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INDIA CLEAN COOKING FORUM 2018: STRATEGIZING RENEWABLE ENERGY FOR COOKING



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Preface

CLEAN's flagship event, India Clean Cooking Forum (ICCF) was initiated jointly by the Ministry of New and Renewable Energy, GoI, and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, in 2013. The ICCF aims at mainstreaming the issue of lack of access to clean cooking energy in India and providing a platform for knowledge dissemination, experience sharing for different stakeholders. The forum has significantly evolved over six annual editions, in line with on-ground developments. The earlier editions held discussions around clean cooking energy access and strengthening the sector by development of partnerships to eliminate the traditional chulha. The latest edition in 2018 will focus on Strategizing Renewable Energy for cooking.

One of the key follow up steps for CLEAN from ICCF 2017 was to prepare a compendium of success stories in RE-based cooking for NITI Aayog as demonstration of alternatives or supplements for LPG. Thus, this booklet cites six notable instances that have altered the lives of the residents remarkably in India:

1. A mould modelled biogas plant describes how a simple mould helps biogas construction faster in one-sixth time, 30% less cost, relatively lesser skill for construction vis-à-vis a conventional biogas plant.
2. Vaayu – a domestic biogas unit helps generate clean cooking gas in households by converting organic material into methane gas through a biological process. It also helps address issues of food waste management and fossil fuel dependence.
3. Greenway Grameen conducts extensive need assessment of the cooking requirements of rural women and provides customised stoves designed to meet those specific requirements.
4. Envirofit SPANDAN, designed three times more efficient than traditional chulhas, benefits households at the community and national level and achieves more complete combustion.
5. Himalayan rocket stoves- efficient stoves based on a dual combustion process leading to reduced demand for wood, improved the quality of life and the environment on which the locals depend.
6. Biogas Based Cooking Grid, a conceptualised by Gram Oorja, provides cooking gas to every household in the community. The generation is at a central biogas plant in the village and the distribution is done using a pipeline to each household.

CLEAN also scouted for recent developments, both in India and abroad (Israel). Israel also has come up with household compact biogas plant and ready for technology transfer in India. However, it was not possible to include this case study in this ICCF but will report it in subsequent ICCF.

We are hopeful that this compilation will generate enough interest in stakeholders, resulting in accelerated support to clean cooking initiatives in India.

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Clean Cooking Systems – A Note

According to the Global Alliance for Clean Cookstoves, exposure to smoke from traditional cook stoves and open fires, causes nearly 783,000 deaths in India every year. The smoke that emanates from cooking contributes to several chronic illnesses and acute health impacts such as early childhood pneumonia, emphysema, lung cancer, bronchitis, cardiovascular disease and low birth weight. It has been found that over 51,000 children in India die annually due to acute lower respiratory infections caused using solid fuels.

Alliance-funded research found that almost 30% of India's outdoor air pollution is due to household energy combustion. In such a scenario, the use of clean cook stoves gains immense credence.

Through ICCF, CLEAN thus aims to address these issues and facilitate the development of a strategy on Renewable Energy (RE)-based cooking to effectively expand clean cooking energy access. They include, identifying niche areas for RE, finding synergies between RE and non-RE solutions, catalysing and goal setting for RE segments, tapping and managing ecosystem forces as basic elements to establish RE based clean cooking energy.

