Verification Report for

Project : Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra

UCR Project ID : 182

Name of Verifier	SQAC Certification Pvt. Ltd.
Date of Issue	18/07/2022
Project Proponent	Gram Panchayat Tiroda
UCR Project Aggregator	Progressive Management Consultants
Work carried by	Mr. Santosh Nair
Work reviewed by	Mr. Suuhas Tendulkar

Summary:
SQAC Certification Pvt. Ltd. has performed verification on the replacement of Non-Renewable Biomass with biogas for cooking and heating water in the village of Tiroda within Sawantwadi, Maharashtra.

Verification for the period 1st January 2014 till 31st December 2021.

In our opinion, the total GHG emission reductions over the crediting / verification period stated in the Project Concept Note (PCN) / Monitoring Report (MR), submitted to SQAC are fairly stated.

The GHG emission reductions were calculated on the basis of UCR Biogas Protocol Standard Baseline which draws reference from AMS. I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User. Owing to the Covid pandemic, the verification was done remotely by way of video calls / verification, phone calls and submission of documents for verification through emails.

SQAC is able to certify that the emission reductions from the Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra for the period 1st January 2014 till 31st December 2020 amount to 13,568 CoUs.

Detailed Verification Report:

Purpose:
The Gram Panchayat Tiroda has set up 260 independent biogas plants (digesters) of $2m^3$, $3m^3$, $4m^3$, $5m^3$, $6m^3$, $7m^3$, $8m^3$ and $9m^3$ capacity each for serving individual households comprising of an average of 4 members each using cattle dung collected from buffaloes, cows and calves currently being housed at such households in the village of Tiroda.

The objectives of this verification are, by way of suitable evidence, to establish that:

1. The project has been commissioned as per the documented / video evidence
2. The details provided in the PCN / MR are correct
3. The emission reductions from the project claimed are correct and in accordance with the requirements of the UCR Standard.

Scope:

The scope covers verification of emission reductions from the project Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra.

Criteria:

Verification criteria is as per the requirements of UCR Biogas Protocol Standard Baseline.

Description of project:

The **Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra** is located in Village: Tiroda, Zilla: Sindhudurg, Taluka: Sawantwadi, State: Maharashtra, India.

The purpose of the project activities is the set-up of 260 independent biogas plants (digesters) of $2m^3$, $3m^3$, $4m^3$, $5m^3$, $6m^3$, $7m^3$, $8m^3$ and $9m^3$ capacity each for serving individual households comprising of an average of 4 members each using cattle dung collected from buffaloes, cows and calves currently being housed at such households in the village of Tiroda, India. Each household is directly connected to the biogas digesters and feeds cattle dung into the anaerobic digesters. The technology involves the construction of foundation, dome, Biogas outlet pipe, inlet mixer tank and outlet tank into which the animal manure mixed with water for the production of biogas. Through a series of biochemical reactions, the organic matter is broken down by mesophilic microorganisms to release biogas, of which methane is the major component. The biogas is released into the pipes connected to the stoves when the stove burner is switched on. The technology to be employed is environmentally safe and sound. The project activity is implemented in a phase wise manner since 01/01/2002.

Each household has installed the biogas plant outside their household and feeds cattle dung into the anaerobic digester. The technology is tried and tested in India and has been in use for many years. By utilizing cattle dung in a controlled anaerobic digestion and combustion system, biogas is available for cooking energy and heat water for bath. Biogas is used on a single ring gas stove having one 4” burner with

a flame temperature of 870^{o} C, supplied as part of the project activity. The biogas slurry is used as bio-manure

By using biogas generated from cattle dung, the project activity replaces Non-Renewable Biomass with biogas for cooking and heating water. The baseline scenario is thermal energy from fuel wood within the domestic households in the village of which a large part of it was non-renewable for domestic cooking and water heating. This project contributes strongly to sustainable development of the rural households involved in the project. The small 2m^3 , 3m^3, 4m^3, 5m^3, 6m^3, 7m^3, 8m^3 and 9m^3 biogas plants are sufficient to provide cooking fuel to a household family with four to five members each. Approximately 0.24 m^3 biogas per capita is estimated per person per day. The Fuel wood scarcity has an impact directly on rural households, which are highly dependent on this fuel.

