

CLEAN
Clean Energy Access Network



India Clean Cooking Forum
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Cooking with Renewable Energy¹

This Discussion Brief summarises takeaways from year-round consultations and engagements of CLEAN (Clean Energy Access Network) with various stakeholders, culminating in the sixth edition of the India Clean Cooking Forum (ICCF) held on September 6-7, 2018. ICCF 2018 was attended by over 100 participants including parliamentarians; senior representatives of various ministries and institutions including Ministry of Environment, Forests & Climate Change, Ministry of New and Renewable Energy, Department of Science and Technology, Indian Institutes of Technology, National Environmental Engineering Research Institute; and practitioners.

Over the last three years, clean cooking energy provision has centred around LPG expansion. A National Mission on Clean Cooking (NMCC) proposed by NITI Aayog is a welcome move. Given India's mammoth and diverse Clean Cooking Energy (CCE) needs, CLEAN believes that the Mission must explore a range of CCE options, including those based on renewable energy. ICCF 2018 shed light on pathways to optimal integration of RE-based options in India's CCE strategy.



Exhibition of Cookstoves at ICCF 2018

IN BRIEF

Renewable Energy-based clean cooking options can play a key and impactful role in several niche areas in households as well as in commercial and community kitchens.

This potential must be factored into the proposed National Clean Cooking Mission.

It is important to identify an anchor for RE-based cooking within the government.

CLEAN has an important role to play in holding together RE-based options and sharing their perspectives and knowledge with policy makers and the research community.

User-responsive innovations must be encouraged by CLEAN through its efforts with the government as well as researchers and product developers.

The policy framework needs to ensure a level playing field for ALL clean cooking energy options by offering technology-neutral incentives and regulations.

The messaging also needs to be focused on moving away from the traditional *chulha* to a range of clean cooking energy options, not a specific option.

A multi-criteria rating and labelling framework being developed by CLEAN is to be operationalised so that it can lead to more informed user choice and targeted product development.

¹ Prepared by WEFT research in partnership with CLEAN

Optimum integration of RE options based on experience and evidence

A range of RE-based CCE options have been in use for several decades and are very promising:

- biogas from a variety of feedstocks,
- improved solid biomass fuels and devices, and
- solar-powered cooking systems.

These options rank high on various facets: energy security, renewable fuel, local availability as well as low-or no-carbon content. Experience with RE options helps identify focus areas and innovative approaches needed, to maximise adoption and impact of these options.

Niche areas for impactful adoption of RE options

RE options can complement LPG in LPG-connected households, to create clean cooking energy “stacks”². Improved biomass options can evolve as the primary source of CCE in areas where LPG access is unreliable, but biomass residue is abundantly available, such as in forest fringe areas or in areas rich in agro residues suitable for pelletisation and / or combustion (e.g. toor dal, coconut, mustard, sunflower).

RE based CCE options are well-suited, impactful and have the highest likelihood of successful adoption in several niche areas:

- In multi-function devices in households – e.g. used for cooking but also for space heating, water-heating, preparation of fodder, country brew etc.
- As the sole or primary CCE source in medium-sized kitchens (that may also serve as community kitchens, helping households to avoid certain types of intensive cooking such as roti making) - examples include road-side tea stalls, roti or dosa stalls, restaurants / dhabas, tribal hostels and small canteens typically cooking 20-500 meals per day as well as local food speciality clusters (like clusters for namkeens in Madhya Pradesh or sweets in Odisha).
- As the sole cooking energy source in very large commercial or community cooking set-ups (serving several thousand meals per day) – successful examples are seen in religious / cultural complexes, mid-day meal kitchens and corporate canteens, and can also be extended to food courts and restaurant complexes.

“Rather than view PMUY as ignoring RE-based cooking, we must build on the fact that PMUY has brought the clean cooking energy issue to the fore. The centre-staging of RE-based cooking should leverage this.”
Shri. Anil Kumar Jain, Additional Secretary, Ministry of Environment, Climate and Forest Change

As an example of the impact of RE-based CCE in community and commercial kitchens, the Ballari kitchen of Akshaya Patra replaced about 55 kg LPG each day with 1000 kg of kitchen waste as its fuel – a triple-win initiative with waste management, cost saving and organic fertilizer generation. RE adoption by this large kitchen, releases enough LPG to serve 120 households.

