



“Modern Clean Cooking Technologies: Challenges and Opportunities”,

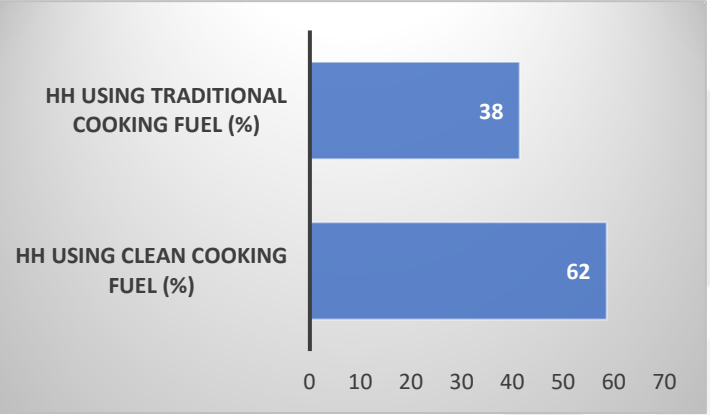
Vimal Kumar

MECS India Lead and Co-founder, Finovista



India's transition towards clean cooking

Cooking with Traditional Fuels



Source: Multiple Indicator Survey (2020-2021)

Traditional fuel includes:
Firewood, Kerosene, Biomass, wood dust, etc.

Clean fuel includes:
LPG, PNG, Electricity and Biogas, Ethanol, Methanol, Bioenergy

- Leads to poor air quality
- Increased respiratory infections
- Causing premature deaths
- Wastage of productive time of women and children



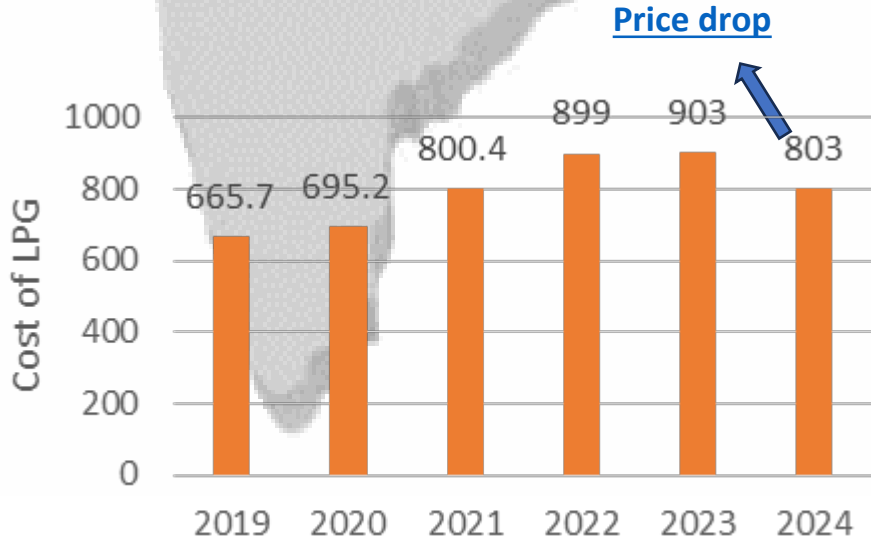
India's Shift to Clean Cooking

PMUY Scheme: 100% LPG coverage in 2024 from only 62% in 2016 ([link PIB](#))

Challenges-

Issues of cylinder refills

Import dependency over [64%](#) for LPG



Switch to Modern Fuels for Cooking

Installed power capacity in India – [450.74 GW](#) ([45%](#) is from RES) [Power availability](#): Urban 23.78 hours and Rural 20.6 hours

Renewable energy generation in India crossed 200 GW

GO ELECTRIC Campaign

ETAC's Report – 25% of HHs to use electricity for cooking by 2030

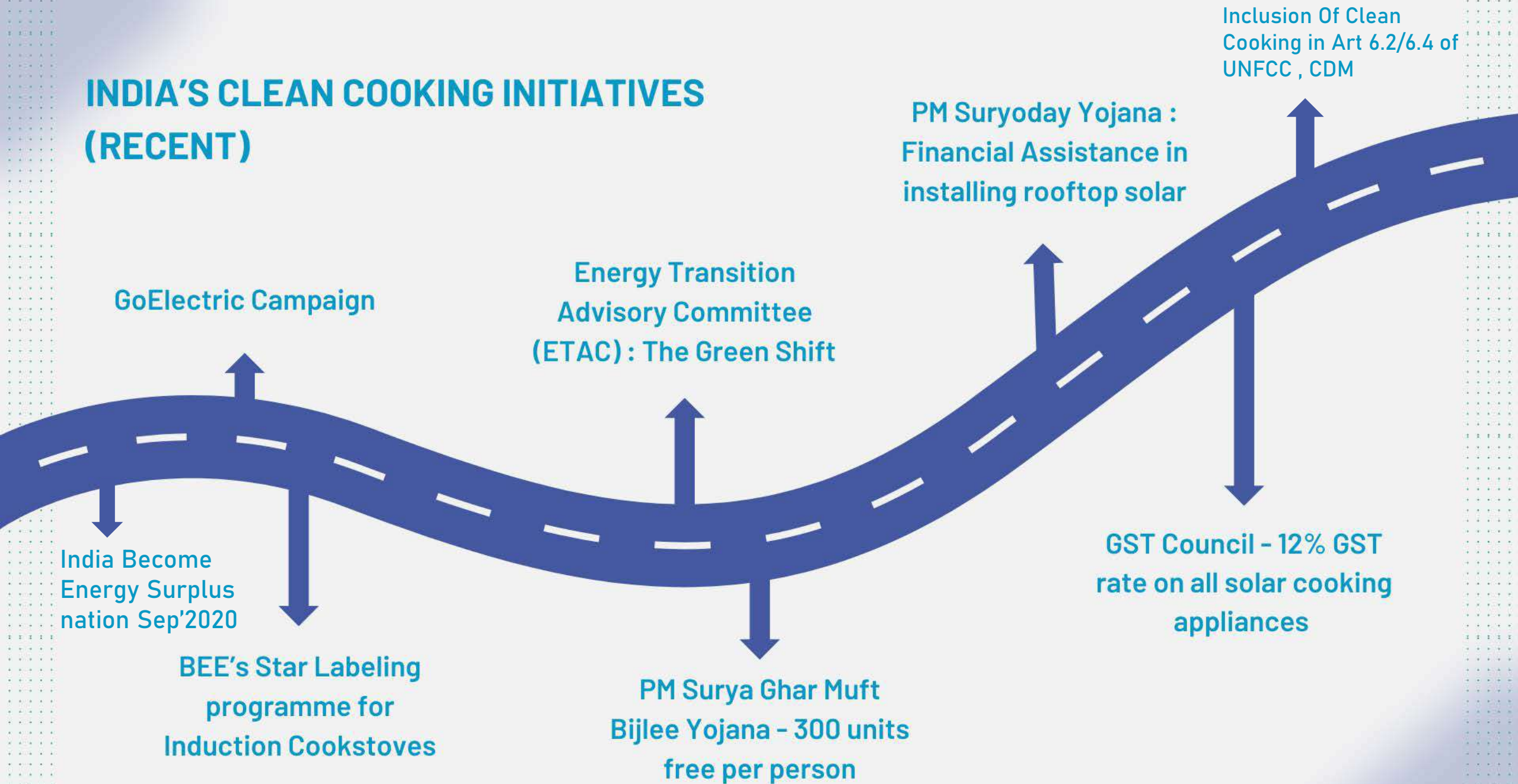
BEE's Star Labelling Prog for Induction Cookstoves