The smoke from burning such fuels causes alarming household pollution and adversely affects the health of women & children causing several respiratory diseases/ disorders. Biogas technology is a particularly useful system in the Indian rural economy and can fulfil several end uses. The gas is useful as a fuel substitute for firewood, dung, agricultural residues, petrol, diesel, and electricity, depending on the nature of the task, and local supply conditions and constraints, thus supplying energy for cooking and lighting. Biogas systems also provide a residue organic waste after anaerobic digestion that has superior nutrient qualities over the usual organic fertilizer, cattle dung, as it is in the form of ammonia. Anaerobic digesters also function as a waste disposal system, particularly in curbing methane emissions from cattle dung which is stockpiled and untreated in most villages.
Livestock production can result in methane (CH_4) emissions from enteric fermentation and both CH_4 and nitrous oxide (N_2O) emissions from livestock manure management systems. Cattle are an important source of CH_4 in many countries because of their large population and high CH_4 emission rate due to their ruminant digestive system.

Methane emissions from manure management tend to be smaller than enteric emissions, with the most substantial emissions associated with confined animal management operations where manure is handled in liquid-based systems. The conventional method of handling manure has been to use sufficient bedding to keep the manure relatively dry and then to move it out of the confinement area and deposit it into a manure pile for months prior to the project activity.

The baseline scenario identified at the PCN stage of the project activity is:

- Thermal energy from more GHG intensive means based on the use of non-renewable biomass for domestic cooking and water heating.

Thus, all these biogas digesters within the project activity are a voluntary investment which replaced equivalent amount of thermal energy from renewable source, the biogas. The project proponents are not bound to incur this investment as it was not mandatory by national and sectoral policies. Thus, the continued operation of the project activity would continue to replace thermal energy from fuel wood and fight the impacts of climate change.

Level of Assurance:
The verification report is based on the information collected through interviews conducted over video calls

/ phone calls, supporting documents provided during the verification, Project Concept Note (PCN) / Monitoring Report (MR), submitted to SQAC. The verification opinion is assured provided the credibility of all above.

Verification Methodology:

Review of the following documentation was done by SQAC Verifier, Mr. Santosh Nair, who is experienced in such projects.

- Project Concept Note (PCN)
- Monitoring Report (MR)
- Commissioning Report of all Bio Digestors
- Data provided upon request of all the documents of the related projects

Sampling Method:
There are 260 independent biogas plants (digesters) of $2m^3$, $3m^3$, $4m^3$, $5m^3$, $6m^3$, $7m^3$, $8m^3$ and $9m^3$ capacity each for serving individual households comprising of an average of 4 members each using cattle dung collected from buffaloes, cows and calves currently being housed at such households in the village of Tiroda, Sawantwadi, Maharashtra India.
A sampling size of 10% was arrived at, which resulted in detailed audit of 26 Bio Digestors of varying capacities.

Applied methodologies and standardized baselines :
AMS.I.E. Switch from non-renewable biomass for thermal applications by the user and UCR Biogas Protocol Standard Baseline.

The technical specifications of the KVIC model bio-digesters are as follows:

Specification	Value
Total Installed Capacity	1509 m^3
Mixing Proportion	(Water: Dung) 1:1
Number of units (digesters)	260
Feed Material	Cattle Dung
Biogas Flow rate	0.9 m^3/hr
Number of Stoves	1 per household
Unit Conversion rate MJ -> kWh	0.28
Efficiency of Burners	60.00%
Calorific Value Biogas	22.1 MJ/m^3
Rated Capacity (thermal) $MW_{thermal}$	0.86 MW_{th}

Applicability of double counting emission reductions

Each of the biogas unit is constructed by the project participant close to the household. The project participants have not applied for carbon credits under any other GHG program.