Niche areas for RE based cooking

- Provide access of clean cooking energy (CCE) to the unreached: India has about 270 million households. Of this, about 167.8 million are rural households. Further, 20% (33.6 million) of rural households already have LPG connection. The PMUY (Prime Ministers Ujjwala Yojana) aims to add 80 million households with LPG by 2022. This leaves about 55 million households yet to be programmed for CCE.
- Accelerate biogas construction: India has potential for constructing 12.4 million biogas units of which 5 million have been installed. However, there is potential for installing another 7.4 million. This would provide cleaner, local and sustainable fuel for cooking. Strategies are required to fast track construction of these biogas plants. In earlier decades India construction about 125,000 biogas plants every year. For India to meet the SDG goal by 2030, it needs to construct nearly 620,000 biogas plants every year, i.e. five- fold increase. At an average cost of Rs 30,000 for a 2 m³ biogas plant, the investment required will be 3.4 billion USD (Rs 22,200 Crore).
- Nearly 48 million traditional stoves still will remain unreached. Though in long term, they would aspire for gaseous fuel like LPG, in short run it is important for India to reduce the inefficient biomass use and reduce impacts of indoor air pollution. Improved biomass stoves, solar cooking systems can complement. Assuming Improved biomass stoves are pushed to service, at an average cost of Rs 2,500, the total investment required will be 2.1 Billion USD (Rs 13,813 Crore).
- Solar energy for cooking holds a lot of promise. But, an estimate of potential has not been made for these as they are still in nascent stage and require much more R&D before they are disseminated on large scale.
- Stove stacking”, a term that refers to the use of multiple stoves by one household, has conventionally been an indicator of unsuccessful stove switching. However, it is now recognised that “stacking” is fine provided all elements of the stack provide clean and reliable cooking services: This will mean facilitating the development of a range of options that are all clean and reliable. In fact, providing a “stack” gives the cook more choices. It is very common in households whether it is urban or rural. In urban area, households have LPG, microwave, induction stoves in most households. In a rural set up, biomass cookstove for main course of cooking, a second stove either LPG or Kerosene stove for making tea, boiling milk, a third biomass stove to prepare fodder for animals, yet another stove in bathroom to heat water, etc. Many experts opine, this stove stacking

will continue even if LPG is reached and distribution network strengthened. Hence, it is appropriate to ensure all stoves used in a kitchen are efficient and make use of fuel as judiciously as possible.

RE-based systems can look beyond household cooking to a range of community and commercial cooking applications. Offering flexible designs that can cater to specialised or multiple cooking and heating applications, e.g. stove with fixed tava for dosas, pancakes, parathas can increase the likelihood of adoption in some cases. Processed fuels have often impeded the adoption of clean cookstoves; this can be overcome by packaging fuels with stoves. In multi-fuel smart kitchens, various RE and non-RE fuels are used together. For example, solar for boiling or day time use with LPG or biogas for other uses).

Developments like a push for bio CNG expansion by oil companies and the use of biomass pellets in thermal power plants is likely to result in the development of ecosystems for these fuels. This is a positive development. However, checks and balances are needed to ensure that these fuels are harnessed sustainably and continue to be available for cooking and for use by marginalised populations.

The Government of India is committed to the goal of ensuring access to clean cooking solutions. The commitment is evident through the launch of programmes such as the PMUY. We hope many stakeholders in the sector, including policy-makers, energy enterprises, financiers and donors will find this compilation useful and practical to inform their decisions.

1 Steel Mould for KVIC Biogas Plant

A mould modelled biogas plant describes how a simple mould helps biogas construction faster in one-sixth time, 30% less cost, relatively lesser skill for construction vis-à-vis a conventional biogas plant.

A conventional biogas plant, such as *Deenbandhu*, requires a fixed underground digester chamber, made with layers of bricks. An additional layer of cement mortar (with sand) forms the roof above. The construction of this chamber and the roof requires high level of skill and takes about 8 weeks to



Half of the mould



Initial arrangement of the mould



Oiling the surface of the mould



Fixing of weld mesh in the mould



Ledge work



Placing of FRP Drum



complete. The total cost of the plant hovers in the range of Rs 30,000 to Rs 35,000. Cost, longer construction period, higher skills in constructing the digester were perceived to be set of barriers apart from others including operational issues for success of biogas programme.

Murtuza Ali, an engineer from a *panchayat* in Mysore, Karnataka, has come up with an innovative model using a mould with mild steel. His invention has eliminated the need for bricks and sand, reduced the construction time to just two days and made the entire construction process much easier and considerably faster. Most importantly, it has reduced the price---the cost to make the mould ranges from Rs 20,000 to Rs 25,000.

