

Verification Report for

Project

: Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala.

UCR Project ID : 284

Name of Verifier	SQAC Certification Pvt. Ltd.
Date of Issue	27/04/2023
Project Proponent	The Andhyodaya, Ernakulam, Kerala, India.
UCR Project Aggregator	The Andhyodaya, Ernakulam, Kerala, India.
Work carried by	Mr. Santosh Nair
Work reviewed by	Mr. Praful Shinganapurkar

Summary:

SQAC Certification Pvt. Ltd. has performed verification of the "Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala" for replacement of Non-Renewable Biomass with biogas for cooking and heating water which replaces inefficient traditional cooking stoves with cleaner biogas stoves. The overall objectives of the project activity are reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of end users due to improved indoor air quality.

The project activity meets the following 7 major UN sustainable development goals (SDG's):



Verification for the period 1st January 2013 till 31st December 2022.

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

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applications by the user. The verification was done onsite by way of onsite interviews, verification and submission of documents for verification through emails.

SQAC is able to certify that the emission reductions from the "Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala" for the period 1st January 2013 till 31st December 2022 amount to 4,43,080 CoUs.

Detailed Verification Report:

Purpose:

The project activity aims at avoidance of fuel wood (firewood) consumption by traditional stove users by switching to bio-digester (biogas) technology using cow dung as a renewable energy fuel. The implemented biogas units for cooking needs helps reduce the amount of fuel wood used for cooking and water heating and replaces inefficient traditional cooking stoves with cleaner biogas stoves. The project activity - Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala is located across many villages in the districts of Alappuzha, Ernakulam, Idukki, Kannur, Kasaragod, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvananthapuram, Thrissur and Wayanad in the state of Kerala, India and setup by the Non-Governmental Organisation (NGO) – The Andhyodaya (Project Proponent-PP). The technology also reduces methane (CH₄) emissions from cattle manure and contributes strongly to the sustainable development of the rural households involved in the project activity. The overall objectives of the project activity are reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of end users due to improved indoor air quality.

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

- 1. The project has been commissioned as per the documented 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.

Location of project activity:

Country : India.
 District : Alappuzha, Ernakulam, Idukki, Kannur, Kasaragod, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvananthapuram, Thrissur and Wayanad
 State : Kerala



Latitude	: 11° 15' 30.1788'' N
Longitude	: 75° 54' 36.1224'' E



The digesters have been operational for a minimum of 330 days in a year with 4 hours of daily useper household.UCR Project ID: 284

5	
Start Date of Crediting Period	: 01/01/2013
Project Commissioned from	: 01/01/2002 onwards
Total Biogas Units in working condition within the Monitoring Period	: 13,326

Size of Digestor (m ³)	Number installed
2	13,326



Scope:

The scope covers verification of emission reductions from the project Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala.

Criteria:

Verification criteria is as per the requirements of UCR Protocol Standard Baseline and AMS.I.E. Switch from non-renewable biomass for thermal applications by the user.

Description of project:

The project activity involves the installation of 13,326 independent biogas plants (digesters) of capacity between 2m³, and each serving individual households comprising of an average of 4-7 members, using cattle dung (renewable energy fuel) collected from buffaloes, cows and calves currently being housed at rural households in the villages. The animal stalls are in the front yard/backyard/porch of the household in most of the cases. The animals are allowed to graze in the free pastures of the village or in some cases fed in the stall itself. One cow produces around 10-12 kg cow dung per day. Before the establishment of the biogas plant, this cow dung used to be dried and processed into dung cakes which were then used to fuel gobar chullas or sold annually to external contractors.

The project activity is implemented in a phase wise manner since 01/01/2002 and 31/12/2007. The majority of the digesters are of the fixed dome Deenabhandhu model, however, a few are of the floating drum and portable models. The slurry is fed from a mixing tank through an inlet pipe connected to the digester. After fermentation, the biogas collects in the space under the dome. It is taken out for use through a pipe connected to the top of the dome, while the sludge, which is a by-product, comes out through an opening in the side of the digester.



