	7	327	3	No
3	41	4	434	10	425	3	No
4	1	6	650	40	610	4	No

Based on the survey report, non-renewable biomass consumption for remaining districts i.e Ahmadnagar, Aurangabad, Beed, Kolhapur, Nasik, Pune, Sangli, Satara, Sindhu durg, Solapur and Wardha were also considered for respective capacities.

Total firewood usage before installation of the project activity(fixed for baseline)

Capacity(m^3)	**Non-renewable biomass(kg/month/plant)**
2	230
3	334
4	434
6	650

Total firewood displaced due to installation of the project activity

Capacity(m^3)	**Non-renewable biomass(kg/month/plant)**	**No. of Plants**	**Average non renewable biomass replaced (kg/month)**
2	226	5229	1181754
3	327	7068	2311236
4	425	153	65025
6	610	24	14640
		Total	**3572655**

Step 2: Determining $f_{NRB, y}$:

In accordance with Paragraph 7 of the chosen methodology, Type I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User, version 05:

Project participants shall determine the share of renewable and non-renewable woody biomass in B_y (the quantity of woody biomass used in the absence of project activity) the total biomass consumption using nationally approved methods (e.g. surveys or government data if available) and then determine $f_{NRB,y}$.

The following principles shall be taken into account:

Demonstrably renewable woody biomass (DRB)

Woody biomass is renewable if one of the following two conditions is satisfied:

1. The woody biomass is originating from land areas that are forests where:

a) The land area remains a forest;
b) Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and
c) Any national or regional forestry and nature conservation regulations are complied with.

Renewable Biomass from Forest:

(a) The total area under forests for Maharashtra is 2,960,300 ha. **This area will remain as forests and therefore meeting first condition.**
(b) These forests are classified as Tropical semi evergreen, Tropical moist deciduous, littoral & swamp, Tropical dry Deciduous, Tropical thorn and Sub tropical broad leaved hill forest. Undertaking sustainable management practices on these land areas to ensure that there is no systematic decrease of carbon stocks, the sustainable rate of extraction is calculated as an average of all these forest and it is 0.33 t/ha/yr (in Maharashtra) (Ravindranath et al. 2001).
(c) Thus the renewable biomass component from the project area is Area (ha) x sustainable harvest (t/ha/yr) 2,960,300 x 0.33 = 989,586t/year.

All national /regional forestry and nature conservation regulations are complied.

Misc. Tree crops & groves

- The total area is 24800 ha.
- Sustainable extraction rate is 2 t/ha/yr (Ravindranath *et al*, 2001)
- Total sustainable biomass is 24800 ha x 2 t/ha/yr = 49,600t/yr.

Culturable non-forest land:- is defined as the net geographical area lying outside recorded forest and forest cover, which can support tree vegetation (excluding areas under westland, riverbeds, perennial snow covered mountains, etc) Thus this area includes all lands other than forest.

- The total area is 13,738,600ha.
- The mean annual increment is 2.84% of the standing biomass (Shailaja and Sudha, 1987).
- Average Standing biomass/ha is calculated with the help of formula given below:
  Biomass=Growing stock*0.8*100/69. Growing stock values are considered from FSI Maharashtra, 2011 i.e. 440.698 (cum). Therefore, average standing biomass is 0.5110tonnes.
- Mean annual increment is 0.0145 tonnes/hectare

- Sustainable extraction from trees on CNFA = 13,738,600 x 0.0145 = 199,362.19tonnes

The fuelwood requirement of the taluk is based on the number of rural households and proportion of families dependent on fuelwood. This is based on the survey conducted and Housing Profile, Census of India respectively.
Thus summarizing the above steps, the table below shows the renewable biomass available as fuelwood. Thus the total non-renewable biomass used as fuelwood is 93%.

