ELECTRIC COOKING
CHALLENGES TO ITS ADOPTION IN INDIA

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The Centre for Science and Environment (CSE) recently organised an online discussion with clean cooking experts from diverse backgrounds to understand the challenges of adopting large-scale electric cooking (e-cooking) solutions in India. The Renewable Energy (RE) unit of CSE led the discussion, which focused on both rural and urban geographies, each presenting unique challenges to adoption.

Panelists included Sunil Mani, Programme Lead at the Council on Energy, Environment and Water (CEEW); Sharmista Shankaranarayana, Founder of RigVed Solutions; and Florian Postel, Energy Advisor at GIZ India. The session was moderated by Jay C. Shiv, Director of the RE unit, with Noble Varghese, Deputy Program Manager in the unit, setting the context at the beginning of the session.

The webinar saw the participation of 72 individuals from various parts of the world, representing diverse backgrounds. The session was vibrant and engaging, fostering a lively discussion on the topic.
KEY DISCUSSION POINTS

NEED FOR E-COOKING IN INDIA

• About 120 million households in India—56 per cent of the rural population and around 15 per cent of urban India—do not have access to clean cooking.

• Indoor air pollution (IAP) causes over two million deaths globally, and about 0.6 million in India every year.

• Although the government has encouraged several clean cooking initiatives, none have proven effective in sustained clean fuel use or the replacement of biomass.

• The main reasons behind this are high costs, lack of access and existing socio-cultural norms.

• Because of India’s ‘net-zero by 2070’ ambition, and high gas import bills, it is not sustainable for LPG to be the only clean cooking option for the country.

• The Bureau of Energy Efficiency’s (BEE) ‘Go Electric’ campaign, Energy Efficiency Services Ltd. (EESL)’s upcoming subsidy on induction cook stoves and Prime Minister Narendra Modi’s endorsement of IOCL’s solar PV e-cookstove make it clear that the government also wants to adopt e-cooking.

CURRENT STATUS OF INDIA’S COOKING FUELS

• CEEW conducted a study called the Indian Residential Energy Survey (IRES) in 2020 to understand household energy use. The survey was conducted in 21 states of India and covered 15,000 households across 152 rural and urban districts.

• Fuel-stacking of LPG and biomass was found in most areas. Odisha, Jharkhand and Bihar were the most prone, with over 50 per cent of the households using biomass.

• The reasons for the above were high costs of cylinder refill, free and easy availability of biomass, preference for traditional cooking forms and a lack of LPG availability.

• E-cooking was found to be cheaper than LPG over a period of time, if the power tariffs for the consumer are below Rs. 9/kWh (unit) of electricity and current prices of LPG are factored in (Rs 1100/refill).

• It is mostly the top five wealth deciles in India (mostly urban areas) who have adopted e-cooking because of consumer awareness, electricity access and affordability.

The study found that household LPG use grew from 29 per cent in 2011 to 71 per cent in 2020. However, 41 per cent of the households still used biomass as their primary fuel.
TRANSITIONING TO E-COOKING IN INDIA

• Urban areas have cooking patterns, consumer awareness, grid infrastructure and affordability that are suited to early e-cooking adoption. As such, it would be more feasible to approach e-cooking in a phased manner, starting with urban areas before moving to rural India.
• The government can incentivise urban households to transition to e-cooking without subsidies or price caps.
• Smart metering in urban grids will help in improving the grid infrastructure.
• If urban India switches to e-cooking then the resources saved can be diverted to rural India, which can benefit from subsidies and stronger LPG distribution networks. At a net LPG refill cost of Rs 450/cylinder, most Indian households can use LPG exclusively without significant additional burden.
• This will help achieve economies of scale and make e-cooking affordable.
• Mass consumer feedback will also give time to design more adaptable solutions for rural India and pilot them in different geographies.
• Will help rural India transition from one clean cooking solution (LPG) to another (e-cooking) relatively easily in the longer term.
• It will also give enough time to decarbonise and improve the grid so it can support wide-scale e-cooking.

