Electric cooking

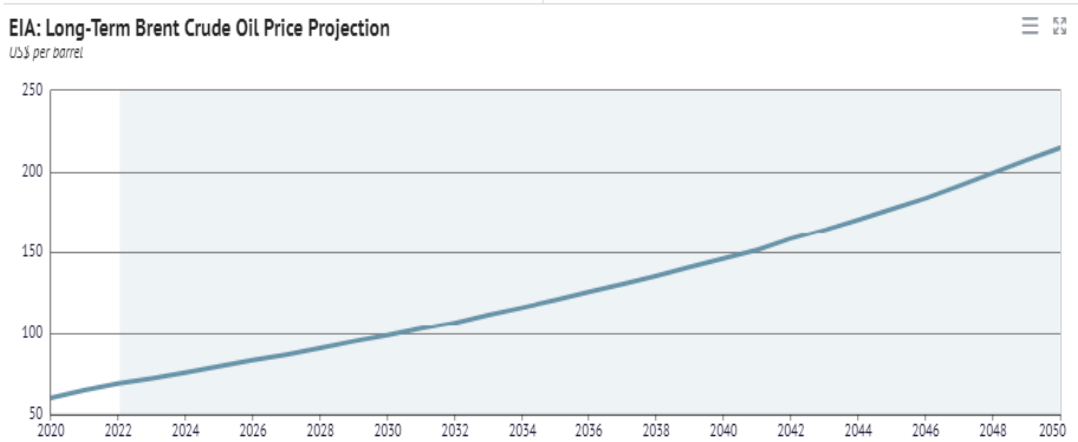
Speaker : *Dr Simon Batchelor,*
Gamos (Modern Energy Cooking Services)

Introduction

- In the inaugural sessions yesterday we heard:-
  - The advent of more renewable generation will make managing the grid more complex although India has made firm realistic commitments at COP26, and there will be an accelerated increase in renewables.
  - The increase in electric vehicles will also prompt smart upgrades to the grid.
  - The decrease of energy storage costs will prompt more use of storage to help manage the grid fluctuations.
  - There was a call (by Tata) for improving the regulatory mechanisms so they ‘force’ data audits and improvements.

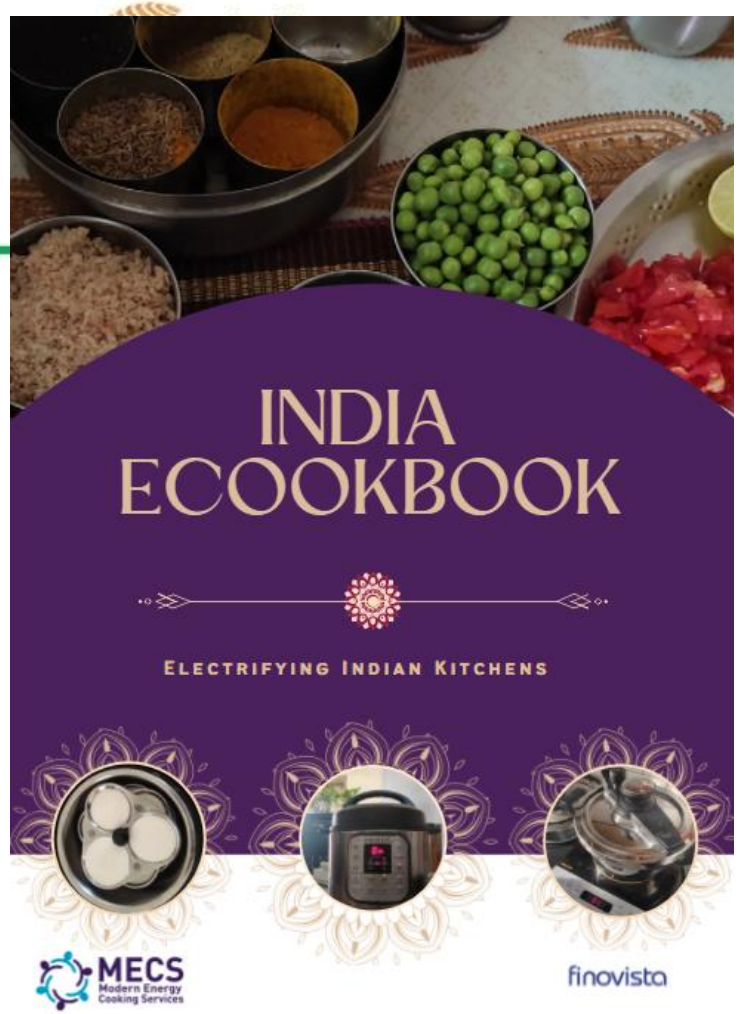
Context

- So how does all this apply to cooking?
- Currently there is a high reliance on LPG.
- Enabling access to LPG has been costing the government $5 to $7 Billion each year
- But also LPG is a global fuel vulnerable to global events
- And COP26 called for removal of inefficient subsidies on fossil fuels
- Both of which will lead to price increases.