Armed with innovative ideas, Murtuza has piloted about 60 biogas plants (BGPs) in various parts of Karnataka. He has also installed 12 biogas plants at Basapura village in HD Kote Taluk and 13 plants at Kalihundi in T Narsipur Taluk and they are functioning effectively.

This new low-cost intervention has altered the method of construction, reduced the cost and helped accelerating the speed of construction.

1.1 Benefits of Mould BGP

- Avoids the use of bricks and sand, saving natural resources.
- Easier and faster construction. (A mould biogas plant takes just 2 days as against 6 to 8 weeks for construction.)
- There is a 40% reduction in the cost of construction
- Not heavily dependent on skillsets unlike conventional digester which requires higher level of skill sets.

1.2 The Road Ahead

While the successful testing of about 60 mould BGPs in Karnataka establishes the numerous advantages they offer, the question that arises is how to scale up and fast-track the construction of these plants across India. A few pointers in that direction are listed below:

- **Training:** Biogas plants are usually built through masonry or fabrication at a factory. However, in mould BGPs, the process of construction is different. Therefore, the mason needs to be trained on the new construction process and educated on various health benefits it offers.
- **Standards:** It is important to set standards and specification for the mould. This will not only help in receiving the financial incentive, but also aid in setting benchmark costs, apart from assisting in quality control and quality assurance.
- **R&D:** The current weight of the mould is about 350 kgs, which is quite heavy. Therefore, further efforts are needed to reduce the weight of the steel mould, to make the construction of the biogas plant easier.
- **Assessment:** An assessment of the mould BGP, for its performance by a third party, would be valuable going forward.
- **Scale-up potential:** The overall potential of family-size biogas plants is estimated at 130 lakh units across the country. In the last 36 years, about 50 lakh units have been installed. That would mean another 80 units are yet to be installed. At the earlier pace, it may take several decades to harness the potential number. The mould model can help fast track the construction, with localized production resulting in enormous entrepreneurial opportunities.

2 Vaayu – A Domestic Biogas Unit

Vaayu – a domestic biogas unit helps generate clean cooking gas in households by converting organic material into methane gas through a biological process. It also helps address issues of food waste management and fossil fuel dependence

Clean cooking is a need of rural as well as urban families----in this regard, biogas technology can serve the needs of both. In rural areas, animal dung and digestible organic matter can be the input. However, for urban settings, food can be the input. *Vaayu* has been designed with the belief in “small is beautiful” technology. It has been modified in such a way that it fits in the balcony or terrace or in the garden and can be operated by a commoner. Moreover, it is a solution to convert organic material into methane gas through a biological process. *Vaayu* also tries to address issues of food waste management and fossil fuel dependence.

Vaayu Mitra is a community of people who use *Vaayu* and are generating it from their waste.



Figure a) Villager in Ratnagiri district of Maharashtra with his Vaayu



Figure b) Smoke free and self-reliant cooking energy with Vaayu



Figure c) 4th standard kids operate Vaayu in the garden



Figure d) 22.5 kg per day installation at BMCC college hostel in Pune.



Figure e) Vaayu in the garden

2.1 Salient Features

- Food waste is put without crushing, so no additional energy is required
- Zero running energy
- Provision for servicing of the unit to remove undigested food material
- Easy to install and maintain. Repairs can be done locally
- Specially engineered relief mechanism for safety
- Efficient and a steady source of cooking fuel. It lasts 3 times more than an LPG cylinder.

2.2 Construction

The product *Vaayu* consists of a biogas generator, a Biogas storage balloon and a gas stove. To get *Vaayu* working, all that is needed is to feed it with organic waste. The gas generated is stored in the balloon and this is taken to a kitchen to light the biogas burner. The cooking experience is the same as that of a regular LPG.

2.3 Target beneficiaries

So far, 110 installations have been done in 10 cities and 7 villages across the state of Maharashtra, benefitting 92 urban households, 5 hotels, 3 societies and 11 farmers. This has helped save around 650 cylinders worth of LPG (on an annual basis) thereby preventing about 25 tons of CO₂ emissions.