FRP Floating Drum Model

FRP Portable Model

Deenabhandhu Model



This is the first monitoring report for the first crediting period for the period 01/01/2013 to 31/12/2022. The operational domestic biogas units are in continuous operation after installation, with minor and major repairs as and when are reported by the PP. Since the UCR protocol for biogas systems is based on a conservative 330 days (default) a year operation, the project activity was never non-operational for a period of 35 days or more during any year of the monitoring period.

Biogas is a mixture of methane and carbon dioxide. It also has traces of hydrogen sulphide (3%), ammonia, oxygen, hydrogen, water vapour etc., depending upon feed materials and other conditions. Biogas is generated by fermentation of cellulose rich organic matter under anaerobic conditions. In anaerobic conditions, the methane-producing bacteria become more active. Thus, the gas produced becomes rich in methane. The optimum utilization depends upon the successful physical installations, which in turn depend upon plant design and its selection. The basic conversion principle is that when a non-ligneous biomass is kept in a closed chamber for a few days, it ferments and produces an inflammable gas.

The individual plant consists of a mixing chamber where wastewater and cow dung are mixed, an inlet pipe to feed the slurry into the reactor, the main biogas reactor/digester where methane formation/recovery takes place, a slurry outlet pipe, an outlet chamber, and a slurry platform. The outlet pipe and tank are provided to remove the digested/treated sludge or fermentation residue and the slurry platform is provided to maintain the treated slurry in clean condition. A pipe leading from the top of the dome to the stove is provided to supply biogas to a 1-2 ring stove inside the house.



The technical specifications of the project activity are as follows:

Specification	Value
Total installed capacity	26652 m ³
Mixing Proportion	(Water: Dung) 1:1
Number of units (digesters)	13326
Feed Material	Cattle Dung
Biogas Flow rate (2 burners each 4")	0.47 m ³ /hr per burner (0.9 m3/hr) Nijajuna, B. T. (2002) pg.157)
Number of Stoves (typical 2 burner)	1 per household
Unit Conversion rate MJ -> kWh	0.28
Efficiency of Burners	60.00%
Calorific Value Biogas	22.1 MJ/m ³ Source: Nijajuna, B. T. (2002): Biogas Technology. New Age International Publishers. New Delhi.
Rated Capacity (thermal) MW _{thermal}	29.61 MW _{th}

The total GHG emission reductions achieved in this monitoring period is as follows:

Summary of the Project Activity and ERs generated for the e	ummary of the Project Activity and ERs generated for the entire Monitoring Period				
Start date of this Monitoring Period	01/01/2013				
Carbon credits claimed up to	31/12/2022				
Total ERs generated over the Monitoring period (tCO_{2eq})	443080 tCO _{2eq}				
Leakage	2332.5 tCO _{2eq}				

The baseline scenario is thermal energy from more GHG intensive means based on the use of nonrenewable 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 a 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.

tCO ₂ /yr As per UCR Biogas Protocol	No. of Digestor	Capacity m ³
3.5	13326	2
4.5	0	3
5.3	0	4
5.5	0	5
6.6	0	6
7.7	0	7
8.8	0	8
9.9	0	9

Level of Assurance:

The verification report is based on the information collected through onsite interviews, 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 details of Bio Digestors
- Data provided upon request of all the documents of the related projects

Sampling Method:

The objective of the sampling effort is to determine the mean yearly value of the following parameters with 90/10 confidence/precision during the crediting period:

• Confirmation that non-renewable biomass has been substituted.