Item	Value	Unit	Source
RENEWABLE BIOMASS IN THE PROJECT AREA			
Total Geographical Area	16,723,700	ha	Forest Survey India report,Maharashtra 2011 (area of the districts included in the project activity are considered)
I. Renewable biomass from forests			
Forest Land	2,960,300	ha	Forest Survey India report,2011
Sustainable rate of fuelwood extraction	0.33	t/ha/yr	Ravindranath et al. 2001
Renewable biomass extraction from forests	989,586	t/yr	Area x sustainable rate of extraction
II. Renewable biomass from Plantation			
Total Plantation area including misc tree crops and groves	24,800	ha	Forest Survey India report,2011
Sustainable extraction rate from plantations	2	t/ha/year	Ravindranath et al. 2001
Sustainable extraction from plantations	49,600	tonnes	calculated
III. Renewable biomass from Culturable non-forest land			
Total Culturable Non-Forest land	13,738,600	ha	Calculated
Mean Annual Increment	2.84%	of standing Biomass	Shailaja and Sudha, 1987
Average Standing biomass/ha	0.5110	tonnes	Calculated
Mean Annual Increment	0.0145	tonnes/ha	Calculated
Sustainable extraction from trees on CNFA	199,362.19	tonnes/ yr	Area x sustainable rate of extraction
Total Sustainable Biomass Available	1,238,548	tonnes/year	calculated
Fuelwood Requirement			
Population	6,832,168	Households	Housing Profile,Census of India
% of households reliant on biomass for cooking	71%		Housing Profile,Census of India
Fuelwood requirement per HH for 2 m3	2.8		
Fuelwood requirement per HH for 3 m3	4.0		

Fuelwood requirement per HH for 4 m3	5.4		
Fuelwood requirement per HH for 6m3	7.8		
Weighted Average	**3.4**		
Total fuelwood requirement	17,571,733	tonnes/year	calculated
Availability ratio	0.070		calculated
NRB	**93%**		calc

According to the methodology, the Non-renewable woody biomass (NRB) is the quantity of woody biomass used in the absence of the project activity (By) minus DRB component, as long as at least two of the following supporting indicators are shown to exist:

- A trend showing an increase in time spent or distance travelled for gathering fuelwood, by users (or fuel-wood suppliers) or alternatively, a trend showing an increase in the distance the fuel-wood is transported to the project area;
- Survey results, national or local statistics, studies, maps or other sources of information, such as remote-sensing data, that show that carbon stocks are depleting in the project area;
- Increasing trends in fuel wood prices indicating a scarcity of fuel-wood;
- Trends in the types of cooking fuel collected by users that indicate a scarcity of woody biomass.

Depletion of carbon stocks:

As per Forest Survey report 2011, there has been decrease of 4 km^2 in the forest cover area as compared to the forest cover in 2009.

Increasing trends in fuel wood prices indicating a scarcity of fuel-wood;

As per State of Environment Report: Maharashtra by Ministry of Environment and Forests, Govt. of India, there has been huge increase in the firewood value. Details are given in the picture below:[16]

Value of Timber and Firewood produced in Maharashtra (Rs. Crore)

Years	Value of Timber	Value of Firewood
1960-61	5.0	1.2
1970-71	8.6	1.5
1980-81	43.9	9.8
1990-91	39.0	2.8
1998-99	106.0	15.0

Also, as per The Woodfuel Scenario and Policy Issues In India by N.C. Saxena, Centre for Sustainable Development, LBS National Academy of Administration, Mussoorie, there has been continuous increase in the price of firewood. Details given below

[16] of Environment Report: Maharashtra by Ministry of Environment and Forests, Govt. of India, page#184

Year	Sale price of dry wood*	Purchase price of wet wood *	Retail price index for town dwellers
1978	Rs 35	Rs 20	188
1980	Rs 40	Rs 25	212
1982	Rs 45	Rs 30	255
1985	Rs 50	Rs 35	315
1988	Rs 60	Rs 40	405
1990	Rs 70	Rs 45	495
Increase during 1978–90	**100%**	**125%**	**163%**

* Rate per quintal

Continuous increase in the price of firewood indicates reduction in the availability of the firewood.

Baseline emissions will be determined with the help of formula given below:

$$ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$$

Where:

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 (fNRB) values available on the CDM website[17]
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	=	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO2/TJ[18]

B_y is determined by using the following option:

- Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year); This is estimated using survey method

Leakage

As per Methodology AMS I.E. Ver 05:

[17] Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/DNA/fNRB/index.html>.

[18] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 tCO_2/TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO_2/TJ for kerosene and 63.0 tCO_2/TJ for liquefied petroleum gas (LPG).

Leakage 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). The following potential source of leakage shall be considered:

The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of nonrenewable woody biomass used by the non-project households/users, that is attributable to the project activity, then y B is adjusted to account for the quantified leakage. Alternatively, y B is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

Survey conducted by EEMG, interviewed non project participant and assessed their requirement before and after the project activity. It is evident from the survey that requirement of firewood is same and non renewable firewood has not been diverted to by non-project households.

If the equipment currently being utilized is transferred from outside the boundary to the project boundary, leakage is to be considered.