2.4 Testimonials

Bhakti Rahate, a *Vaayu Mitra*, shares her experiences regarding *Vaayu*

- **Ease of space** – *Vaayu* needs less space and does not need any underground digging or construction. Hence, this made the set-up easier in the backyard and the entire construction took only two hours to complete in comparison to traditional biogas plant which need a larger area for construction.
- **LPG Savings** – Using *Vaayu*, LPG usage has started reducing immediately. One cylinder lasts for 5 months unlike LPG, which lasts for only 1.5 month (per cylinder). The best part is that it can be constructed by a common man and is free.
- **Chulha** – Since LPG usage was always a concern due to its high cost, the *chulha* continued to be used, albeit sparingly. However, after the intervention of *Vaayu*, there is hardly any smoke in the house.
- **Firewood**- Bringing firewood used to cost about Rs 2,000 per year and it involved manual work. Both have been reduced significantly since the use of *chulha* has been reduced drastically.
- **Repair and maintenance** – *Vaayu* is easy to repair in case there is an issue since it is on the ground and all parts are accessible.
- **Team Work** – Making *Vaayu* accessible to people has been possible owing to team work and small issues have been resolved.

2.5 The Road Ahead

- *Vaayu Mitra* aims to spread '*Vaayu*' to as many people as possible across the world.
- Develop small generators to make electricity from biogas.

- To develop affordable sensors so that the user can monitor health---it will also make remote monitoring possible.

3 Greenway Grameen Initiative of Smart Stoves

Greenway Grameen conducts extensive need assessment of the cooking requirements of rural women and provides customised stoves designed to meet those specific requirements

Greenway Smart Stove is a flagship product founded by Neha Juneja (CEO) and Ankit Mathur (Inventor) of Greenway Grameen Infra. The aim is to develop high impact products that deliver health, savings and convenience to low income consumers. Built using their patented air-regulated technology, it emits 70% less smoke.

According to the Indian National Initiative for Advanced Biomass Cook stoves, more than 4% of greenhouse gas emissions come from the traditional mud stoves. In fact, household air pollution is the second largest killer in India and resulted in 1.04 million direct premature deaths in 2010. This is higher than Malaria, HIV and tuberculosis put together. "Rural India must convert to clean cooking gas, but until that happens, there has to be a healthier alternative" believes Neha Juneja, founder of Greenway Grameen Infra.

Greenway aims to continually develop products that solve some of the pressing needs of mass market households. It has also been observed that markets do not often work for the low-income group and more specifically for low-income women. To overcome this barrier, Greenway actively works on enabling consumer credit, community buy in and deep distribution networks. Since its inception in 2012, the company has created and commercialized a range of clean cook stoves and satellite home antenna systems. Therefore, so far, over 700,000 households across the Indian sub-continent use Greenway products.

To create a stove that would solve the fundamental needs of the people, 10 different prototypes were tested in five pre-identified states wherein local women were approached for feedback. All the concerns were carefully analysed and incorporated into the final product.



Greenway Vadodara Facility

3.1 Construction

Greenway smart stove is a single burner and a high efficiency cook stove that works on all solid biomass fuels such as wood, dry dung, crop waste, coconut waste, bamboo and so on. The stove does not require any fuel processing/cutting and is made with steel and aluminium bake lite handles. It has a loading capacity of 25 kgs with an ergonomic front-loading design.

The size of the smart stove is 9.8" x 7.6" x 11.6" and it reduces cooking time by almost 304 productive hours per year on an average. Currently, the company sells stoves of two sizes priced at Rs 1,399 and Rs 2,499.