Sample Size: The sample size was determined by using the following equation



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

Where:

- n : Sample size
- N : Total number of households (11429)
- p : Expected proportion (0.75)
- 1.645 : Represents the 90% confidence required
- 0.1 : Represents the 10% relative precision

Therefore, the required sample size is at least 89.61 (approx. 90) households. This is assuming that 75% of the biogas units would be operating during the verification process. This assumption is conservative as the biogas systems within the monitoring report are all currently operational since the Project Proponent ensures that all the digesters are immediately repaired and operational. Since, the parameter of interest, i.e., confirmation that non-renewable has been replaced, will be in terms of percentage of households, there is no need to specify a variance to estimate.

SQAC conducted detailed audit of 106 Bio Digestors as samples, the list is attached below and as per the details mentioned in the format alongside.

	Vaar	Date of Visit :
	tear.	Date of File.
1	Biogas Plant, UID No.	
2	Address of Biogas Plant	
3	Name of District ; Gramapanchyath/Municipality	
4	Number of family members	: 4 /5 /6 /7 /8 /9
5	Capacity & Type of Biogas plant	: 1m3 /2m3 /3m3 /4m3 /6m3 /7m3/9m3 : Fixed /Dome /Floating Drum
6	Year of installation of Biogas plant	
7	Number of cattle	: 2 /3 /4 /5 /6
8	Approximate quantity of cow dung & organic waste available per day in KG	: 25 /50 /75 /100 /125
9	is the family feeding biogas plant everyday	Yes No
10	Do they feed any Non-organic matter into the biogas plant	: Yes No
11	is there slurry discharge everyday	: Yes No.
12	Has family done periodical refilling of biogas plant	: Yes No
13	Does get into the biogas plant from outside	: Yes No
14	is the biogas pipeline proper	: Yes No
15	Is the blogas stove functional	: Yes No
16	Has the family done any alteration to biogas stove	Yes No
17	is the family cleaning the stove every quarter	: Yes No
18	is the family able to save time for cooking in comparison with use of fire wood	: Yes No
19	Do they get the required quantity of gas everyday	: Yes No
20	is the family happy about the bingas plant	Yes No
	Name & signature of field staff	



	Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala List of Biogas Plants Audited					
SL. NO	BIOGAS PLANT UID NUMBER	NAME	DISTRICT	CAPACITY	ТҮРЕ	GRAMA PANCHYATH
1	AYA/EKM/2004/1326	M K Sunny	Ernakulam	2M ³	Deenabandhu	Ayyampuzha
2	AYA/EKM/2004/1691	T V Poulose	Ernakulam	2M ³	Deenabandhu	Ayyampuzha
3	AYA/EKM/2002/0438	P P Pappachan	Ernakulam	2M ³	Deenabandhu	Ayyampuzha
4	AYA/EKM/2002/0449	Jose	Ernakulam	2M ³	Deenabandhu	Ayyampuzha
5	AYA/EKM/2005/2334	K.S.Raphel	Ernakulam	2M ³	Drum	Ayyampuzha
6	AYA/EKM/2002/0416	K O Devassy	Ernakulam	2M ³	Deenabandhu	Ayyampuzha
7	AYA/EKM/2003/0484	Tomy M P	Ernakulam	2M ³	Deenabandhu	Ayyampuzha
8	AYA/EKM/2003/0483	T V Thomas	Ernakulam	2M ³	Deenabandhu	Ayyampuzha
9	AYA/EKM/2004/1548	Thomas Thottakara	Ernakulam	2M ³	Deenabandhu	Ayyampuzha
10	AYA/EKM/2002/0153	Biju P J	Ernakulam	2M ³	Deenabandhu	Karukutty
11	AYA/EKM/2004/1057	Chakochan P.J	Ernakulam	2M ³	Deenabandhu	Karukutty
12	AYA/EKM/2002/0217	Chandran P K	Ernakulam	2M ³	Deenabandhu	Karukutty
13	AYA/EKM/2005/1837	Jolly Jacob	Ernakulam	2M ³	Deenabandhu	Karukutty
14	AYA/EKM/2004/0942	Laiju P V	Ernakulam	2M ³	Drum	Karukutty
15	AYA/EKM/2006/3351	Martin C T,	Ernakulam	2M ³	Deenabandhu	Karukutty
16	AYA/EKM/2003/0589	Rosily Davis	Ernakulam	2M ³	Deenabandhu	Karukutty
17	AYA/EKM/2002/0207	Sanjobhavan	Ernakulam	2M ³	Deenabandhu	Karukutty
18	AYA/EKM/2004/1708	V V Jose	Ernakulam	2M ³	Deenabandhu	Karukutty
19	AYA/EKM/2006/3359	Jose T J	Ernakulam	2M ³	Deenabandhu	Karukutty
20	AYA/EKM/2006/3350	Antony V V	Ernakulam	2M ³	Deenabandhu	Karukutty