PM Surya Ghar Muft Bijli Yojana- 300units of free electricity

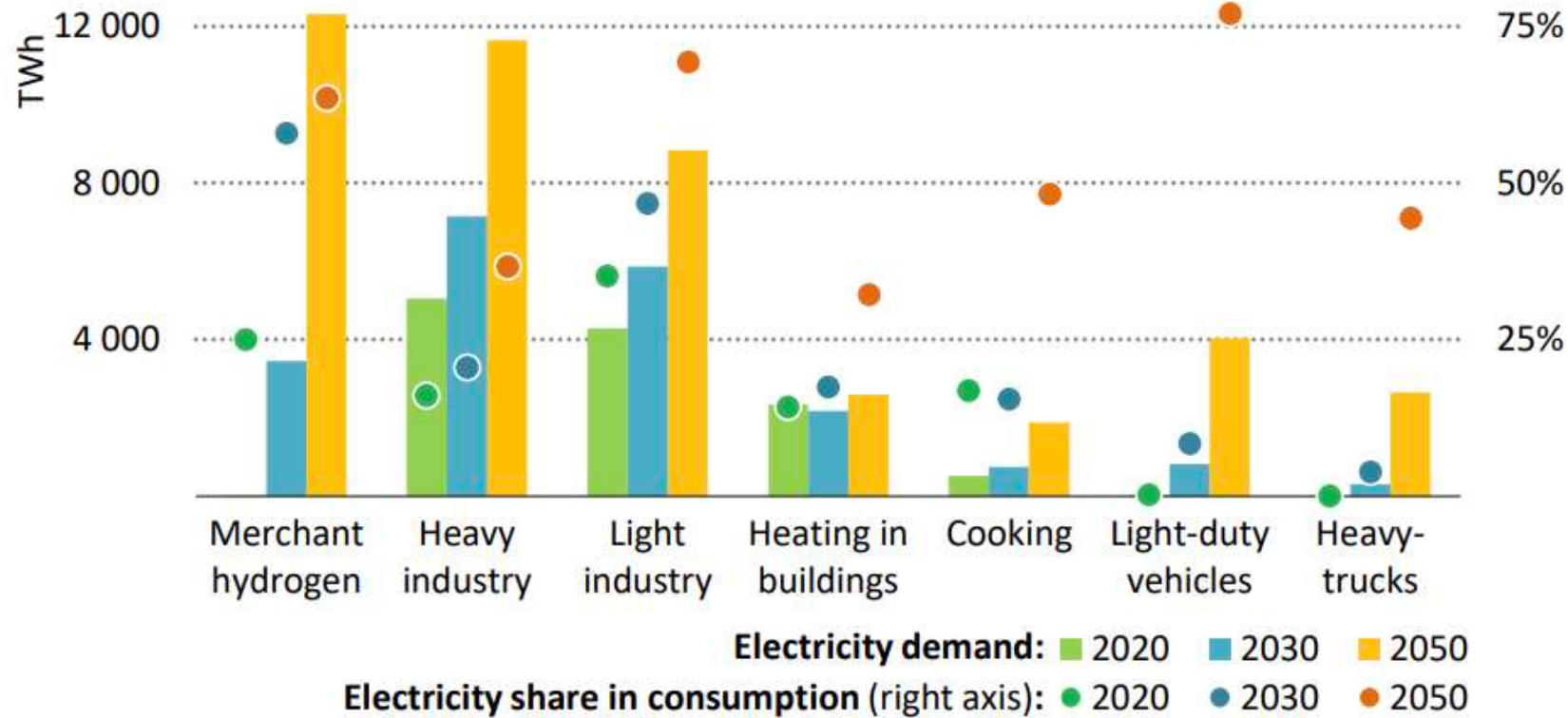
5% penetration of e-cooking devices in Indian households- [\[10.3% in cities and 2.7% in rural\]](#)



INDIA'S CLEAN COOKING INITIATIVES (RECENT)