Relevance

- So I still haven't linked smart grids to cooking!
- In slide 1, we noted that smart grids will make more use of renewable energy (and storage), and in that sense once installed potentially become untied from the global oil price.
- In slide 2 we noted the governments concern to provide cost effective cooking fuel to the population.
- With the increase of electricity access gained over the last decade, India can now pivot to using energy efficient cooking devices.
- Doing so leverages the gains made in electrification while alleviating the dependence on fossil fuels (and addresses concerns about deforestation, health, gender and economic activities).



The Kitchen Laboratory experiments in this eCookBook compared Electric Pressure Cookers (EPCs) to induction with a conventional pressure cooker and showed that:

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

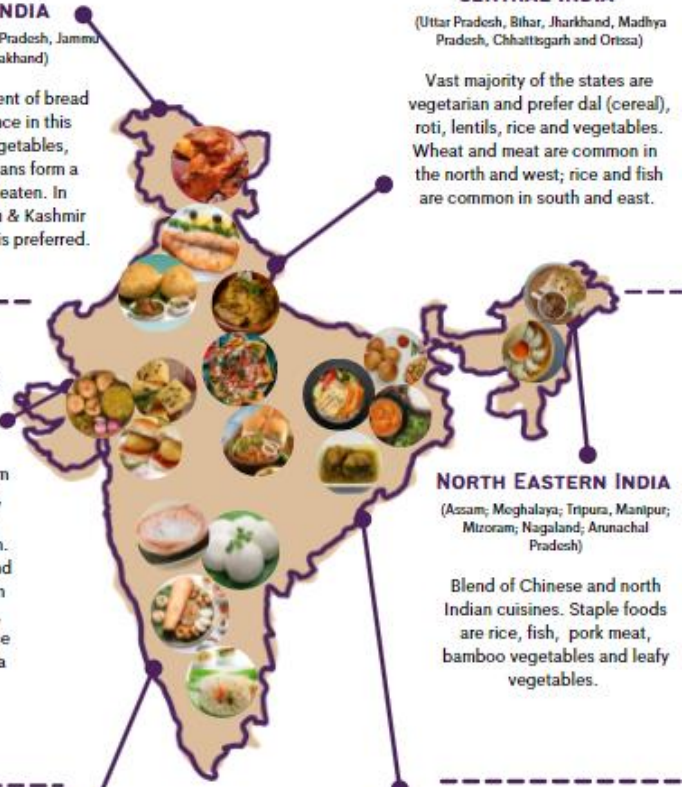
- fully automated
- pre-set menus
- can be left unattended

EPCs can achieve superior texture and flavour blends with dal

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

The evidence in this eCookBook shows that **an EPC can be a valuable complement to an Indian kitchen**. An EPC can very efficiently replace conventional pressure cookers, idli makers, steamers and rice cookers and other utensils partially and thus, **it is likely to be a valuable tool for the electrification of Indian kitchens.**

REGIONAL COOKING CULTURE



NORTHERN INDIA
(Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir and Uttarakhand)

Dairy and an assortment of bread have a huge presence in this region. Dal, dry vegetables, Tandoori roti and naans form a major part of food eaten. In Himachal and Jammu & Kashmir non-vegetarian food is preferred.

CENTRAL INDIA
(Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh and Orissa)

Vast majority of the states are vegetarian and prefer dal (cereal), roti, lentils, rice and vegetables. Wheat and meat are common in the north and west; rice and fish are common in south and east.

WESTERN INDIA
(Rajasthan, Gujarat, Maharashtra and Goa)

Corn, lentils, and gram flour, as well as nuts, are staple foods in Gujarat and Rajasthan. Fish, rice, coconut, and peanuts are staples in Maharashtra cuisine, and fish, pork, and rice are the staples of Goa cuisine.

NORTH EASTERN INDIA
(Assam; Meghalaya; Tripura, Manipur; Mizoram; Nagaland; Arunachal Pradesh)

Blend of Chinese and north Indian cuisines. Staple foods are rice, fish, pork meat, bamboo vegetables and leafy vegetables.

SOUTHERN INDIA
(Andhra Pradesh, Tamil Nadu, Karnataka, Kerala)

In spite of variations across the states, the food is known for its spicy curries with rice as the major staple food. Seafood, spices and coconut products have a significant presence.

EASTERN INDIA
(West Bengal; Bihar; Jharkhand; Sikkim; Orisaa)

Contains significant amount of sweets, fish and other seafood. Use high amounts of spice. Staple foods are: rice, fish, vegetables and lentils. Various ethnic groups have their own distinct cuisines.