21	AYA/EKM/2006/3367	Baby M P	Ernakulam	2M ³	Drum	Karukutty
22	AYA/EKM/2006/3366	C P Varghese	Ernakulam	2M ³	Deenabandhu	Karukutty
23	AYA/EKM/2006/3337	Daughters of Saint Mary of Leuca	Ernakulam	2M ³	Deenabandhu	Karukutty
24	AYA/EKM/2006/3368	M P Joy	Ernakulam	2M ³	Drum	Karukutty
25	AYA/EKM/2006/3373	Kripasanam	Ernakulam	2M ³	Deenabandhu	Karukutty
26	AYA/EKM/2004/1613	G A Mathew	Ernakulam	2M ³	Deenabandhu	Manjapra
27	AYA/EKM/2002/0410	jose	Ernakulam	2M ³	Deenabandhu	Manjapra
28	AYA/EKM/2004/1192	Mathu Antony	Ernakulam	2M ³	Deenabandhu	Manjapra
29	AYA/EKM/2003/0543	Shaju PP	Ernakulam	2M ³	Deenabandhu	Manjapra
30	AYA/EKM/2003/0663	V V jose	Ernakulam	2M ³	Deenabandhu	Manjapra
31	AYA/EKM/2003/0857	George PP	Ernakulam	2M ³	Deenabandhu	Manjapra
32	AYA/EKM/2006/3379	Assesi mercy home	Ernakulam	2M ³	Deenabandhu	Karukutty
33	AYA/EKM/2005/1921	Jomon P.J	Ernakulam	2M ³	Deenabandhu	Karukutty
34	AYA/EKM/2005/2692	Sisily Kuriappan	Ernakulam	2M ³	Deenabandhu	Karukutty
35	AYA/EKM/2002/0413	Shaji	Ernakulam	2M ³	Deenabandhu	Manjapra
36	AYA/EKM/2005/1824	O.V Devassy	Ernakulam	2M ³	Deenabandhu	Manjapra
37	AYA/EKM/2002/0408	joy k a	Ernakulam	2M ³	Deenabandhu	Manjapra
38	AYA/TSR/2007/0625	Bainy	Thrissur	2M ³	Deenabandhu	Aloor
39	AYA/TSR/2004/0338	Paul	Thrissur	2M ³	Drum	Aloor
40	AYA/TSR/2004/0367	T P Thomas	Thrissur	2M ³	Drum	Aloor