No equipment is transferred from outside the boundary to the project boundary.

Therefore, no significant sources of leakage are identified and it is considered as 0.

Emission reductions:

$$\mathbf{ERy = BE_y - LE_y}$$

B.6.2. Data and parameters fixed ex ante

<table>
<tr><td>Data / Parameter</td><td>D_y</td></tr>
<tr><td>Unit</td><td>Kg/month</td></tr>
<tr><td>Description</td><td>Total amount of biomass substituted</td></tr>
<tr><td>Source of data</td><td>Survey</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><th>Size</th><th>Before installation of Biogas plants(D_y)</th><th>After installation of Biogas plants(P_y)</th><th>Amount of firewood displaced (B_y)</th></tr>
<tr><td>2</td><td>230</td><td>4</td><td>226</td></tr>
<tr><td>3</td><td>334</td><td>7</td><td>327</td></tr>
<tr><td>4</td><td>434</td><td>10</td><td>425</td></tr>
<tr><td>6</td><td>650</td><td>40</td><td>610</td></tr>
</table>
</td></tr>
<tr><td>Choice of data or Measurement methods and procedures</td><td>Survey was conducted to know the firewood consumption pattern Environment and Energy Management Group, Bhopal</td></tr>
<tr><td>Purpose of data</td><td>Baseline emissions</td></tr>
<tr><td>Additional comment</td><td>$B_y = D_y$ (fixed as per baseline) - P_y (project firewood usage will be monitored annually)</td></tr>
</table>

Data / Parameter	$f_{NRB,y}$
Unit	%
Description	Fraction of Non Renewable Biomass
Source of data	Calculated
Value(s) applied	93%
Choice of data or Measurement methods and procedures	Fraction of Non-renewable biomass was calculated.
Purpose of data	Baseline emissions
Additional comment	Not Applicable

Data / Parameter	NCV_i
Unit	TJ/tonne
Description	Net Calorific Value of non-renewable biomass
Source of data	IPCC
Value(s) applied	0.015
Choice of data or Measurement methods and procedures	Default Value obtained from 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Purpose of data	Baseline emissions
Additional comment	Not Applicable

Data / Parameter	$EF_{projected\_fossilfuel}$
Unit	tCO_2/TJ
Description	Emission factor
Source of data	IPCC
Value(s) applied	81.6 tCO_2/TJ
Choice of data or Measurement methods and procedures	Default Value obtained from methodology "AMS-IE, Switch from non-renewable biomass for thermal applications by the user", Ver-05
Purpose of data	Baseline emissions
Additional comment	Not Applicable

B.6.3. Ex-ante calculation of emission reductions

Baseline Emissions

The amount of firewood saved due to the project activity will be the baseline for calculating the emission reductions. The annual baseline emissions (ERy) in tCO_2, during each year of the crediting period are expressed as follows:

$$ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$$

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 (fNRB) values available on the CDM website[19]
$NCV_{biomass}$ = Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$ = Emission factor for the substitution of non-renewable woody biomass by similar

[19] Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/DNA/fNRB/index.html>.

consumers. Use a value of 81.6 tCO2/TJ[20]

B_y is determined by using the following option:

- Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year); This is estimated using survey methods

Size of Biogas plants(m3)	2	3	4	6
By * fNRB,y	3	4	5	7
NCVi(TJ/tonnes)	0.015	0.015	0.015	0.015
EFCO2i(tCO2/TJ)	81.6	81.6	81.6	81.6
ERy (per plant)	3	4	6	8
Total No.of plants	5,229	7,068	153	24
ERy tCO2	16,060	31,409	884	199
Total ERy tCO2	**48,551**			

Leakage:

As per methodology: Leakage 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).

As per the "Sampling guidelines for CDM project activities and programme of activities" EB 69, Annex 5, 30 non targeted households will be surveyed.

The potential leakages as set out in the methodology are assessed regarding their risk:

Leakage from	Estimate of risk	Justification
a) The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of nonrenewable woody biomass used by the non-project households/users that is attributable to the project activity then B y is adjusted to account for the quantified leakage. Alternatively, B y is multiplied by a net to	Negligible	As per the survey conducted in non project households, their requirement is same after the installation of the project activity as it was before. They are not utilizing any extra firewood. Therefore, leakage is not considered.

[20] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 tCO_2/TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO_2/TJ for kerosene and 63.0 tCO_2/TJ for liquefied petroleum gas (LPG).

gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.		
b) If the equipment currently being utilized is transferred from outside the boundary to the project boundary, leakage is to be considered.	No	Project equipment is not transferred outside the project boundary and therefore, leakage is not considered.