SOCIO-CULTURAL CHALLENGES TO CLEAN COOKING ADOPTION IN INDIA

India has a wide spectrum of socio-cultural belief systems that affect cooking patterns. These patterns are different in every district. Because of this, there is no silver bullet for India’s clean cooking problem. Existing cultural practices need to be considered while designing clean cooking solutions in India, especially for rural areas. Each solution needs to be adaptable and accepted by the community first. Certain realities need to be factored in, such as the caste system in India where upper castes may object to lower castes getting access to the same cooking solutions, population migration from rural to urban areas, and the need to get a buy-in from the village head before clean cooking can be adopted by the village. Also, the younger generations tend to move to cities leaving the older generation behind, who may find it difficult to adopt new cooking practices or afford expensive solutions. Access to financial instruments from banks are also a crucial need for rural India and influence the accessibility to clean cooking.

The clean cooking problem is a socio-cultural problem first and an economic/public health/climate problem second.

India needs to look beyond LPG as the only clean cooking option in the country. Not only is it not succeeding in transforming India’s clean cooking story, but is also a fossil fuel and a burden on India’s GDP due to the gas import bill and govt. price cap on the oil companies.

Sunil Mani, Programme Lead at CEEW

Before we try to push a solution that we think is for the better of rural India, we need to first understand the unique cultural needs of the community and design a solution, or adopt a solution that is accepted by them easily.

Sharmista Shankaranarayana, Founder of RigVed
GIZ conducted a survey in 2021 to understand the market for induction cooktops (IC) in India. They interviewed over 800 manufacturers, retail chains, e-commerce retailers, social enterprises and distributors across 10 states in India. They also did a pilot study where free ICs were distributed amongst 300 households in both rural and urban areas in India in order to understand user perception and cooking patterns.

GIZ found over 40 brands of IC retailing in India with Prestige and Bajaj leading the market. Consumer demand was high for 1200–2000W IC and a price range of Rs 1,800–4,000 per unit. Consumer demand for ICs was highest in South and West India. Over 60 per cent of the demand came from urban households.

The market for ICs has shown a compounded annual growth rate (CAGR) of 15 per cent year-on-year since 2014, but the total adoption has been minimal. The reasons behind this are high costs of the induction device and related utensils, lack of reliable electricity, unfamiliarity with new cooking patterns and a lack of consumer awareness.

Even in houses that did adopt IC, LPG was not replaced but complemented.

The total cost of ownership (TCO) of different cooking fuels over a period of five years was done as part of the study. The traditional chulha was the cheapest at around Rs 25,000, piped natural gas (PNG) cost approx. Rs 32,000, and e-cooking was similar to unsubsidized LPG (taken at Rs 850/ refill) at around Rs 52,000 each.

GIZ did an assessment of the impact of e-cooking adoption in India on the grid. They partnered with Tata Power Central Odisha Distribution Limited (TPCODL) for data for two feeders (urban and rural). They used this data to simulate the impact an additional e-cooking load would have on the grid in multiple future scenarios and cases.

Load Flow Analysis (LFA) and Time Series Load Flow Analysis were done of a High Tension (HT) network (11 kV) up to the grid substation. Load profiles also extrapolated for a 0.415 kV Low Tension (LT) network.

Assumptions: GIZ calculated that a household would consume 4 kWh of energy a day (based on 8–10 LPG cylinders consumed annually), and that max power consumption would not exceed 2.67 MW for urban areas.