41	AYA/TSR/2005/0476	Ouseph N V	Thrissur	2M ³	Deenabandhu	Aloor
42	AYA/TSR/2003/0106	M K Raman Embranthiri	Thrissur	2M ³	drum	Aloor
43	AYA/TSR/2002/0002	m rajan	Thrissur	2M ³	Deenabandhu	Annamanada
44	AYA/TSR/2002/0005	radhakrish nan m g	Thrissur	2M ³	Deenabandhu	Annamanada
45	AYA/TSR/2002/0010	Seethi	Thrissur	2M ³	Deenabandhu	Annamanada
46	AYA/TSR/2003/0256	Jaison P.Y	Thrissur	2M ³	Deenabandhu	Annamanada
47	AYA/TSR/2007/0696	Annie Thomas	Thrissur	2M ³	Deenabandhu	Annamanada
48	AYA/TSR/2002/0018	V.M Abdhulkha dhar	Thrissur	2M ³	Deenabandhu	Chalakudy
49	AYA/TSR/2002/0014	Prabakaran K.R	Thrissur	2M ³	Deenabandhu	Kodakara
50	AYA/TSR/2005/0456	Togi Jacob	Thrissur	2M ³	Deenabandhu	Koratty
51	AYA/TSR/2006/0534	Anil C.K	Thrissur	2M ³	Drum	Koratty
52	AYA/TSR/2007/0633	Poulose P.P	Thrissur	2M ³	Deenabandhu	Annamanada (Parakadavu)
53	AYA/IDK/2003/2222	Sojan	Idukki	2M ³	Deenabandhu	Kamakshi
54	AYA/IDK/2003/2224	Sunny Davassia	Idukki	2M ³	Deenabandhu	Kamakshi
55	AYA/IDK/2003/2226	Rajeev V.R	Idukki	2M ³	Deenabandhu	Kamakshi
56	AYA/IDK/2003/2227	Shainu	Idukki	2M ³	Deenabandhu	Kamakshi
57	AYA/IDK/2003/2230	Dileep kumar T.R	Idukki	2M ³	Deenabandhu	Kamakshi
58	AYA/IDK/2003/2231	Vishnu Murali	Idukki	2M ³	Deenabandhu	Kamakshi
59	AYA/IDK/2004/3967	Joseph Sebastin	Idukki	2M ³	Deenabandhu	Kamakshi
60	AYA/IDK/2004/3968	Babu K	Idukki	2M ³	Deenabandhu	Kamakshi
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61	AYA/IDK/2006/6606	Sebastian	Idukki	2M ³	Deenabandhu	Kamakshi
62	AYA/IDK/2007/7334	Thomas Varkey	Idukki	2M ³	Deenabandhu	Kamakshi
63	AYA/IDK/2007/7336	Joy Kurian	Idukki	2M ³	Deenabandhu	Kamakshi
64	AYA/IDK/2007/7337	Thomas	Idukki	2M ³	Deenabandhu	Kamakshi
65	AYA/IDK/2004/4392	Joseph Cheriyan	Idukki	2M ³	Deenabandhu	Kanjikkuzhy
66	AYA/IDK/2002/0003	Bijo Michael	Idukki	2M ³	Deenabandhu	Mariyapuram
67	AYA/IDK/2005/5637	Mathew A D	Idukki	2M ³	Deenabandhu	Mariyapuram
68	AYA/IDK/2005/5804	Joseph Thomas	Idukki	2M ³	Deenabandhu	Vathikudy
69	AYA/IDK/2005/6367	Raju Velayudan	Idukki	2M ³	Deenabandhu	Vathikudy ((Vandanmed u)
70	AYA/IDK/2005/5908	Santhosh.P. A	Idukki	2M ³	Deenabandhu	Vathikudy
71	AYA/IDK/ 2005/6014	Varkey.Jose ph	Idukki	2M ³	Deenabandhu	Vathikudy
72	AYA/IDK/2005/5910	Biju.George	Idukki	2M ³	Deenabandhu	Vathikudy
73	AYA/IDK/2005/5844	P.K. Sabu	Idukki	2M ³	Drum	Vathikudy
74	AYA/IDK/2005/6114	Ramakrishn an Kadutha	Idukki	2M ³	Deenabandhu	Vathikudy
75	AYA/IDK/ 2003/3281	George.Tho mas	Idukki	2M ³	Drum	Vathikudy
76	AYA/IDK/2005/6098	K R Raveendran	Idukki	2M ³	Deenabandhu	Vathikudy
77	AYA/IDK/2005/5819	Joseph.Cha cko	Idukki	2M ³	Deenabandhu	Vathikudy
78	AYA/IDK/2003/2960	Vijayan.T.D	Idukki	2M ³	Deenabandhu	Vathikudy
79	AYA/IDK/2007/7523	Nino George	Idukki	2M ³	Deenabandhu	Vathikudy
80	AYA/IDK/2005/5859	Thankachan	Idukki	2M ³	Deenabandhu	Vathikudy