3.2 Features

- The clean cook stove reduces emissions to safe levels, apart from saving fuel and time.
- Every stove that generates more than 1 carbon credit every year, helps mitigate climate change.
- In 2017, Greenway introduced India's first multi-satellite TV receiver enabling users to watch 100 TV + 48 educational channels for free.
- The usage of Greenway's products has mitigated upwards of 3 million tonnes of carbon emissions.
- Over the years, Greenway has made 22 IP filings with 7 grants and received numerous awards. These include:
 - TIME Magazine Award for excellence and sustainability in manufacturing, 2017.
 - International Ashden Award, 2014
 - Intel Global Challenge Award, 2012.
 - Business world Young Entrepreneur Award, 2011

3.3 Road Ahead and Potential

- The company operates two offices across Mumbai and Bangalore and a 30,000 sq. ft. manufacturing plant in Vadodara, Gujarat. It works with stakeholders across the development and market spectrum to generate awareness, enable product access and provide small ticket consumer finance to overcome the challenges of information, access and affordability that low-income markets face.
- Greenway has been incubated by IIM Ahmedabad's Centre for Innovation Incubation and Entrepreneurship (CIIE).
- Within the first six months of the product launch, Greenway Grameen was averaging 5,000-unit sales per month and now, it has managed to sell over three lakh units in India, mainly in the southern states.
- From a three-member team to around 130 employees so far, this fast-growing start-up has managed to become India's largest selling cook stove, scaling across international markets such as Nepal, Bangladesh and Mexico.
- From a three-member team to around 130 employees so far, this fast-growing start-up has managed to become India's largest selling cookstove scaling it across international markets such as Nepal, Bangladesh and Mexico.

4 Efficient Biomass Chulha for Cooking

Envirofit SPANDAN designed three times more efficient than traditional chulhas, benefits households at the community and national level and achieves more complete combustion

Envirofit SPANDAN wood cook stove is a modern cooking appliance that uses the same fuel as a traditional *chulha* with less smoke and a shorter cooking and cleaning time.

The major issues with the traditional *chulha* include:

- Exposure to household air pollution and its deadly consequences.
- The time-consuming task of collecting fuel wood.
- It is less efficient compared to modern cook stoves.
- Smoke from traditional *chulhas* kill 780,000 people in India annually.



A before and after looking at the reduced HAP that comes from having a modern, efficient cookstove.

Vatsala lives in Bor, and loves her efficient cookstoves



The Envirofit SPANDAN stove is portable and lasts up to 5 years with proper upkeep

A cutaway view of the SPANDAN that showcases the many efficiency features that allow it to surpass traditional chulhas.



Workers in Aurangabad pose with an almost complete SPANDAN efficient cookstove.



A rural family with their Envirofit SPANDAN efficient cookstove.

However, Envirofit SPANDAN is designed in a manner that it is three times more efficient than traditional *chulhas*, benefits households at the community and national level and achieves more complete combustion. Homes with efficient stoves such as SPANDAN benefit from reduced exposure to HAP, spend lesser time collecting wood or spend lesser amount of money purchasing it. Improved combustion efficiency benefits communities and helps reduce deforestation---this results in better health and improved air quality.

4.1 Benefits of Efficient Biomass Cookstoves

- Fuel reduction up to 60%
- Cooking time reduction up to 50%.
- Toxic emission reduction up to 80%.
- Reduced time spent on collecting firewood
- Increased fuel efficiency means less time spent collecting firewood, which lowers women's exposure to gender-based violence.
- Lower HAP exposure reduces watery eyes, scratchy throats and dirty homes

4.2 User Testimonial

Vatsala never knew of any other way to cook other than the traditional *mitti-ka-chulha*. These have been used by generations of rural women to prepare food and there has never been any alternative.

"I realized there was another way after I saw (the Envirofit) team come to our village to demonstrate their cook stoves. That was when I found out that the *mitti-ka-chulha* was very harmful to my health and had led to my cataract. I didn't realise this at all since I've seen my mother use the traditional cook stove and have used it myself from an early age for all domestic purposes. I was struggling to see well for a long time and my eyes were painful, red and itchy. Later, I was operated for cataract."

"My eyesight is still weak, but I manage, for the sake of my family. I used to walk miles every day to collect wood, even in bad weather, for no wood meant no food, and as a mother I cannot tolerate that. Even though I used LPG, I found it to be very expensive and we couldn't afford it. So, the traditional cook stove was the only option we had."