Estimates indicate that the energy requirement for mid-day meals in India (for over 110 million children) is the equivalent of 1000 tons of LPG per day. Currently, LPG is the recommended fuel for mid-day meal kitchens. If all mid-day meal kitchens were to use RE options instead of LPG, this could potentially release enough LPG to serve 20 lakh households. The choice of RE technology (or mix of technologies) would have to be carefully done and the energy equations would also vary depending on the scale of operation and type of food being cooked.

² “Stove stacking”, a term that refers to the use of multiple stoves by one household, has conventionally been seen as 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.

Importantly, there is anecdotal evidence that the poorest (Bottom-of-Pyramid) Ujjwala beneficiaries, particularly those that also suffer from social exclusion on account of caste or location, have switched to traditional cookstoves because of lack of reliable and affordable LPG refills. In such situations, replacing the traditional cookstove with a clean option based on locally available, familiar renewable energy fuel, will create an clean cooking energy “stack”/ basket.



User-responsive innovation to enhance RE adoption

Many RE systems have reportedly substituted (partly or completely) LPG and /or traditional cookstoves. This has been made possible through innovations motivated by user priorities. Here are a few examples of user-centric innovations that pertain not just to device design but also to marketing, fuel supply, etc:

- Beyond households: RE-based systems that look beyond household cooking can effectively cater to community and commercial applications (e.g. biogas grids to supply a hamlet / cluster of households from a centralised plant or centralised solar charging stations to power induction cooking in a hamlet)
- Specialised designs: Offering designs that cater to specialised cooking applications or cuisines can increase the likelihood of adoption. Examples include stoves fitted with tava for dosas, pancakes, parathas are very relevant for food stalls or restaurants.
- Multi-function devices: Cookstoves that double up as space-heating or water heating devices are particularly relevant in cold, hilly regions.

“Schemes such as the MPLAD / MLALAD can be used to facilitate the supply of clean cooking energy stacks comprising LPG along with clean renewable energy based cooking energy solution.”
Shri. Nagendra Kumar Pradhan, Member of Parliament

- Innovative fuel delivery: Processed fuels have often impeded the adoption of clean cookstoves; this can be overcome by packaging fuels with stoves. Mobile biomass pellet plants in use in China can be examined for replication.
- Fuel flexibility: An example is that of biogas. It is now possible to generate biogas from multiple feedstocks (e.g. vegetable and food waste, human excreta apart from animal dung) and the output can be gas or electricity. Solid biomass stoves that can use a variety of feedstocks interchangeably are likely to be used regularly.
- “Smart” multi-fuel kitchens: Such models indicate high flexibility and optimisation where various RE and non-RE fuels are used together based on ease of availability, cost and suitability for an applicability (e.g. solar for boiling or day time use with LPG or biogas for other uses).

RE options can also take a leaf out of user-responsive steps taken to improve reach and affordability of LPG. Not only is the rural LPG distribution network being expanded, in a recent move, women self-help groups, gram panchayats and fair price shops will be roped in to serve as delivery points for LPG. Making available the smaller and more affordable 5-kg LPG cylinder refill at over 2500 points across the country, is also an important step.

Multi-criteria assessment to guide consumer choice and product development

Helping consumers to choose wisely and to push for continuous improvement – this is the motivation for CLEAN’s initiative to develop a framework for labelling and rating solid biomass stoves. The labelling framework for solid biomass stoves is in an advanced stage of development. The proposed label consists of (i) a star rating based on various criteria reflecting fuel efficiency, emissions performance and user-friendliness; (ii) information that is required as per law and (iii) some good-to-share information as well as (iv) a user manual. These together will help users choose the stove that is best suited for their needs.