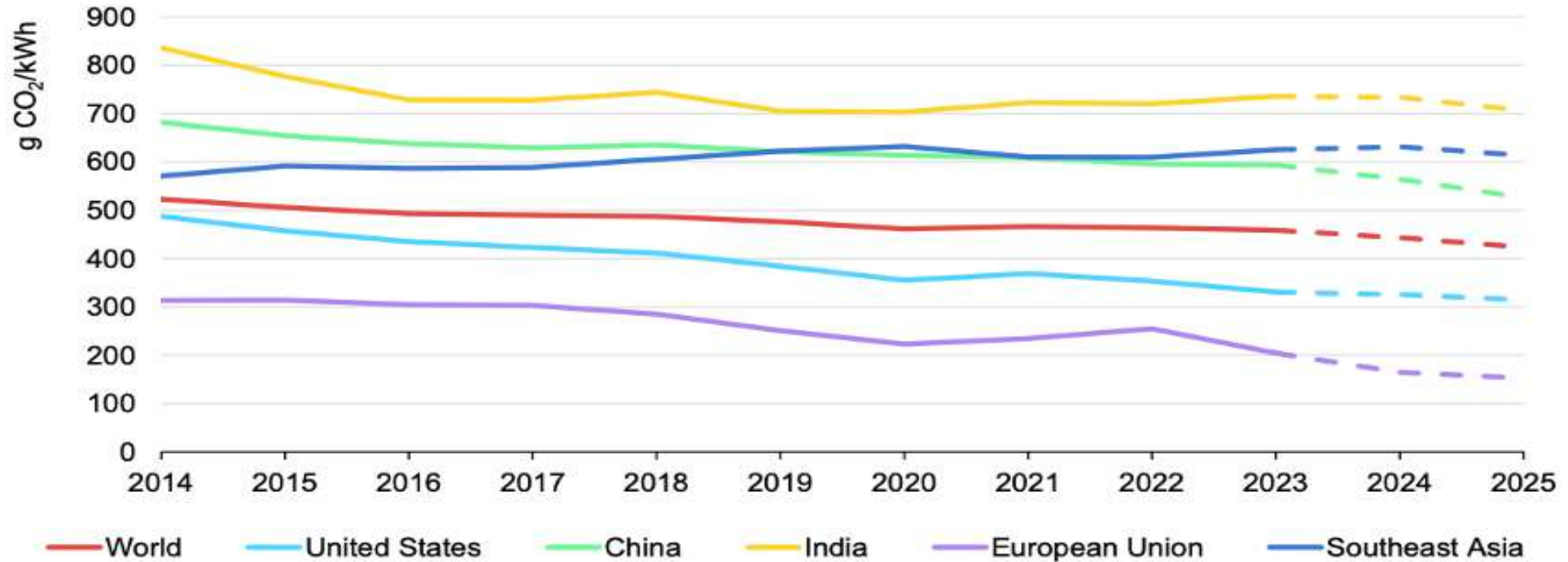
Global electricity demand and share of electricity in energy consumption in selected applications in the Net Zero Emission (NZE)



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Note: 1,104 terawatt-hour (TWh) of energy is used for cooking in India

How green is the electricity we use?



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Note: The CO₂ intensity is calculated as total CO₂ emissions divided by total generation.

Fun Fact: India is 3rd largest emitter of carbon worldwide however the per capita emission is less than half of the global average



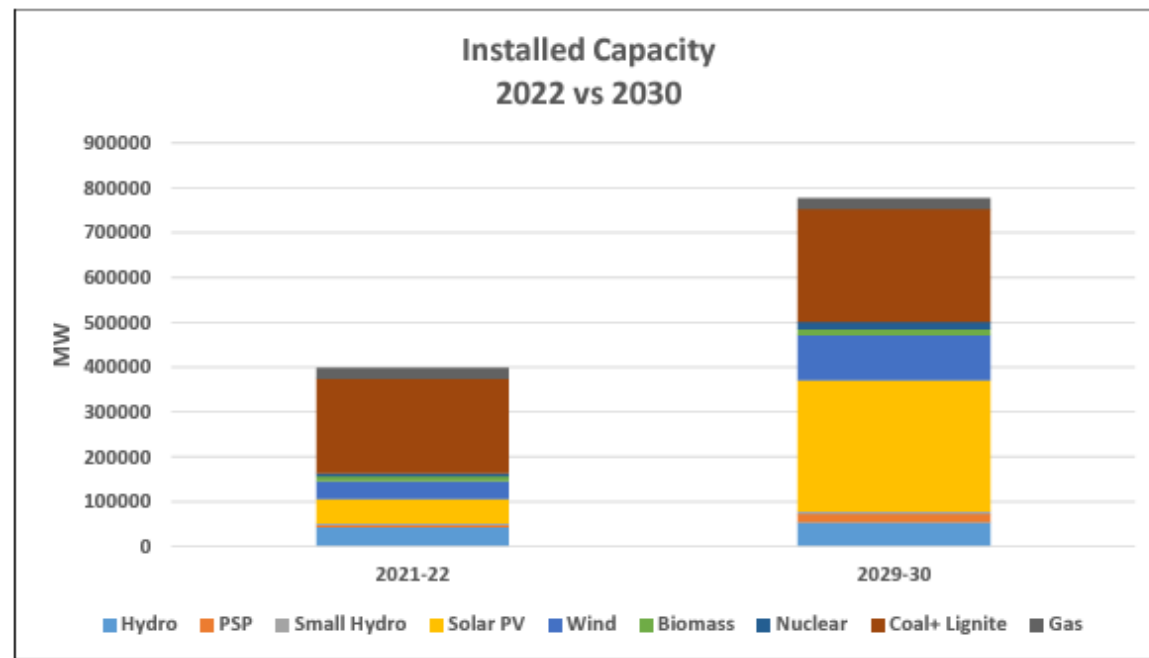
Greening India's Energy Generation

India's per capita electricity consumption was 1255 kWh in 2021-22, which is around one-third of the global average of per capita energy consumption

- India has Increased the generation capacity by 70% from 248,554 MW in March 2014 to 425,536 MW in October 2023.
- During the period from 2014-15, India has added 97501.2 MW in the conventional power sector and 96282.9 MW of renewable energy capacity.
- India is committed to install 500GW renewable energy capacity by 2030.
- India has already achieved 200 GW of renewable energy capacity