Konde, Vatsala's husband, says, "The worst part of this was that I wasn't worried about her health at all. I had seen my mother cook like this her entire life. So, for me it was normal, and I continued to be ignorant---but not anymore."

With a bright smile, Vatsala admits, "I have a better cook stove now, Envirofit has made me realise that even a small change in the kitchen can make your life easy, happy, and healthy."

5 Himalayan Rocket Stove

Himalayan rocket stoves- efficient stoves based on a dual combustion process leading to reduced demand for wood, improved the quality of life and the environment on which the locals depend

In the Himalayan areas, wood is currently being unsustainably harvested, leading to deforestation---this in turn is leading to many issues such as impact on wildlife, impact on the environment and an increase in drudgery for the women and children who go to collect the wood. To save one million trees by 2026, Himalayan Cookstove has introduced the Himalayan Rocket Stove to benefit the communities and environment of the Himalayas by making highly efficient fuel stoves accessible to people who typically burn wood to heat their homes and cook their food.

The rocket stove is based on a dual combustion process where wood, gas and smoke are drawn into a secondary combustion chamber---this burns the smoke and releases an abundance of additional heat. Reducing the demand for wood improves the quality of life and the environment on which the locals depend. The makers of this stove are currently targeting the Himalayan regions of India, Nepal and Bhutan with a view to scaling out to global markets over the coming years.

If wood is converted to heat energy, 1 million trees could be saved from being cut over the next decade. According to innovators of this stove, all it takes is a redesign of the humble wood combustion heater, so that with less than half the usual amount of wood, there is clean and consistent heat at home.



For this, they have developed high efficiency wood combustion heaters in 3 models that suit a home of any size and enable heating/cooking. Following are some benefits.

5.1 Save Trees and Wood

Each Himalayan Rocket Stove in use saves at least 1 mature tree from being felled each year--- equivalent to 2,000 kg of wood.

5.2 Heating Water

Heating water is a crucial aspect of healthy living and only some people have the luxury of hot water through the tap. Most people burn additional wood to create hot water outside through the day, a task which is cumbersome in winter.

5.3 Clean Air

By using these stoves, pollution is reduced by a massive 90% or more. There are very few emissions from these stoves as they burn so hot and cleanly.

5.4 Health Impact

Women and children do most of the work----of sourcing and carrying wood for home. This has a long-term impact on their health. By using the stove however, the need for wood is reduced significantly since each stove saves 2,000kg of wood----this means 100 loads of 20kg each that don't have to be carried every time.

5.5 Other Impact

With a load of wood taking more than 2 hours to source, saving 100 loads is saving more than 200 hours of labour each year. If it is not sourced for personal use, wood is purchased, often illegally, from the black market and sellers who secretly chop trees for commercial gain.

6 Biogas based Cooking Grid

Biogas Based Cooking Grid, a conceptualised by Gram Oorja, provides cooking gas to every household in the community. The generation is at a central biogas plant in the village and the distribution is done using a pipeline to each household

Conceptualised by Gram Oorja, a biogas-based cooking grid provides cooking gas to every household in the community. In terms of how it works, essentially, there is a central biogas plant in the village where all the cow dung is deposited by the villagers daily. This biogas is then transferred using a pipeline to each household---the flow is measured, and the pressure is regulated, to provide a satisfying cooking experience.

Gram Oorja executes the entire project of biogas cooking grid---from the preliminary village survey to commissioning of the project. The formation of a village energy committee, setting up the agreeable rates for raw material and biogas and structuring of an economical modal for the village are done with help of the local NGO and villagers. Also, Gram Oorja undertakes the design, implementation and commissioning of biogas grid to supply biogas to each beneficiary from the village. It facilitates training of the biogas plant to two or three technical persons from the same village. The basic requirement of the plant, in terms of maintenance, is also communicated to the villagers so that they are aware of how to run the plant efficiently.

