



ELECTRIC COOKING

The Way Forward

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ELECTRIC COOKING – The Way Forward | www.indiasmartgrid.org | www.globalsmartenergy.org

CONTEXT

Globally, around 3 billion people cook using firewood, charcoal, biomass, dung cake or kerosene

4 million people die prematurely each year due to household air pollution

Households using firewood or biomass for cooking:
Rural India: 63%
Urban India: 18%

Outdoor average PM2.5 in rural India is in the range of 22 to 112 $\mu\text{g}/\text{m}^3$

Indoor PM2.5 in rural India ranges from 106 to 512 $\mu\text{g}/\text{m}^3$ in India

To meet NDC targets, developing countries **MUST REDUCE** Emissions from Kitchens!

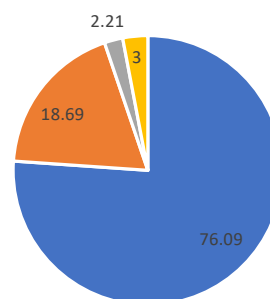
TIME HAS COME TO PROMOTE ELECTRIC COOKING IN INDIA

- Various Rural Electrification Schemes in past few decades **electrified all the 619,000 villages by April 2018**
- **SAUBHAGYA** Scheme **electrified almost all (>99%) households by March 2019**
- **GO ELECTRIC** Scheme launched in February 2020 aims to **promote Electric Cooking and E-mobility**

COOKING ENERGY SCENARIO IN INDIA

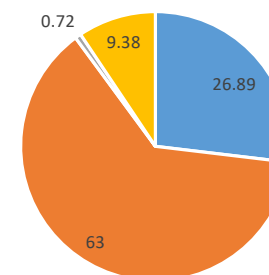
- In 2016, GOI gave subsidised LPG connection to about 275 million households in the country and the coverage has reached 96.9% as of January 2020 – but every do not refill the cylinders regularly
- City Gas Distribution (CGD) connections are about 7.25 million by 2020; new CGD licenses for 226+ towns issued
- Use of kerosene for cooking has been drastically reduced in the recent past
- Over 300 million LPG cylinders are handled every year in India – not sustainable!

Cooking Energy Use in Urban India



■ LPG/Electricity ■ Firewood ■ Kerosene ■ Others

Cooking Energy Use in Rural India



■ LPG/Electricity ■ Firewood ■ Kerosene ■ Others

ELECTRIC COOKING

- Today, a large range of electric cooking appliances are available at affordable prices that can cook all items of any regional cuisines in any country
- The range include electric pressure cooker, induction cooktop, hot plate, kettle, microwave oven, electric oven, electric rice cooker, steam cooker, air fryer etc.



Hot Plate



Electric Kettle



Electric Pressure Cooker



Induction Cooker



Slow Cooker



Microwave Owen



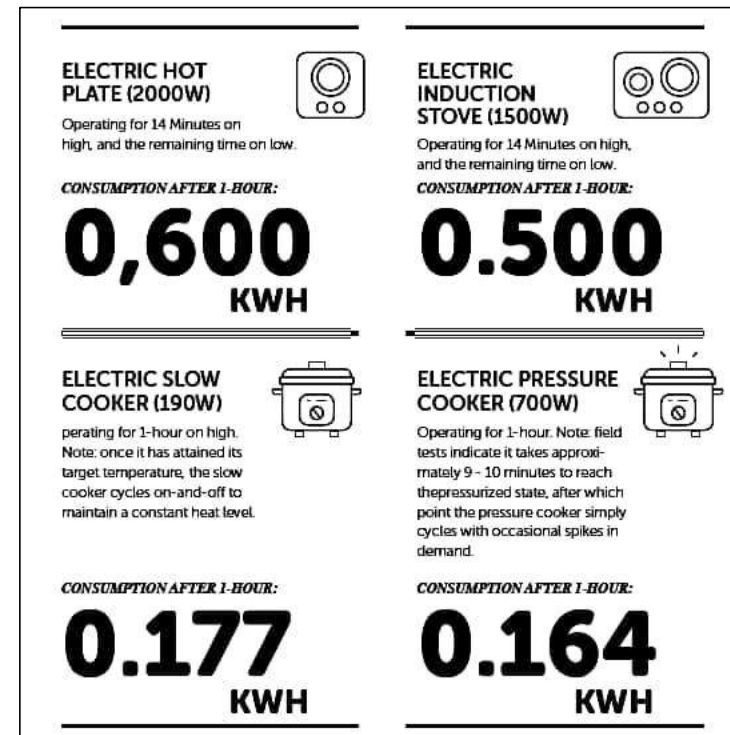
Electric Owen



Air Fryer

ELECTRIC COOKING

- Hot plate is the most common electric cooking device with a heat regulator that maintains a range of pre-set temperatures and is safe and maintenance free
- Most electric cooking devices have flat heating surface and hence it is efficient to use flat bottomed utensils
- Induction cooktops have a thermal efficiency of up to 84% which is twice of than that of gas cooktops
- **Electric Pressure Cooker** has emerged as the most energy efficient device for cooking
- Over a one-hour cooking period, a pressure cooker uses approximately one quarter (¼) of the electricity of an electric hot plate