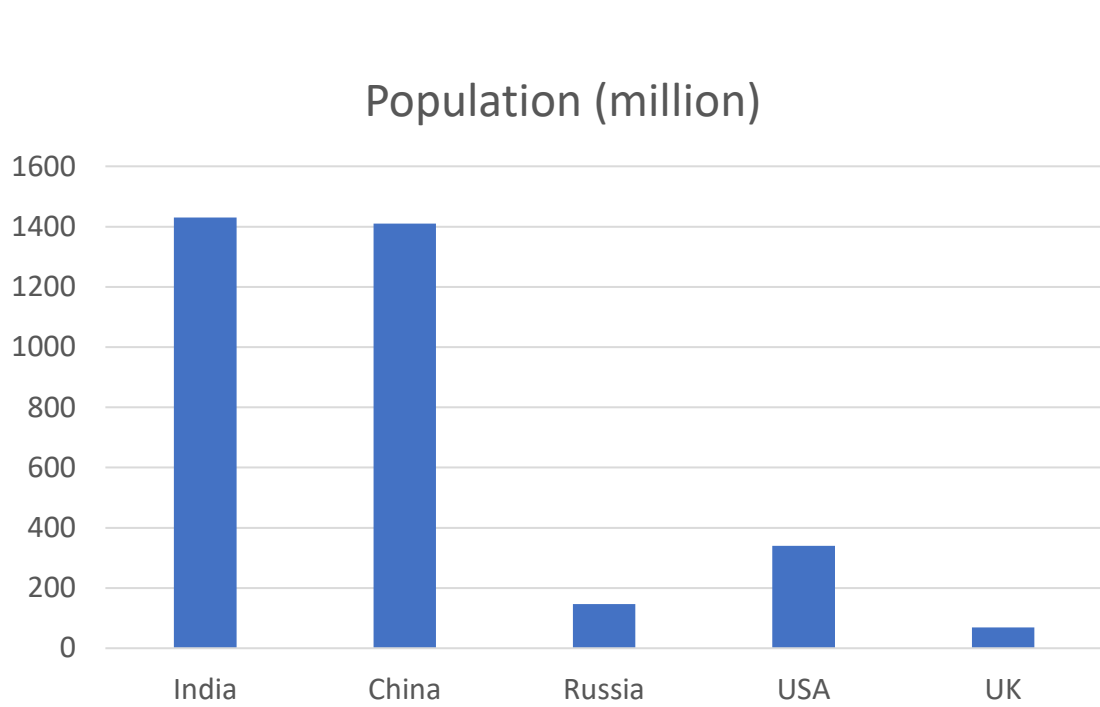
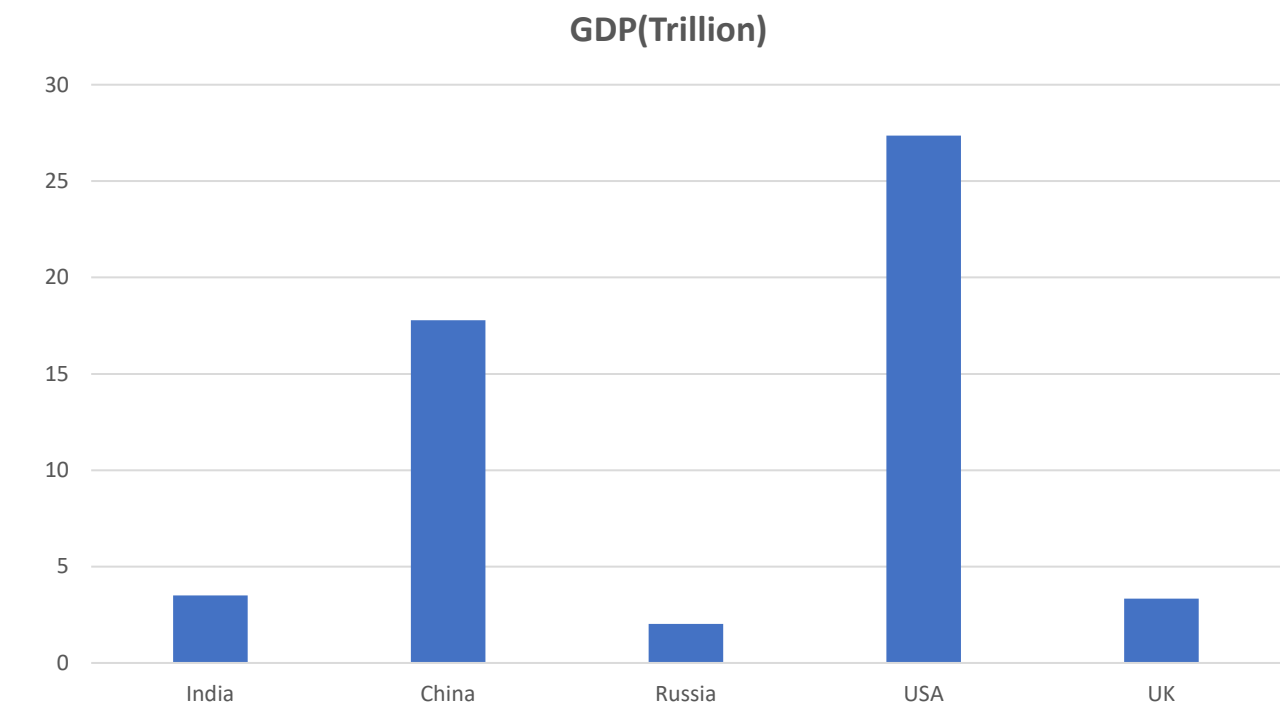
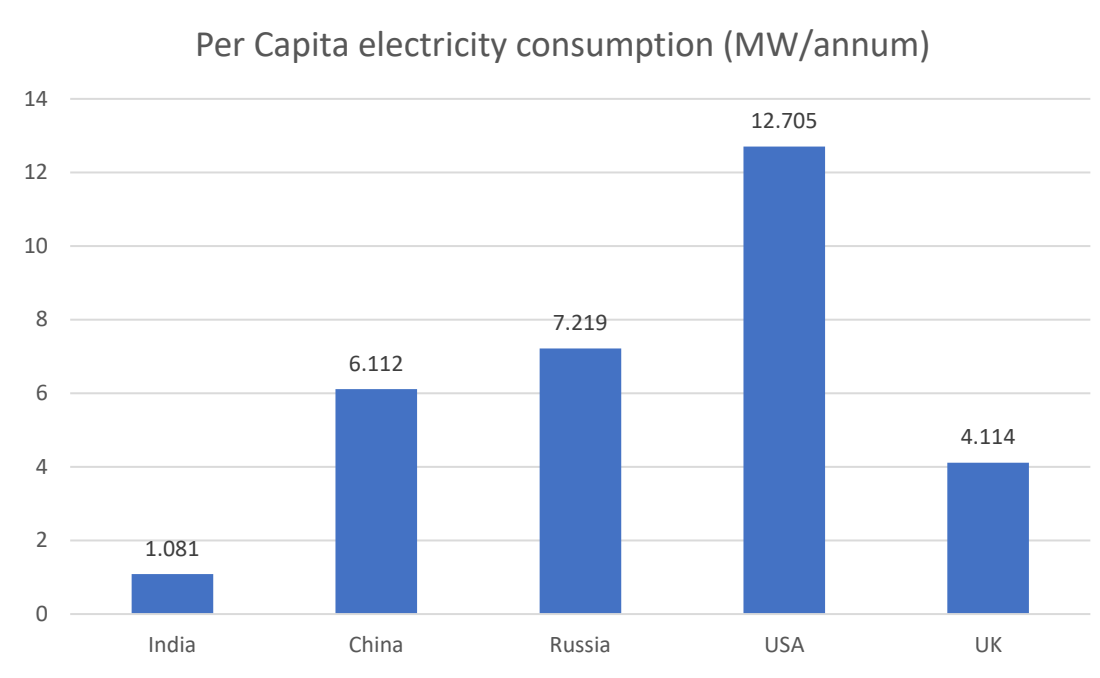
“India has become a energy surplus nation in 2023”