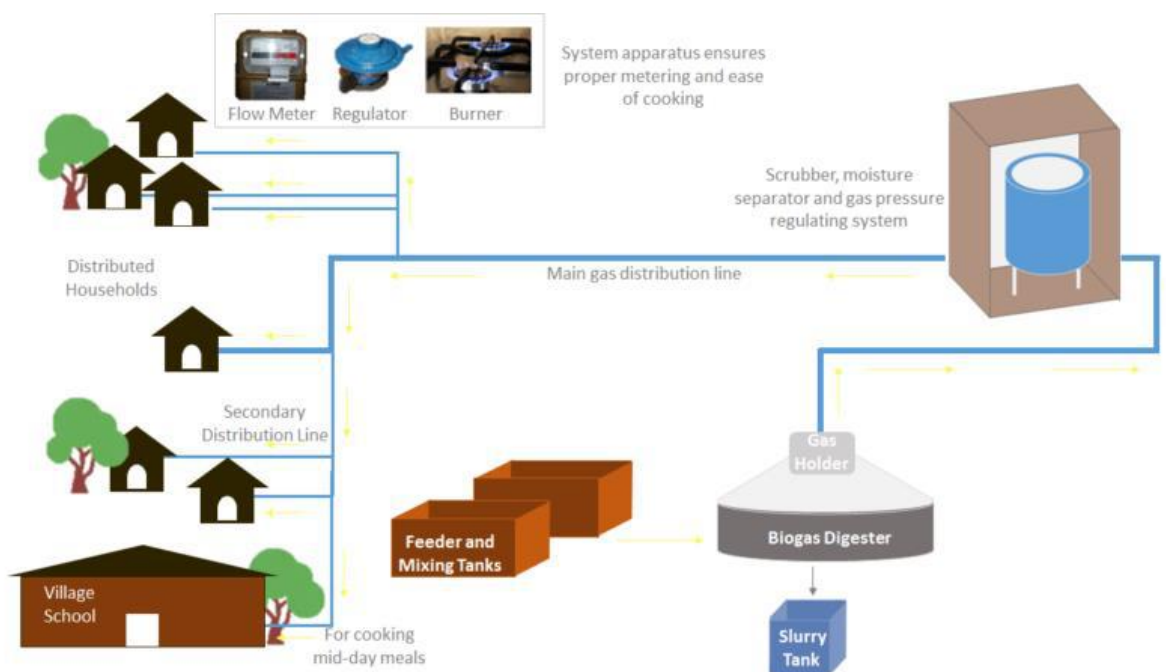
Till now, Gram Oorja has implemented the biogas cooking grid at Gawaliwada for 14 households as a demonstration project. Gawaliwada is a village located at Mulshi block of Pune district, Maharashtra and the main occupation of the inhabitants is dairy farming.

- The size of the biogas plant is 20 Cu. m and the gas storage capacity at the site is 30 Cu. m.
- Biogas which is generated, is passed through the scrubber to remove hydrogen sulphide from the gas. The biogas is then boosted with a blower and passed to the main gas grid.
- Biogas is transported to around 500 m from the project site and each consumer is provided with the gas flow meter. The tariff is set for usage of biogas.
- The local energy committee, *Kalbhairav Oorja Samiti*, collects the amount for monthly usage, which is used for operating and maintaining the plant.

6.1 Community bio-gas plant, piped gas network

- Community bio-gas plant based on cattle manure, food or agro-waste (subject to availability) and piped gas distribution network
- Gas can be used for cooking or process heating - time to cook food are the same as for LPG
- Bio-gas usage can be metered and charged to the consumers based on a predetermined tariff rate which can take care of operations and maintenance costs
- The estimated cost is Rs30 to Rs35 lakhs. for communities with 50-60 households
- Beneficiaries:
 - Communities using firewood for cooking
 - Communities facing difficulty in getting LPG cylinders due to remoteness
 - School refectory or mid-day meal kitchens in semi-urban or rural schools
- Geography: Anywhere across India

- Projects done: Piped gas network for community in Gawaliwada, Pune district, Maharashtra



Source: <http://gramoorja.in/portfolio-items/biogas-cooking-grid/>

Before the advent of the biogas cooking grid, life for the villagers in Dhopateshwarwadi involved several challenges----Owing to its remoteness, the village did not have access to modern facilities. To procure LPG, a trip to Aurangabad (16 km away from the existing village) was necessary and hardly a viable option for the inhabitants. Furthermore, since the firewood was exhausted, the only option left was the agro based biomass for cooking.