ELECTRIC COOKING – COMPARISON



GAS STOVE	ELECTRIC STOVE	INDUCTION STOVE
Comparing the Energy Efficiency		
40% Energy Efficiency	74% Energy Efficiency	84% Energy Efficiency
Costs of the Heating 10L of Water		
INR 5.09 (with subsidised LPG) Rs 10.80 (with unsubsidised LPG)	INR 5.91	INR 5.21

Source - <https://www.bijlibachao.com/appliances/best-induction-cooker-cooktop-stove-india.html>

COMPARISON OF COST OF COOKING WITH LPG AND ELECTRICITY

PARAMETER	LPG	ELECTRICITY	ASSUMPTIONS/REMARKS
Energy in Mega Joules (MJ)	46.1 MJ/kg	3.6 MJ/kWh	
Price per MJ (INR)	1.38/MJ	2.22/MJ	LPG: Price of a 14.2 kg Cylinder assumed at Rs 900 Electricity Tariff of Rs 8/kWh considered
Efficiency of the Cooking Appliances	50%	80%	LPG: Average efficiency of LPG stoves at 50% is considered Electric Cooktops: 80% efficiency considered for calculations (induction cooktops efficiency is 84% while coil-top cooktops are in the range of 74-80%).
Scenario-1: To Boil 10 litre Water require 3.15 MJ			
Energy required with the Cooking Appliance	6.3 MJ	3.94 MJ	50% efficiency for gas stove and 80% efficiency for induction cooktop is considered
Cost to boil 10 litre Water	INR 5.09 (Subsidized), INR 10.80 (Un-Subsidized)	INR 5.21	With subsidized LPG, cost is almost same as electric cooking
Scenario-2: To cook 1 kg rice require 1.5 MJ			
Energy required with the cooking Appliance	3.0 MJ	1.88 MJ	50% efficiency for gas stove and 80% efficiency for induction cooktop is considered
Cost to cook 1 kg Rice	INR 4.14	INR 4.17	Cost of LPG and electric cooking is almost same

SAVING BILLIONS IN FOREX AND GENERATING NEW JOBS

- Surplus energy available on the grid at several time slots in a day could be allotted for cooking by sending price signals (rebates on electricity tariff) to customers
- With smart plugs (cost below US\$ 10), households can operate cooking appliances remotely
- Electric cooking can assist the grid in demand growth and load balancing
- 2-3 year's LPG and kerosene subsidies will be sufficient for strengthening the electricity distribution network to support electric cooking

SUBSIDY AMOUNT IN INR (CRORES)	2018-19 (ACTUAL)	2019-20 (REVISED BUDGET ESTIMATES)	2020-21 (BUDGET ESTIMATES)
LPG	20,268	34,086	37,256
KEROSENE	4,569	4,483	3,659
TOTAL AMOUNT	24,837	38,569	39,915

ROADMAP FOR ADOPTION OF ELECTRIC COOKING

- **Electrify all commercial kitchens on fast track** – hotels, restaurants, canteens, military mess, college/school/hospital canteens
- Estimation of **capex to strengthen the medium voltage and low voltage grids to provide 24x7 supply at 3kW to 5kW connections to all households** so that they could use electric cooking appliances and air-conditioners
- Life cycle cost comparison of **building new city gas distribution networks to supply PNG as against strengthening the electric network** for transition to electric cooking in urban and semi-urban households
- Estimation of annual cost of LPG cylinder distribution in rural areas as against strengthening the electric network which is one time cost
- Assessment of **availability of electric cooking appliances in different regions**, its cost and performance, roadmap for augmenting the manufacturing capacity of such appliances in the country

ROADMAP FOR ADOPTION OF ELECTRIC COOKING

- Assessment of skill development and **employment generation potential in the electric cooking** domain as against the job losses in LPG distribution
- Detailed assessment of **health benefit from transition from firewood/biomass/kerosene etc to electric cooking and avoided cost towards providing healthcare to millions** suffering from indoor air pollution
- Detailed assessment and estimation of the environmental benefits from electric cooking by **reducing GHG emissions and avoiding deforestation**
- Development of different strategies for promotion of electric cooking and **campaigns for consumer awareness** and adoption of electric cooking appliances and practices
- Technical feasibility studies for **leveraging renewable energy for electric cooking and integration of cooking appliances with the grid** – smart cooking with green electricity bought from the cheapest resource on the grid!

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