India's Projected Energy Mix



Source: Central Electricity Authority Report

Countries	GDP(Trillion)	Population (million)	Per Capita electricity consumption (MW/annum)
India	3.5	1430	1.081
China	17.79	1410	6.112
Russia	2.02	147	7.219
USA	27.36	340	12.705
UK	3.34	69	4.114





Indian Consumer willingness to pay for Cooking Fuel

Monthly Income of
INR 5,000, 74% of
rural household ready
to pay INR 391 pm

Monthly Income of
INR 2,500, 59% of
rural household ready
to pay

- Irrespective of income level, over 80% of households did not use LPG as high recurring costs as a barrier.
- Of the households not using LPG in 2018, 83 per cent expressed interest in getting it.
- Over 60 per cent of these interested households are willing to spend INR 300 or more a month (INR 450 or more in six weeks) to use LPG for all cooking needs

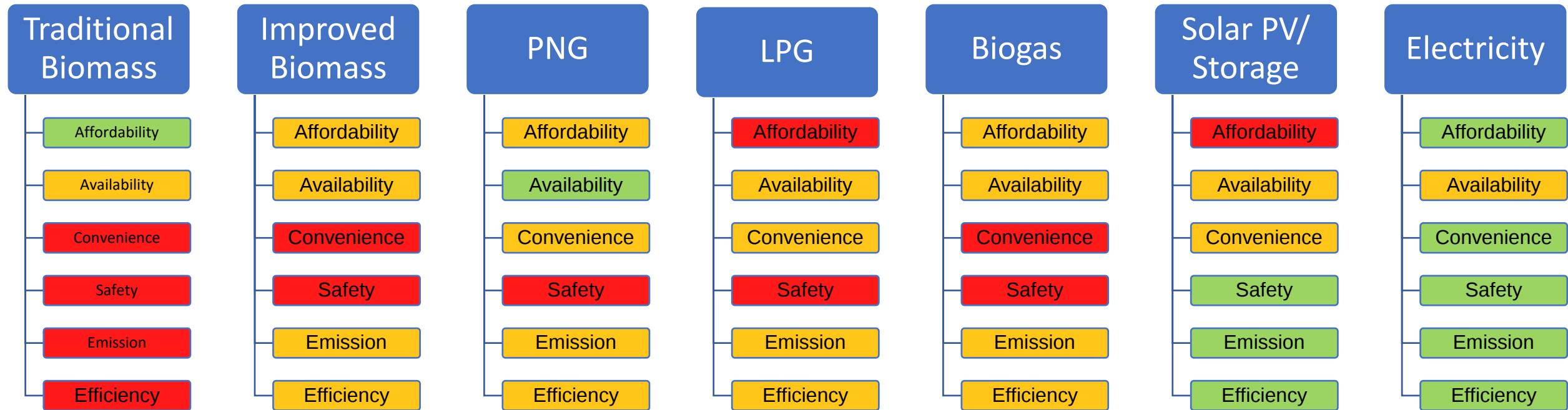


Benefits of eCooking

- **Lower capital outlay:** Electric cooking equipment costs 15 – 20% less to purchase than gas equipment and has lower lifetime maintenance costs, making it budget-friendly.
- **Increased productivity:** Cooking with electric equipment increases yields with faster preheat and recovery time.
- **Energy efficiency:** Electric cooking equipment is more energy efficient because more of the energy goes into cooking the product. Ventilation hood requirements are reduced for electric cooking, as well.
- **Improved equipment performance:** Overall equipment service life is longer and, therefore, with less required maintenance, equipment downtime is reduced.
- **Better Lifestyle:** Cooking with electricity is safe and causes no harmful effect on health due to emission less cooking and also eCooking aids in saving enormous amount of time spend on collecting firewood.

Cooking with Electricity vs other Fuels

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Cooking with Electricity is the most
AFFORDABLE, AVAILABLE, CONVENIENT, SAFE, LOW EMISSION and EFFICIENT

Current Electric / Solar Cooking Device Range



Rice Cookers

Low utility just boil or steam rice
Used for steaming rice
Easily Available
1Lt to 5Lt, starting from 400Watt to 800Watt

Induction Cookstove

High Utility
Requires investment in cookware
Easily available
High watt consumption
Average price/unit is INR 1200

Microwave

Mostly used for re-heating, baking and grilling
Very low utility, with no staple food being cooked
Easily available
High Watt Usage
Require specific Cookware

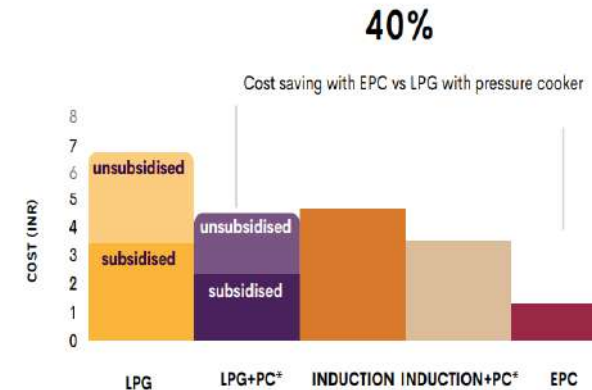
Electric Pressure Cooker

High Utility, multiple functions, No additional cookware required
Average price is INR 5,000
Available in 3ltr to 8ltr capacity. 60 Ltr is under-trial
Over 20 brands in India