“Many aspects go into the successful adoption of a stove - suited to local cooking type, uses locally available feedstock, requires minimum cooking behaviour change, serves multiple functions, requires least maintenance. These aspects have to be factored in along with emissions and efficiency.”
Ms. Vishaish Uppal, WWF India

The multi-criteria rating is also meant to push product development towards:

- Enhancing cook-friendliness without compromising on efficiency and emissions, and / or
- Improving emissions and environmental performance of options that are otherwise user-friendly

In product development, apart from technology research, a great deal of societal research is needed around cooks and kitchens. It may also be pointed out that while on the one hand, there is a lot of expectation around flame-less cooking, what is needed in the short to medium term is to make available a wide variety of clean RE-based cooking solutions – ranging from simple retrofits for traditional stoves to high-tech cooking devices.

Catalytic policy and institutional framework: urgent action to optimally use ALL clean cooking energy options

Cooking energy provision needed in “mission mode”

A National Clean Cooking Mission is the need of the hour. The mission proposed by NITI Aayog, must be

- technology-agnostic,
- involve multiple agencies representing various cooking energy options and users,
- look beyond households at community and commercial cooking and other thermal energy needs
- factor in devices and fuels as well as other relevant aspects like ventilation, cooking utensils, in some cases, other functions served by cookstoves such as space heating

- look at end-to-end solutions covering not just appropriate technology development but also distribution, last-mile servicing and financing (for users and enterprises)

Governmental anchor for RE-based clean cooking options

While cooking gas has an anchor ministry in MoPNG; renewable energy, in general is being handled by MNRE. However, there is no parent or anchor ministry for RE-based cooking. This needs to be addressed clearly, bearing in mind the various cross-linkages that are necessary and can be tapped for maximum impact. For instance, bio-fuels need close linkages with forestry and agriculture and as mentioned above, RE expansion will benefit from linkages with mid-day meal schemes as well as tribal hostels, religious and tourist centres etc.



Level playing field for ALL clean cooking fuels and devices

The PMUY *Ujjwala* scheme has brought the clean cooking energy issue to the fore. The centre-staging of RE-based cooking can be a beneficiary of this. Currently, however, the focus of messaging has been on “switching to LPG”. It is recommended, instead, that the messaging highlight switching “away from” the traditional *chulha* to a variety of clean energy options (including RE-based options).

At present, LPG enjoys a prime position in the CCE policy space, but similar importance must be given to all clean cooking energy options, leaving the consumer to decide what is best for her. Specifically, the principle of level playing field must ensure that the extent of policy support (if any) is applied equally to all clean cooking energy fuels / devices.

In lieu of subsidies for specific cooking fuels and devices / connections, it is recommended that a technology-agnostic cooking energy allowance or subsidy be made available to needy households, in a fuel-neutral manner. The narrative must transition to clean cooking energy per household instead of amount of LPG or kg of biomass etc. to ensure that the policy framework is truly technology-neutral.

“There are 170 million homes that require access to clean cooking energy. With efficiency and emission improvements, enabled through investment in research, the surplus collectible agro residue estimated at 145 tonnes will be adequate to cook in 170 million rural homes. The sun is also benevolently shining on India; this resource will never deplete or get affected by weak currency or high oil prices. Additionally, over 90% percent of India’s biogas potential from agricultural, animal and municipal waste is waiting to be tapped. Together RE sources have a huge potential.”

Ms. Svati Bhogle, Chairperson, Clean Energy Access Network

Bio-CNG and biomass pellets expansion to be tapped to “fire up” RE based cooking

Several recent developments can spur an ecosystem for renewable fuels and these need to be channelised for RE-based cooking with targeted measures:

- Biomass pellets in coal-based thermal power plants: The Ministry of Power has called for using 5-10 percent of biomass pellets alongside coal for power generation in thermal power plants across the country. The move is aimed at helping curb air pollution in Delhi by diverting crop residue to pellets instead of being burnt. This could propel an ecosystem around biomass pellets. It is important to examine if the source of biomass is sustainable (preferably bio-waste) and to ensure that this does not adversely affect the availability and affordability of pellets for cooking applications.
- Bio CNG³⁴: Like the pellets move above, there is a plan for oil companies to invest in the production of CNG from agricultural and food waste. This bio-CNG, will be injected into the gas grid or transported in trucks. Bio-CNG production is also planned at large agri-facilities like those of NAFED. In this case too, while biogas may get a boost, the implications for biogas for local / smaller scale needs like household cooking is unclear and must be protected through targeted interventions.