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81	AYA/IDK/2006/6770	Sali.Scaria	Idukki	2M ³	Deenabandhu	Vathikudy
82	AYA/IDK/2005/5689	Thersyamma Babu	Idukki	2M ³	Deenabandhu	Vathikudy
83	AYA/IDK/2002/0535	Jimmy Sebastian	Idukki	2M ³	Deenabandhu	Vathikudy
84	AYA/IDK/2007/7551	Johny Thomas	Idukki	2M ³	Deenabandhu	Vathikudy
85	AYA/IDK/2004/4611	Mary Jose	Idukki	2M ³	Deenabandhu	Vathikudy
86	AYA/IDK/2002/0002	Thadhevus mathayi	Idukki	2M ³	Deenabandhu	Vathikudy
87	AYA/IDK/2004/4552	Sattili Jose	Idukki	2M ³	Deenabandhu	Vathikudy
88	AYA/IDK/2005/6135	јоу	Idukki	2M ³	Deenabandhu	Vathikudy
89	AYA/IDK/2004/4793	Johny.Mich eal	Idukki	2M ³	Deenabandhu	Vathikudy
90	AYA/IDK/2003/3947	Mohanan	Idukki	2M ³	Deenabandhu	Vathikudy
91	AYA/IDK/2004/4175	Reji	Idukki	2M ³	Deenabandhu	Vathikudy
92	AYA/IDK/2002/0001	Eliama Thomas	Idukki	2M ³	Deenabandhu	Vathikudy
93	AYA/IDK/2004/4431	Biju	Idukki	2M ³	Deenabandhu	Vathikudy
94	AYA/IDK/2004/4882	George Mathew	Idukki	2M ³	Deenabandhu	Vathikudy
95	AYA/IDK/2005/5745	Prabhakaran O N	Idukki	2M ³	Deenabandhu	Vathikudy
96	AYA/IDK/2005/5912	Bindhu Anil	Idukki	2M ³	Deenabandhu	Vathikudy
97	AYA/IDK/2005/5913	Sini K S	Idukki	2M ³	Deenabandhu	Vathikudy
98	AYA/IDK/2003/3841	Santhosh	Idukki	2M ³	Deenabandhu	Vathikudy
99	AYA/IDK/2003/3173	Jessy Sebastian	Idukki	2M ³	Deenabandhu	Vathikudy



100	AYA/IDK/2003/3847	Chacko Antony	Idukki	2M ³	Deenabandhu	Erattayar
101	AYA/IDK/2002/0936	Joy George	Idukki	2M ³	Deenabandhu	Erattayar
102	AYA/IDK/2003/3463	Mathew Joseph	Idukki	2M ³	Deenabandhu	Erattayar
103	AYA/IDK/2002/0093	Jojo	Idukki	2M ³	Deenabandhu	Erattayar
104	AYA/IDK/2005/6294	James Joseph	Idukki	2M ³	Deenabandhu	Vathikudy
105	AYA/IDK/2004/4151	Sebastian A J	Idukki	2M ³	Drum	Vathikudy
106	AYA/IDK/2007/7495	Sebastin Sebastin	Idukki	2M ³	Deenabandhu	Vathikudy

Applied methodologies and standardized baselines:

- SECTORAL SCOPE 01 Energy industries (Renewable/Non-renewable sources)
- TYPE I Renewable Energy Projects

CATEGORY - AMS. I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User (Ver.12.0)

> This methodology comprises of activities to displace the use of nonrenewable biomass by introducing renewable energy technologies to households, communities, and/or institutions such as schools, prisons or hospitals (hereinafter referred as end users). Examples of these technologies include but are not limited to: Biogas stoves.