Therefore leakages are not considered.

B.6.4. Summary of ex-ante estimates of emission reductions

Year	Project emissions (tCO_2 e)	Baseline emissions (tCO_2e)	Leakage (tCO_2 e)	Emission reductions (tCO_2 e)
Year 1[21]	0	48551	0	48551
Year 2	0	48551	0	48551
Year 3	0	48551	0	48551
Year 4	0	48551	0	48551
Year 5	0	48551	0	48551
Year 6	0	48551	0	48551
Year 7	0	48551	0	48551
Year 8	0	48551	0	48551
Year 9	0	48551	0	48551
Year 10	0	48551	0	48551
Total	**0**	**485514**	**0**	**485514**
Total number of crediting years	10			
Annual average over the crediting period	**0**	**48551**	**0**	**48551**

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

[21] First Crediting period starts from 30/04/2012 till end of last crediting period i.e.29/04/2022

Data / Parameter	Displacement or substitution of the non-renewable woody biomass
Unit	kg
Description	Monitoring should confirm the displacement or substitution of the non-renewable woody biomass at each location.
Source of data	Survey
Value(s) applied	-
Measurement methods and procedures	Survey will be conducted in the sample group to ensure at each location firewood has been replaced. In case any household switch to renewable biomass, quantity of the renewable biomass will be monitored.
Monitoring frequency	Biennial for first retroactive crediting period Annual - second crediting onwards
QA/QC procedures	NA
Purpose of data	Emissions reductions
Additional comment	Monitoring parameter ensures amount of non-renewable woody biomass displaced/substituted. Any usage of firewood in the project activity (Py) will be considered in emissions reductions.

Data / Parameter	Checking of sampled biogas plants
Unit	%
Description	Monitoring consist of checking of representative sample, to ensure that biodidgesters operating or are replaced by an equivalent in service appliance
Source of data	Survey
Value(s) applied	-
Measurement methods and procedures	Survey will be conducted in the sample group to check the functionality of biogas plants
Monitoring frequency	Biennial survey for retroactive crediting period Annual survey from after retroactive crediting period till end of crediting period
QA/QC procedures	NA
Purpose of data	Baseline emissions
Additional comment	NA

Data / Parameter	Amount of firewood saved under the project activity that is used by non-project households/users
Unit	-
Description	In order to assess the leakages specified under paragraph 10 of AMS IE, version 05, monitoring shall include data on the amount of woody biomass saved under the project activity that is used by non-project households/users (who previously used renewable energy sources).
Source of data	Survey
Value(s) applied	-
Measurement methods and procedures	Survey will be conducted in 30 households to check the amount of firewood saved under the project activity that is used by non-project households/users
Monitoring frequency	Biennial for first retroactive crediting period Annual - second crediting onwards
QA/QC procedures	NA
Purpose of data	Leakage
Additional comment	NA

B.7.2. Sampling plan

As per AMS I E, version 05 - A statistically valid sample where the systems are deployed will be selected. As per ***GUIDELINES FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES***, EB 69, Annex-5, the project proponent chooses simple random sampling and will consider, a 95% confidence interval and a 10% margin of error requirement for the sampled parameters. Therefore, total 251 random plants will be selected and monitored. [22]

B.7.3. Other elements of monitoring plan

Third party survey will be conducted to monitor all the monitoring parameters required as per the methodology and will also include monitoring of all non neutral sustainable parameters.
AKKPS will provide regular service to the plant owners. In case of malfunctioning of the biodigester, plant owner will inform AKKPS or any of its representatives. AKKPS will inspect the plant and resolve the problem at earliest.

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity

01/01/2009 (commissioning of first biogas plant)

C.1.2. Expected operational lifetime of project activity

[22] GUIDELINES FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES, WB 69, Annex-5 & VER calc sheet

15 years 0 month

C.2. Crediting period of project activity
C.2.1. Type of crediting period
Fixed

C.2.2. Start date of crediting period
09/05/2012[23]

C.2.3. Length of crediting period

10 years

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts

The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India, 2006. [24]

Hence, it is not required by the host party.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders

Since project is retroactive, Stakeholder feedback round was conducted on 3rd Dec, 2013 to intimate the local community about the project activity and the benefits on its implementation and to get their feedback about the proposed project.

The stakeholders were invited through an advertisement in the local news paper of the Kolhapur district as well as personal invitations were sent to the local people.