Parameter / Devices	Electric Pressure Cooker (EPC)/ Multicooker	Induction Cookstove	Rice cooker	Roti Maker	Air Fryer	Radiant/Infrared cookstoves
Brands	Over 20 brands viz, Ascent, Aufla, Borosil, Butterfly, Crockpot, Croma, Hitech, Kent, Preethi, Prestige, Usha, Wonderchef, American Micronics Instrument, Geek, Elica, Instantpot, Mealthy, Nutribullet, Panasonic, Wellspire etc	Over 25 brands viz, Phillips, Borosil, Butterfly, Bajaj, Croma, Kent, Panasonic, Prestige, Usha, Wonderchef, Easy, Oster, Cuckoo, Maharaja Whiteline, Kanchan, Koollin, Maestro, V-Guard, Brayden, Havells, Usha, Pigeon, Agaro, clearline, etc.	Over 40 brands viz, Phillips,Butterfly, Bajaj, Croma, Kent, Panasonic, Prestige, Usha, Wonderchef, iBell, Maharaja Whiteline, Kanchan, Lifelong inferno, Orbon, Usha, Pigeon, clearline, etc.	Over 20 brands viz, OTC, Gi-Shop, Prestige, Libra, Aarmish, Is Laurels, Surya crystal, Enamic UK, etc.	Over 20 brands viz, Phillips, Inalsa, Nutricook, Kent, Havells, Instapot, Ibell, Hilton, Pringle etc.	Over 20 brands viz, Cooka - (Single Burner - Green) Infracooka) Prestige, Bajaj, Surya, McCoy, Summercool, Vandana Trade Links Pvt Ltd Glen Appliances Pvt. Ltd etc
Pot Material	Aluminum and Steel	-	Aluminum and Steel	N/A	Stainless steel	Steel and Glass
Wattage	700 – 1000w	1200-3000W	700-1200 W	900-1500 W	1000-1700W	1200- 3000W
Capacity	3 – 6 liters	-	1-3 Litres	N/A	2-5 Litres	-
Retail Price	INR 4,000 - 10,000	INR 1,500 – 4,000	INR 2,000 – 5,000	INR 1500-2000	INR 4,000-12,000	INR 2,000-6,000
Availability	Devices are easily available on online and offline		Note: For 100% eCooking devices like egg boilers, dosa makers, kettles, Immersion rods, etc are required. In Several brands for induction-based cooking, associated utensils like pans, tawa, and kahdai are available for around INR 3000			

MECS Key Initiatives: INDIA ECOOKBOOK

- Feasibility of cooking a wide range of Indian staples and popular dishes on an Electric Pressure Cooker (EPCs)
- Potential savings that a household can achieve by cooking with efficient devices like EPCs
- Time, and energy consumption comparison with popular alternatives i.e. LPG and Induction cookstoves.



60% Cost saving with EPC vs induction with pressure cooker

Most everyday Indian dishes can be cooked using an EPC

around **85%** of typical weekly menu can be cooked with an EPC

Indian households could make substantial cost savings

savings on pressure cooked, steamed & boiled dishes of up to:

40% vs. subsidised LPG + pressure cooker

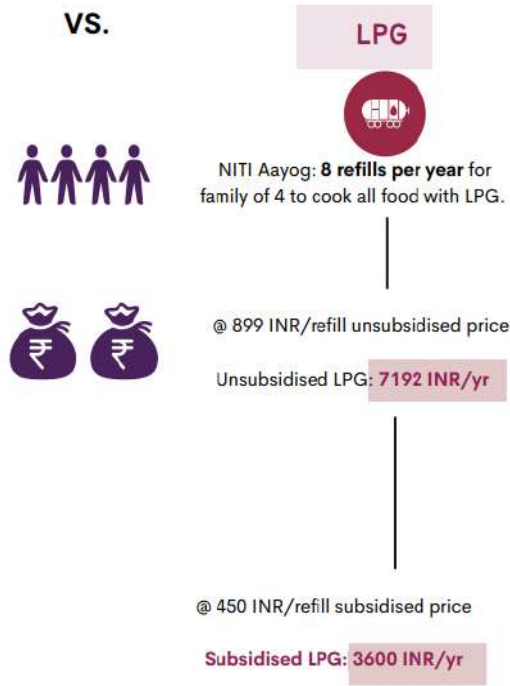
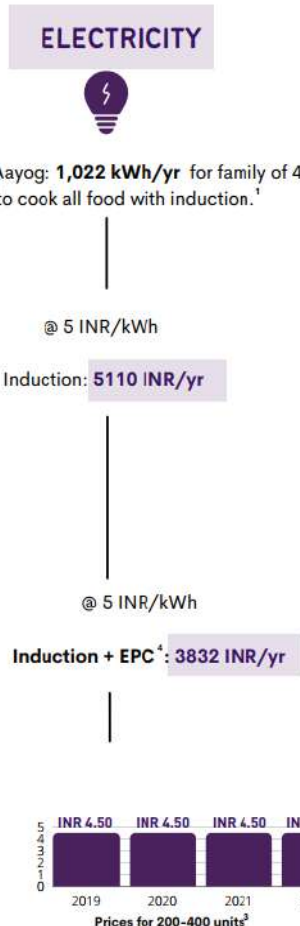
60% vs. induction pressure cooker

EPCs are extremely convenient allowing multi-tasking

- fully automated
- pre-set menus
- can be left unattended

EPCs can achieve superior texture and flavour blends with dal

"Rajma Masala flavours blended well and the gravy had a thick consistent texture"