Total Biogas Units in the 1st monitoring period: 13,326 individual units.



Capacity (m ³)	2	3	4	6
		-		
E (MJ/day)	26.52	0	0	0
E(kwh/d)	7.4256	0	0	0
Thermal capacity kw				
@0.9/m ³ flow rate	2.222222	0	0	0
Installed (KW)				
thermal capacity	29613.33	0	0	0

Applicability of methodologies and standardized baselines

- The project activity is biogas cook stove for households and provides thermal energy from cattle dung that is renewable. It replaced the baseline technology mud/clay, three-stone traditional cook stove that used non-renewable biomass at the household level. The biogas produced is also used for captive power generation. All biogas units distinct from each other.
- Biogas produced by the digesters are used. The project involves the installation of bio digester and biogas stoves that replace the use of traditional stoves fuelled by nonrenewable biomass. Hence the project fulfils the applicability criteria of AMS I.E.
- The annual average temperature of the biogas site is located is higher than 5°C
- The storage time of the manure after removal from the animal barns, including transportation, does not exceed 45 days before being fed into the digesters.
- The storage time of the manure after removal from the animal barns, including transportation, does not exceed 45 days before being fed into the digesters.
- The residual waste from the animal manure management system is handled aerobically.
- The communities across India are using non-renewable biomass since 31st December 1989. This is based on using published literature, official reports and statistics.



- The project activity does not use renewable biomass. The renewable source is cattle dung.
- The project activity is biogas cook stove and is not electric cook stoves.
- There is a technology switch from traditional stove to biogas stove.
- This is a small-scale project with total thermal capacity of 29.61 MWth which is not greater than the small scale thresholds defined by the applied methodology I.E. the limit of 45 MWth is the installed/rated capacity of the thermal application equipment or device/s (e.g. biogas stoves)".

Applicability of double counting emission reductions

Each of the biogas unit is constructed by the project participant close to the household. The details of the end user are provided in the emission report in the below sample format. The UID Number is unique for all the digesters in the project activity. The project participants have not applied for carbon credits under any other GHG program.

	-				1				
UID Number	Date of installation	Head of the Family	Address	District	Family Membe rs	Capacity	Туре	No. of owned Cattle	Grama Panchaya
AYA/KNR/2002/0003	01-01-2002	Thomas T C	Thundiyil,Naduvil P O 670582	Kannur	5	2m3	Deenabandhu	4	Naduvil
AYA/KTM/2002/0001	01-01-2002	E.J.Sebastin	Edayanimattathil.H,Val avoor.P.O 686635	Kottayam	3	2m3	Dheenabhandhu	0	Karoor
AYA/KTM/2002/0002	01-01-2002	Mary Mathew	Koiyppuram(H)Muthol y(PO) 686597	Kottayam	3	2m3	Dheenabhandhu	3	Mutholy
AYA/KTM/2002/0003	01-01-2002	K.B Narayanan	Kochuparambil H,Neeloor P.O.,Azhikkanny 686651	Kottayam	6	2m3	Drum	0	Kadanad
AYA/KRD/2002/0001	01-01-2002	M V Mathew	Mukaleparambil(H),Pal avayal(P.O) 670511	Kasaragod	4	2m3	Dheenabandu	2	East Elary
AYA/KRD/2002/0002	01-01-2002	Moly. Thomas	Panamattathil H,Thachenny P.O 670511	Kasaragod	5	2m3	Dheenabhandhu	3	East Elary
AYA/IDK/2002/0001	01-01-2002	Eliama Thomas	Panamparambil (H)	Idukki	6	2m3	dheenabandhu	2	Vathikkudi
AYA/IDK/2002/0003	01-01-2002	BIJO MICHAEL	KUNNUMTHOZHUTH (H)	Idukki	4	2M3	dheenabandhu	2	MARIYAPURAM
AYA/IDK/2002/0005	01-01-2002	P. LIOSEPH	PANTHACKAL (H)	Idukki	5	2M3	dheenabandhu	3	MARIYAPURAM





