Action plan for CLEAN: holding together RE options, linking up with researchers and policy makers

RE-based CCE group to work closely with Mission

In order to strengthen the space of RE-based cooking, it is important that these options (such as solid biomass, biogas, solar) work together. Here, CLEAN, as a network of RE practitioners, has a key role to play. The strengthening of the Clean Cooking Energy Group at RE will facilitate this. The Household Energy Platform in Bangladesh, is a Public-Private Partnership hosted by the Sustainable Renewable Energy Development Authority (SREDA), Bangladesh which responds to the dynamic needs of the sector, based on stakeholder needs and perspectives. A group of practitioners may be similarly inducted by CLEAN in India to work with the National Clean Cooking Mission to provide perspectives from users and practitioners.

³ <https://www.livemint.com/Industry/1JQt4n4rvk9VsrY57NaXhJ/Indian-Oil-HPCL-BPCL-to-invest-Rs10000-crore-for-BioCNG.html>

⁴ https://www.business-standard.com/article/news-ani/bio-cng-plants-in-rural-india-soon-pradhan-118062100598_1.html

Co-ordinate focused and goal-oriented research and development around fuels and devices

CLEAN will devise a focused and co-ordinated programme for clean cooking energy research involving technical teams, grassroots persons and the government.

- The programme may be anchored around Department of Science and Technology, Government of India
- Thematic discussions between researchers and practitioners will be useful in ensuring that research incorporates field perspectives of users and practitioners. Scaling up and improving upon user-responsive innovations such as those mentioned above will part of the agenda. Examples of themes to be discussed include developing smaller scale versions of solar concentrator, replacing fossil fuels with RE in small commercial-scale tandoors and thermal storage.
- In lab-to-field bridging, CLEAN will play a facilitative role by bringing together sector expertise, financing and practitioners.
- CLEAN will communicate findings from preliminary labelling work (see below) to identify gaps in various products or product categories where further research is needed (for instance user acceptance of a certain type of stoves may benefit from a feature such as enhanced flame controllability).

“What is needed is a lab-to-field bridging in a co-ordinated way and here practitioners must be roped in. CLEAN has a crucial role to play in this.”

**Dr. Sangeeta Kohli, Professor,
IIT Delhi**

Operationalise and build on the labelling initiative

CLEAN will finalise and take forward the labelling being developed for solid biomass stoves on several fronts:

- Set up an expert panel to finalise the scheme, particularly the test protocols
- Finalise the scheme for pilot testing with volunteers
- Discuss with various governmental agencies the operationalisation of this scheme along the lines of the star rating for energy efficiency
- Finalise design aspects of the label
- Explore extension of the labelling scheme to all RE-based cooking energy options

Gather and communicate field findings to facilitate evidence-based policy-making

CLEAN proposes to work with its member network and research organizations to collect field-level emissions data for RE-based cookstoves as a function of variables like fuel type, extent of ventilation, vessel type and size of kitchen as a paid service for members. It would also reach out to its members and research organizations to compile baseline data and explore the link between usage of traditional cookstoves and exposure to hazardous air quality to understand the role of parameters like socio-economic status, agro climatic zones, extent of urbanization, use of cookstoves for multiple needs etc. Through these efforts, CLEAN will be in a position to provide evidence-based inputs to policy makers on which fuels and devices give optimal indoor air quality and health results and under what conditions.

“Clean cooking should not be seen in isolation, but should be inter-woven with portfolios of projects that reduce pollution related health burden.”

**Ms. Julia Kennedy, Deputy
Director, Energy and
Environment Office, USAID
India**



About CLEAN

Clean Energy Access Network(CLEAN) is an all India representative organization launched in 2014 with a clear mandate to support, unify and grow the decentralized clean energy sector in India. It particularly aims to bring together diverse stakeholders across India working to improve energy access for the rural and urban poor and create an inspiring model for countries around the world to follow. CLEAN is technology agnostic. Technologies include solar, wind, bioenergy, pico hydro. The scale of its members' operation ranges from pico solutions to larger, decentralized solutions and they are mostly small and medium enterprises. CLEAN currently has over 150 members, with over 30 members who have an active interest in the clean cooking energy space.

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