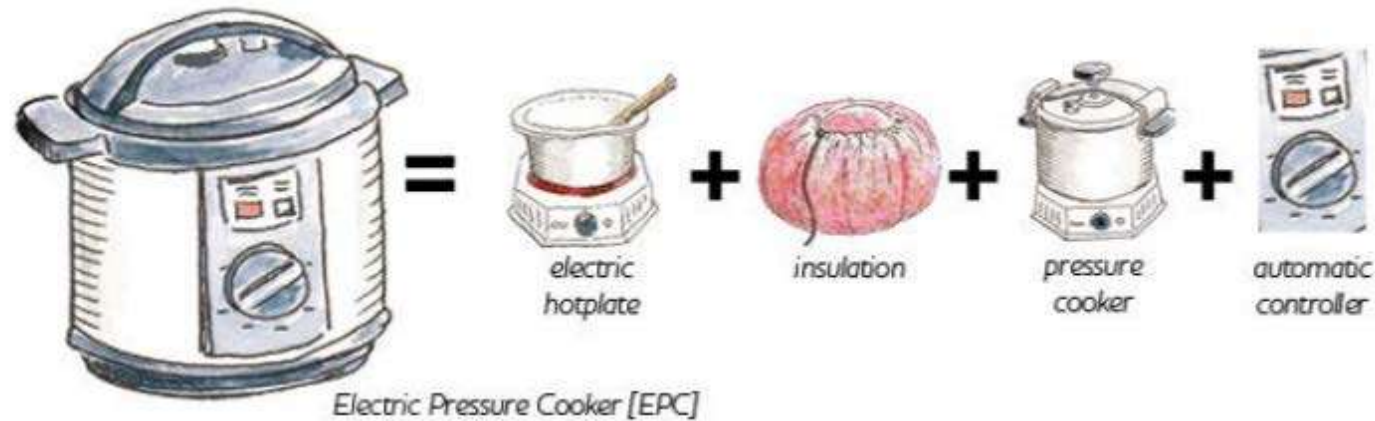


Unsubsidised LPG prices are **steadily increasing**²



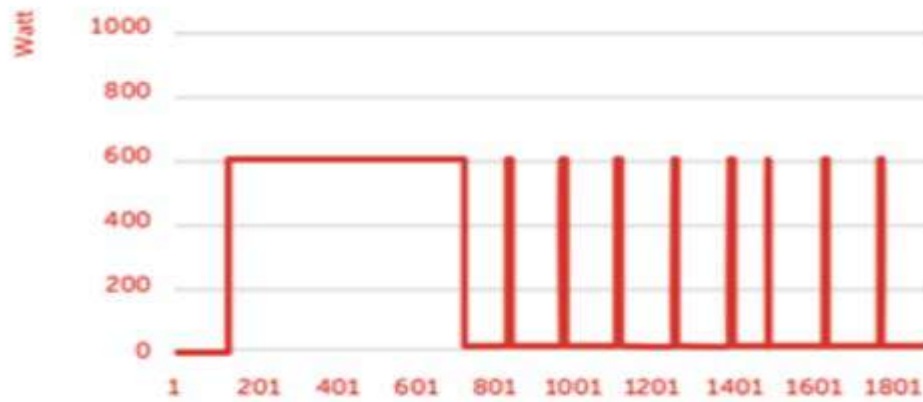
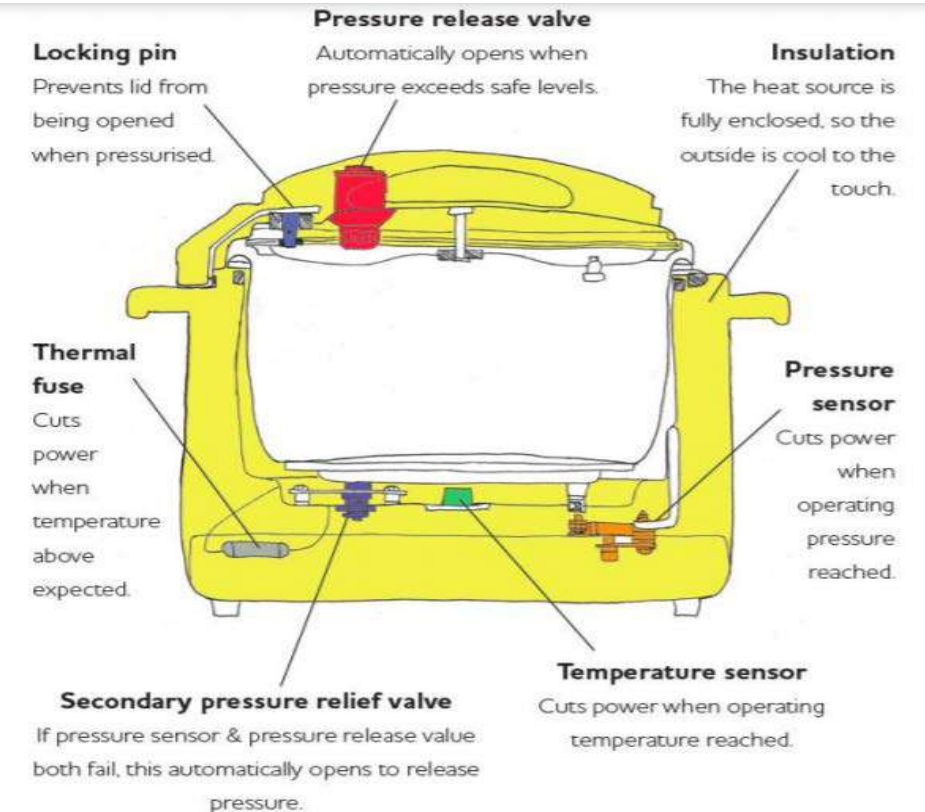
Electric Pressure Cooker (EPC) / Multicooker

As per MECS research EPC is the most eCooking appliances, suitable for most of the cooking needs except Deep Frying and Chapati/Roti/Flatbread



The fundamental components of an EPC

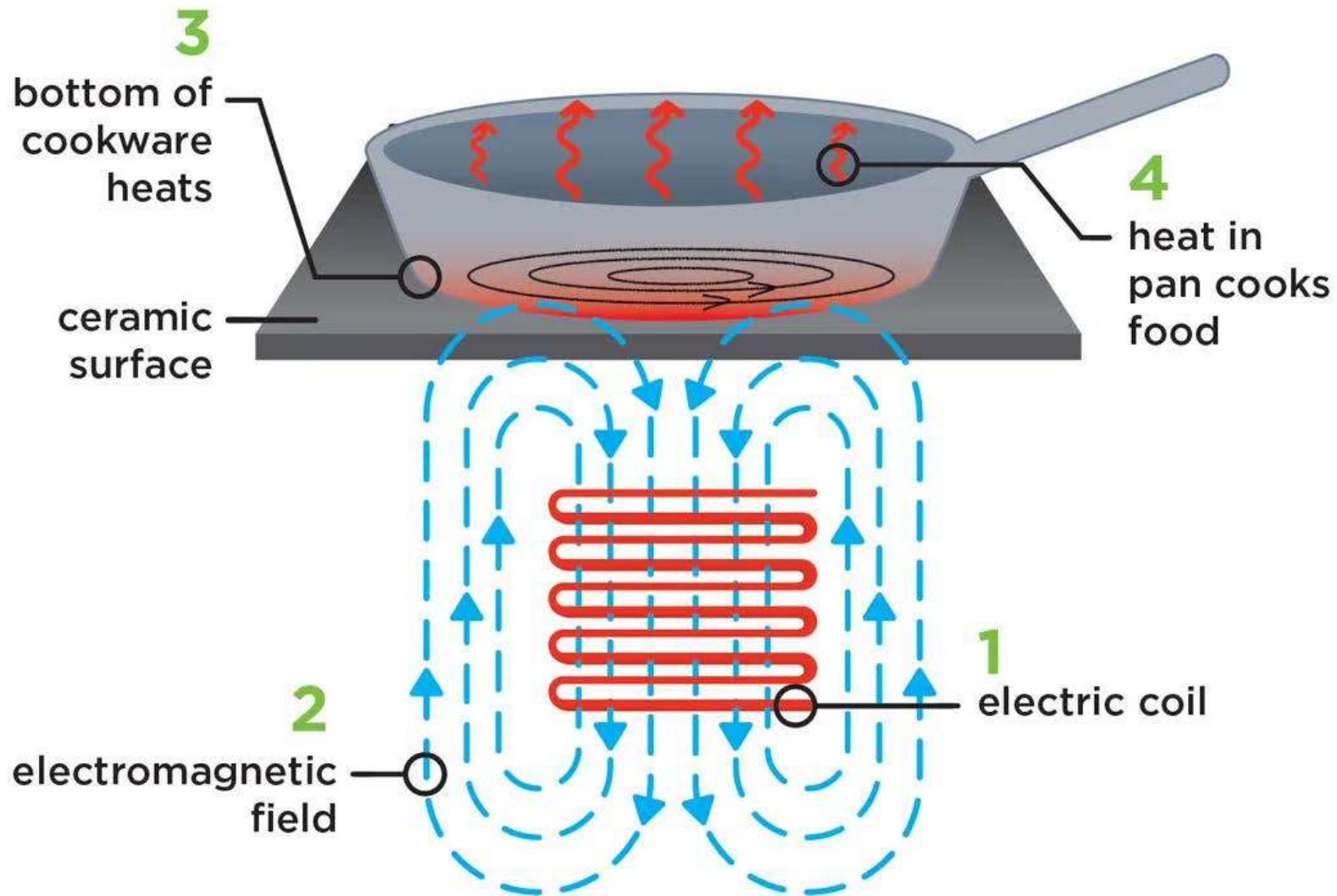
MECS supported the Global LEAP Awards, to identify best EPC device through global competition