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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 Major source of emission Excluded for simplification. This is conservative Excluded for simplification. This is conservative Heat is generated from collected biogas, hence these emissions are not accounted for CO ₂ emissions from the decomposition of organic waste are not accounted Excluded for simplification. This is conservative		
Baseline	Emissions from	CO ₂	Included	Major source of emission		
	burning non- renewable wood	CH4	Excluded	Excluded for simplification. This is conservative		
	Emissions from animal manure stored on site	N ₂ O	Excluded	Excluded for simplification. This is conservative		
Project Activity	Emissions from	CO ₂	Excluded	Heat is generated from collected biogas, hence these emissions are not accounted for CO ₂ emissions from the decomposition of organic waste are not accounted		
	residue from anaerobic digester	CH4	Excluded	Major source of emission Excluded for simplification. This is conservative Excluded for simplification. This is conservative Heat is generated from collected biogas, hence these emissions are not accounted for CO ₂ emissions from the decomposition of organic waste are not accounted Excluded for simplification. This is conservative Excluded for simplification. This is conservative		
		N ₂ O	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.

<u>Leakage related to the non-renewable woody biomass saved by the project activity</u>: The following potential source of leakage shall be considered:

- (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 non-renewable woody biomass used by the non-project households/users, that is attributable to the project activity, then BEy is adjusted to account for the quantified leakage.
- (b) Alternatively, BEy is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

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

Option (b) is selected wherein, "BEy is multiplied by a net to gross adjustment factor of 0.95 to account for leakages", and hence in this case, surveys of non-renewable woody biomass used by the non-project households/users will not be required.

Establishment and description of baseline scenario (UCR Protocol)

The baseline scenario is thermal energy from more GHG intensive means based on the use of nonrenewable 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 a SSC methodology.

According to the UCR project standard for such project activities, CoUs or carbon credits for small scale biogas units are based on approved fossil fuel emission displacement rates established worldwide. These rates have taken into account the size of the biogas unit, fossil fuel displaced and size of a household.



1 – 2 Cubic Meter 3.5 CoUs/year

BEy is determined by taking the following option: (a) Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year). Baseline emissions are derived as follows:

Calculated Annual Baseline Emission Reductions: BE_y = HG _{ythermal} x EF _{FF, CO2}

BEy = 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

 $EF_{FF, CO2} = 3.5 \text{ tCO}_2 \text{eq/year} - CO_2$ emission factor of the fossil fuel displaced in the baseline as determined by the UCR Standard for up to $2m^3$ digestor capacity.

Baseline Emissions tCO₂/yr As per UCR Biogas Protocol	Capacity m ³
3.5	1 - 2

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Baseline Emissions (tCO2eq)	46641	46641	46641	46641	46641	46641	46641	46641	46641	46641	Total
Leakage (tCO2eq)	2332.05	2332.05	2332.05	2332.05	2332.05	2332.05	2332.05	2332.05	2332.05	2332.05	
Emission Reductions (tCO2eq)	44308	44308	44308	44308	44308	44308	44308	44308	44308	44308	443080

NCV _{CH4} = NCV of methane (MJ/Nm³) (default value: 35.9 MJ/Nm³)

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



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

Total emission reductions (ERy) = 4,43,080 CoUs (4,43,080 tCO_{2eq})

Monitoring period number and duration

First Issuance Period: 10 years, 0 months – 01/01/2013 to 31/12/2022

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 onsite audit and 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 - Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala, UCR ID-284, for the period 1st January 2013 till 31st December 2022 amounts to 4,43,080 **CoUs (**4,43,080 **tCO**_{2eq}**)**

Santosh Nair Lead Verifier (Signature)



Praful Shinganapurkar Senior Internal Reviewer (Signature)

Date: 27/04/2023