Gram Oorja, which focuses on “community based renewable energy solutions” for remote and decentralized solutions demonstrated “biogas cooking grid” at Dhopeshwarwadi, Pune. This biogas plant operates with cattle dung as feeding material. The village community has more than 250 cattle and more than 2 tonnes of cattle dung.

6.2 CONSTRUCTION AND FEATURES

The construction of the plant began on April 24, 2017 and took 20 days to complete. For the purpose, a bio-digester was constructed with brick work, covered with a balloon to create an anaerobic environment and to trap biogas in to it. For storage, another balloon of 70 cubic meters was provided. A control room of 12 feet x 12 feet was erected at the site to cover H₂S scrubber and pressure boosting. Also, a GI pipe and fittings were used for internal fittings at user ends. A regulator, flow meter and different valves were fitted as part of internal gas fittings and a biogas burner was provided to each beneficiary.

6.3 Target Beneficiary

The biogas-based cooking grid model can be used by any community in India that utilises firewood for cooking or is facing difficulty in getting or refilling LPG cylinders due to remoteness. So far, 130 households and one primary school have been connected to the grid.



Construction of biogas digester and erection of biogas plant



Excavation for laying a biogas grid



Complete installation of biogas at Dhopteshwarwadi

6.4 Potential Impact of the Intervention

- Such interventions can make use of locally available resources to meet energy needs. It can increase feeling of participation, ownership, and accountability.

- There are two products namely, gas which is used for cooking, enriched organic manure that can be used as fertilizer. In the absence of biogas plant, most often people make cow dung cakes and burn them off
- It can arrest methane generation which is a highly potent Greenhouse gas.
- India has 600,000 villages, most villages have a potential for biogas plants, possibly a community biogas plant grid of this type.

6.5 Benefits of Biogas based cooking grid

- Reduction in smoke-related health problems due to burning of wood.
- Saves time, energy and money spent in getting firewood/kerosene/LPG.
- Increases time for family and for productive cottage industries.
- Reduced burden on forests due to less dependency on firewood.
- Nominal harmful greenhouse gas emissions due to the use of clean energy.



About Clean

Clean Energy Access Network (CLEAN) is an all India representative organization launched in 2014 with the vision of serving as India's leading industry association for decentralised clean energy organisations and paving the way towards energy access for all citizens in India. CLEAN is technology and scale agnostic and represents organisations across the DRE sector covering solutions ranging from Solar home systems, lanterns, mini-grids, solar pumps, pico-hydro as well as cookstove distributors and manufacturers. As of August 2018, CLEAN has 150 members. The Founding Members & Advisory Group of CLEAN features some of the most respectable Indian and global organizations that have been working for sustainable development for decades. The key objectives of CLEAN include addressing policy and regulatory uncertainty in the DRE sector, availability of skilled human resources, improving the access to finance and technology development driven by innovation to make energy access affordable and reliable. Its high-level goals direct its mission, focusing CLEAN's activities along its six dedicated focus areas:

CLEAN recognises the uplifting role that decentralised clean energy plays in the lives of unserved and underserved communities. Off-grid solutions work to address critical needs such as lighting, cooking, heating and pumping. They offer opportunities that go beyond bridging the energy gap by contributing to improved outcomes in agriculture, education and health. They enhance livelihoods thereby impacting the overall quality of life. CLEAN aims to bring change in the lives of, (i) 118 million Indians who don't have access to electricity, (ii) 64% of population who depend on traditional cooking fuels in inefficient cookstoves and, help government and private players to fully realise India's renewable energy potential from the DRE sector.

CLEAN FOUNDING MEMBERS



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