Typical load profile for a 700W rated EPC on a half hour cooking cycle

Source: MECS 2018

Heat loss mechanisms mitigated by insulating the cooking pot and heating device



(Adapted from the [Massachusetts Clean Energy Center](https://www.canarymedia.com/articles/electrification/how-do-induction-stoves-actually-work))

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Challenges in the supply chain

Non-availability of components for assembly/repair of eCooking devices domestically

Lack of established supply chain infrastructure

Device Standards

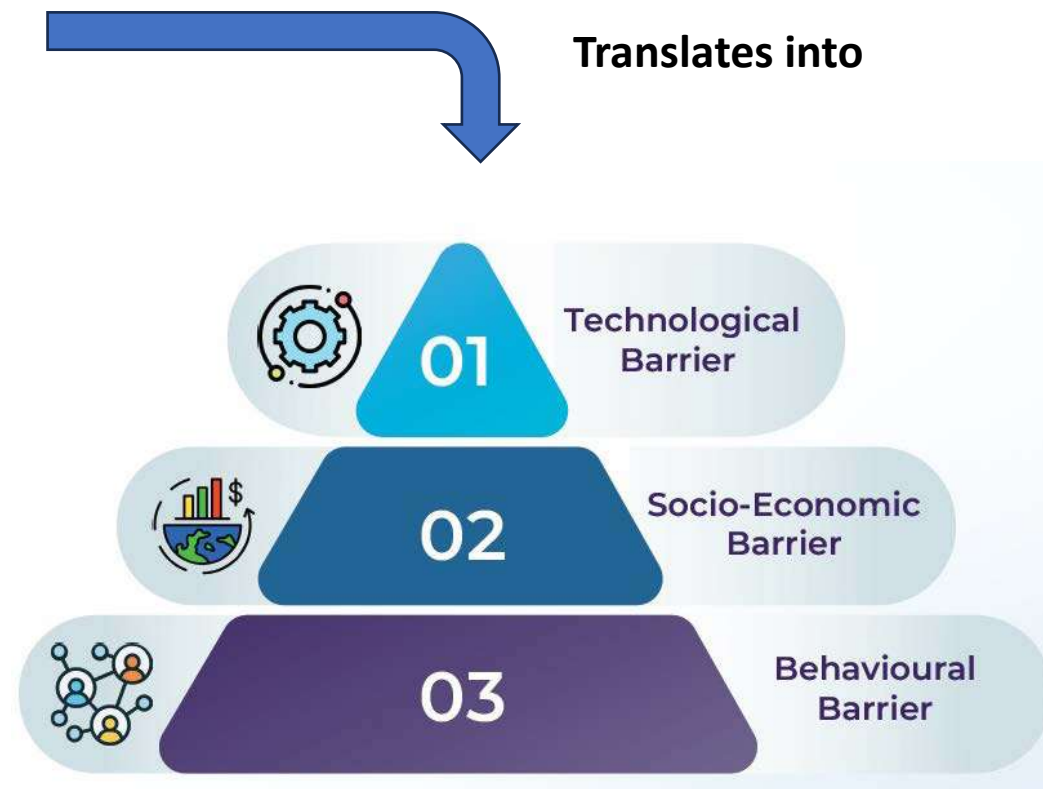
Lack of financial support

Poor connectivity in rural areas- lack of decentralized distribution networks

The capital cost involved in transition & Utensil compatibility for induction stove

Uninterrupted and quality power supply

Skilled localized manpower for post-sale services.



Loughborough
University



ESMAP
Energy Sector Management
Assistance Program



UK Government

MECS Country Jigsaw to Scale UP

Policy Enabling Environment

Talk Series (Monthly)

Modern Energy Cooking Forum (Annually)

Enabling eCooking with states

Women in Clean Cooking - WMEC

Policy Compendium

Building Evidence

India eCookbook

100% Cooking with Electricity

Evidence based Research in Clean cooking with NIAS

Consumer Awareness

Promotion through training and demonstration

Clean energy access for cooking for street food vendors

eCooking Fun

Work with states through SDAs

Training of the Trainers

Supply Chain

EDP

Manufacturers Connect

Exhibition and technology showcase

Demand aggregation and Large Scale Deployment

Supply chain need assessment

Technology Compendium

Finance

Investor Pitching & Connect



Behavior

Economics

Technology

On a positive note

- “While the world is working towards electric cars, in India, in addition to electric cars, electric stoves would go a long way in meeting the needs of the people. This innovation would, in one stroke, significantly impact the nation’s dependence on imported fuel.”

- Hon’ble Prime Minister of India



THANK YOU