Project boundary, sources and greenhouse gases (GHGs)

The project boundary includes the physical, geographical site(s) of:

- Biogas digesters;
- Households using biogas for heating and cooking

	Source	GHG	Included?	Justification/Explanation
Baseline	Emissions from burning non-renewable wood	CO_2	**Included**	Major source of emission
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	Combustion of renewable biogas for cooking	CO_2	Excluded	Heat is generated from collected biogas, hence these emissions are not accounted for. CO2 emissions from the decomposition of organic waste are not accounted
	Emissions from residue from anaerobic digester	CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative

Leakage Emissions is not applicable as the project cook stove is not switching to charcoal or processed renewable biomass.

Establishment and description of baseline scenario (UCR Protocol)

The baseline scenario is thermal energy from more GHG intensive means based on the use of non-renewable biomass for domestic cooking and water heating. Thus, this project activity was a voluntary investment which replaced equivalent amount of thermal energy from renewable source, the biogas. The baseline emission boundary is site of the anaerobic digester in the case of project activity that recovers and utilizes biogas for producing thermal energy and applies this methodology on a standalone basis, i.e., without using a Type III component of an SSC methodology.

The project proponents are not bound to incur this investment as it was not mandatory by national and sectoral policies. Thus, the continued operation of the project activity would continue to replace thermal energy from fuel wood.

The CoUs or emission reductions for small-scale biogas units are based on approved fossil fuel emission displacement rates established by the UCR Standard. These rates have taken into account the size of the biogas unit, fossil fuel displaced and size of a household.

Digester M3	Emission Reduction tCO2 /yr
2	3.5
3	4.5
4	5.3
5	5.5
6	6.6
7	7.7
8	8.8
9	9.9

Annual Emission Reductions: $BE_y = HG_{ythermal} \times EF_{FF, CO2}$

BE_y = Emission reductions from the use of non-renewable biomass as per the UCR protocol in a year y.

where:

$HG_{y, thermal}$ = Total thermal capacity of the number of digesters in year y

$EF_{FF, CO2}$ = 5.5 CoUs/year - CO2 emission factor of the fossil fuel displaced in the baseline as determined by the UCR Standard for $5m^3$. CO2 emission factors for $3m^3$ and $4m^3$ are used at 4.5 CoUs/year and 5.3 CoUs/year respectively as indicated in the UCR Standard. CO2 emission factors for $6m^3$ CoUs/year, $7m^3$ CoUs/year, $8m^3$ CoUs/year and $9m^3$ CoUs/year are 6.6, 7.7, 8.8 & 9.9 respectively.

GWP_{CH4} = 21 is the default IPCC value of CH_4 applicable to the crediting period ($tCO_{2e}/t\ CH_4$)

NCV_{CH4}= NCV of methane (MJ/Nm^3) (default value: 35.9 MJ/Nm^3)

$NCV_{biomass}$ = Net calorific value of the non-renewable biomass as per UCR Standard (0.015 TJ/tonne)

Total baseline emission reductions (BE_y) = 13568 CoUs (13568 tCO_{2eq})

Monitoring period number and duration

First Issuance Period: 8 years, 0 months – 01/01/2014 to 31/12/2021

Capacity m^3	No of Digestors	CoU's
2	1	28
3	11	396
4	24	1017.6
5	60	2640
6	80	4224
7	78	4,804.8
8	2	140.8
9	4	316.8
	260	**13,568**

Conclusions:

Based on the audit conducted on the basis of UCR Biogas Protocol Standard Baseline which draws reference from AMS. I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User, the documents submitted during the verification including the data, Project Concept Note (PCN) / Monitoring Report (MR), SQAC is able to certify that the emission reductions from the project - Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra for the period 1st January 2014 till 31st December 2021 amounts to **13,568 CoUs.**