Scenario 1 and 2 comparison: Base load profile + e-cooking:
- Case 1: Base load + 30 per cent of e-cooking, after 5 years
- Case 2: Base load + 70 per cent of e-cooking load, after 10 years
- Case 3: Base load + 100 per cent of e-cooking load, after 15 years

Findings and recommendations from the study:
- Urban feeders are almost fully loaded (current base load at 97 per cent) and do not have much capacity to accommodate additional loads from e-cooking.
- Peri-urban/rural feeders are not fully loaded and therefore, do have the capacity to accommodate additional e-cooking loads at the feeder level.
- Impact of additional load: Peak load and losses will increase, as well as overloading of the lines and dropping of tail end voltage of distributed transformers (DT).
- Potential of measure for additional load
  - Solar PV: Peak load and line loading reduction is possible if peak usage coincides with solar generation hours and improvement of tail-end bus voltages
  - Storage: Peak load reduction is possible during battery discharging period, reduction in line loadings
  - Demand Side Management (DSM): Peak demand shifting to off-peak hours will result in peak load and line reduction
- Additional e-cooking load offers potential financial benefits to Discoms

The Centre cannot be the only player that drives e-cooking adoption, especially as there is such a strong social angle to this problem too. We need to involve NGOs at the grassroots, pvt. players, the MNRE to green the grid and the Ministry of Power to improve the grid. We also need to have organizations that bring women’s voices to the table as they are the ones who are the primary users of any kind of clean cooking solutions.

Florian Postel, Energy Advisor at GIZ

The challenges to electric cooking adoption is not a simple challenge, rather a multi-faceted challenge which needs a multi-pronged approach to solving it. Starting with subsidies on devices, electricity shortages and increasing the manufacturing capacity & market for induction cooktops.

Jay C. Shiv, Director, Renewable Energy Unit, CSE
The webinar saw excellent and continuous engagement from the audience and had around 30 questions posed to panelists. Some of the questions were answered by the panelists on chat and some were answered during the Q&A session at the end. Due to the paucity of time (the webinar exceeded its allotted time by ten minutes), all the questions posed by the audience could not be addressed.

**Q. Is it possible for Discoms to divert peak loads beyond peak times effectively? Also, is there a plausibility of an additional feeder dedicated for e-cooking?**

Power demand due to EVs, additional thermal cooling in buildings, and e-cooking in the future will increase. Grid upgrade needs to be planned keeping this in mind.

Cooking times cannot be changed and therefore, Discoms will have to shift other peak demands to off-peak hours.

A dedicated feeder for e-cooking is something that needs more research.

**Q. Will variable electricity tariff rates (or peak tariff rates) in the future discourage consumers from adopting e-cooking as it will make it economically unviable?**

Smart metering can play an important role. It can measure where the consumption is coming from, therefore subsidies or base rates can be applied for the energy consumed for cooking, and peak rates for all other peak consumption.

The government needs to decide which direction to take as currently, different ministries look after various priorities of clean cooking—Bureau of Energy Efficiency (BEE), the Ministry of New and Renewable Energy (MNRE), and the Ministry of Petroleum and Natural Gas (MoPNG).

**Q. Who should be the one leading the charge in encouraging e-cooking adoption in India? Should it be the BEE, the oil marketing companies (OMCs), the Discoms or private players?**

The Centre cannot be the only player that drives e-cooking adoption, especially as there is such a strong social angle to its widespread adoption.

In order for clean cooking policies to work, the Centre-State divide needs to be bridged.

All stakeholders need to work together as no one entity can ensure clean cooking adoption.

There is a need to involve NGOs working at the grassroot-level, private players, the MNRE to green the grid and the Ministry of Power (MoP) to improve the grid.

There is also a need to have organisations that bring women’s voices to the table as Women are the most important stakeholders and the primary users of any kind of clean cooking solutions.

Prime Minister’s Ujjwala Yojana (PMUY) scheme had MoPNG and the OMCs of India driving the adoption of LPG, but rural adoption has not been successful. Now, other ministries such as the Ministry of Rural Development, State Rural Livelihood Missions, etc. have also become involved. A similar strategy is needed for e-cooking.

Private micro-finance players need to also be involved so that rural households can use new clean cooking solutions in a sustained manner.

EESL in India can be one of the entities to take the lead in e-cooking adoption in India.