All the local and international Gold Standard NGO supporters were invited through mails along with local NGOs, Panchayat members and local residents.

AKKPS' and VNV's representatives explained about their project activity and the benefits about the project. It was informed that reduction in emissions by implementing biodigesters will improve the ambient air quality of the houses. Evaluation forms were also circulated to the stakeholders during the meeting to obtain their feedback.

E.2. Summary of comments received

After discussions about the project, the stakeholders were asked to raise their doubts and concerns of the proposed project activity. The comments can be summarized as positive and environmental friendliness due to the installation of biodigesters for thermal energy applications and Socio economic benefits from

[23] Since project activity is retroactive, crediting period would be two years prior to the date of registration
[24] http://envfor.nic.in/legis/eia/so1533.pdf;(LIST OF PROJECT OR ACTIVITIES REQUIRING PRIOR ENVIRONMENTAL CLEARANCE)

the project activity had also been appreciated. A more detailed description has been given in the local stakeholder consultation report.

E.3. Report on consideration of comments received

No negative comments due to the project activity

SECTION F. Approval and authorization

NA

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Appendix 1: Contact information of project participants

Organization	VNV Advisory LLP
Street/P.O. Box	41/1, Church Street
Building	Reyyan Towers
City	Bangalore
State/Region	Karnataka
Postcode	560001
Country	India
Telephone	+91 98450 17165
Fax	+9180 4242 9905
E-mail	contact@vnvadvisory.com
Website	www.vnvadvisory.com
Contact person	Sandeep Roy Choudhury
Title	Partner – Head Originator
Salutation	Mr.
Last name	Choudhury
Middle name	Roy
First name	Sandeep
Department	Emissions & Investments
Mobile	+91 98450 17165
Direct fax	+9180 4242 9905
Direct tel.	+9180 4242 9933
Personal e-mail	sandeep@vnvadvisory.com

Appendix 2: Affirmation regarding public funding

No public funding of any kind is applicable for the project activity.

Appendix 3: Applicability of selected methodology

Applicability of the methodology has been detailed in Sec B.2 of the PDD

Appendix 4: Further background information on ex ante calculation of emission reductions

Ex ante calculation has been given in detail under section B.6.1

Appendix 5: Further background information on monitoring plan

For calculating project households' sample:

As per Sampling guidelines for CDM project activities and programme of activities" EB 69, Annex 5, Simple random sampling has been chosen to calculate the number of samples.

As per methodology AMS I E, version-05,

For Biennial survey (first retroactive crediting period):

95% confidence level with 10% precision error and 0.6 as proportion has been considered. As all 12474 plants included in project activity were installed by Dec 2011. Third party survey was conducted in Jan 2014, to check the functionality rate of biogas plants and it was found all the biogas plants were working. Considering the survey and robust monitoring system , 0.6 has been chosen as proportion.

Formula used has been given below:

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1)\times 0.1^2 \times p^2 + 1.645^2 p(1-p)}$$

Where

n	Sample size
N	Total number of households (12474)
p	Our expected proportion (0.60)
1.64	Represents the 90% confidence required
0.1	Represents the 10% relative precision (0.1x0.6 =0.06 = 6% points either side of p)

As per the formula, 251 households will be surveyed.

For Annual survey:

90% confidence level with 10% precision error has been considered to calculate the sample size.

For leakage:

As per methodology AMS IE ver 05, 90% confidence level with 30% precision error , 0.5 as proportion and population of non project rural households i.e. 6819694 [25] should be considered. Hence, total 30 samples are required to be surveyed. Therefore 30 non project participants will be surveyed to assess the change in their firewood consumption pattern .In case there is any increase in consumption of firewood, leakage will be calculated.

Monitoring Plan:
AKKPS will recruit local villagers and provide training to them for maintenance of the biogas plants. AKKPS will also conduct regular end users training & workshops. In case of malfunctioning of the

[25] Housing profile Maharashtra

biodigester, plant owner will inform local technician of AKKPS and resolve the problem at earliest. AKKPS will also maintain service record of the bio digesters.

Third party survey will be conducted to monitor all the monitoring parameters required as per the methodology and will also include monitoring of all non neutral sustainable parameters.

Appendix 6: Summary of post registration changes

Not applicable

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities" (EB 66, Annex 9).
03	EB 28, Annex 34 15 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02	EB 20, Annex 14 08 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01	EB 07, Annex 05 21 January 2003	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		