8

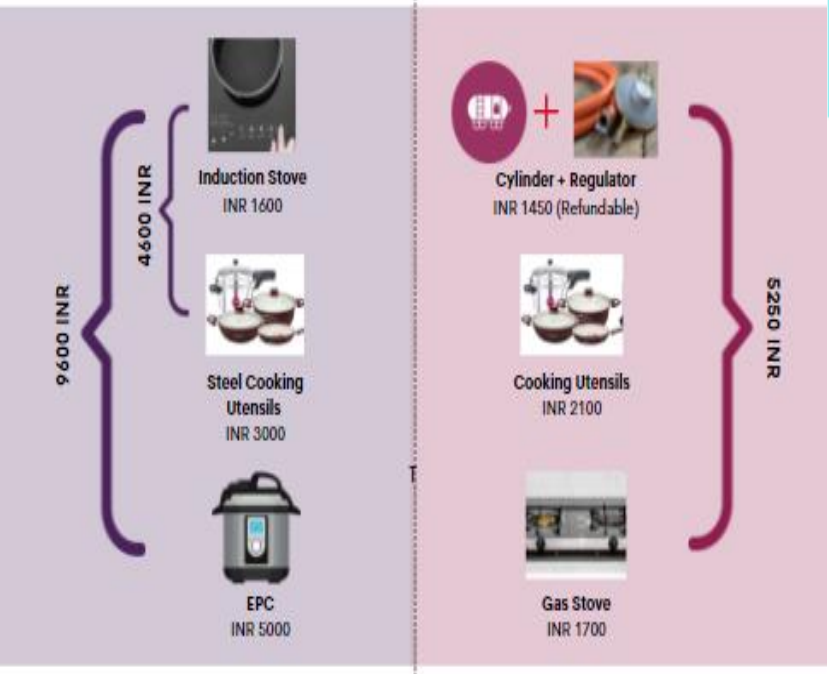
TYPICAL UPFRONT COSTS

ELECTRICITY VS. **LPG**

eCooking with induction has a **lower upfront cost** than LPG,

WHILE

the cost of induction cooking is **lower than unsubsidised LPG**, it is higher than subsidised LPG.



eCooking with Induction + EPC has a higher upfront cost than LPG,

HOWEVER

the cost of cooking with induction + EPC is **comparable to subsidised LPG.**

TYPICAL COSTS OF COOKING

ELECTRICITY VS. **LPG**

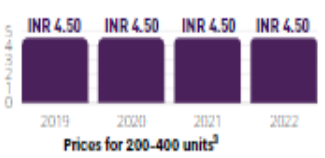
NITI Aayog: **1,022 kWh/yr** for family of 4 to cook all food with induction.[1]

@ 5 INR/kWh

Induction: **5110 INR/yr**

@ 5 INR/kWh

Induction + EPC[4]**: 3832 INR/yr**



Prices for 200-400 units[3]

NITI Aayog: **8 refills per year** for family of 4 to cook all food with LPG.

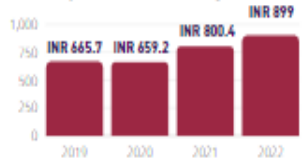
@ 899 INR/refill unsubsidised price

Unsubsidised LPG: **7192 INR/yr**

@ 450 INR/refill subsidised price

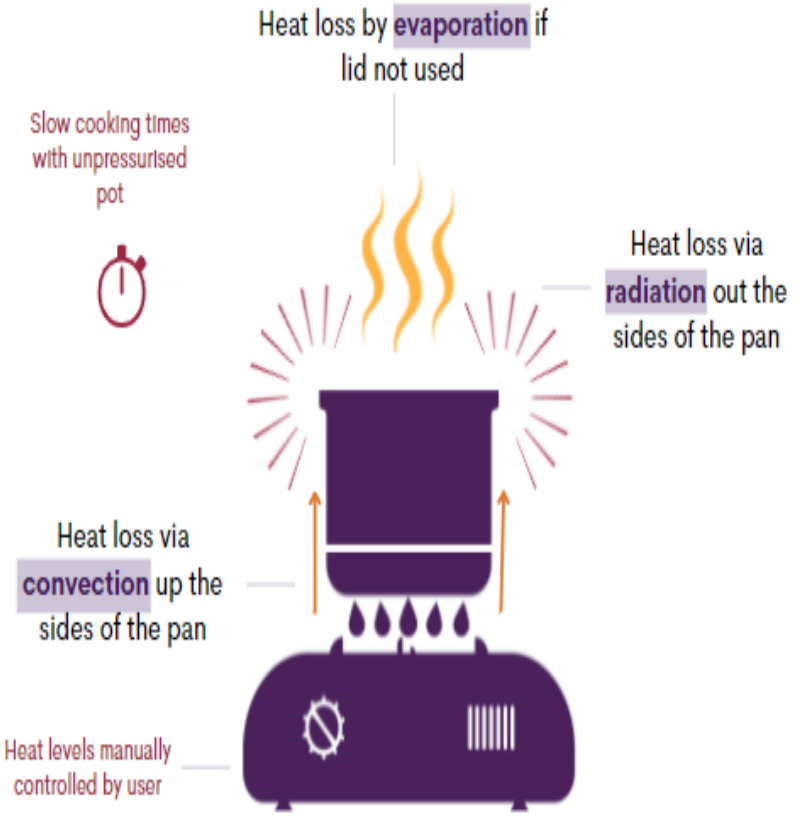
Subsidised LPG: 3600 INR/yr

Unsubsidised LPG prices are **steadily increasing**[2]



Conventional cooking techniques waste energy through a variety of mechanisms, creating opportunities for modern appliances to reduce energy consumption.

LOWER ENERGY CONSUMPTION = CHEAPER COOKING.



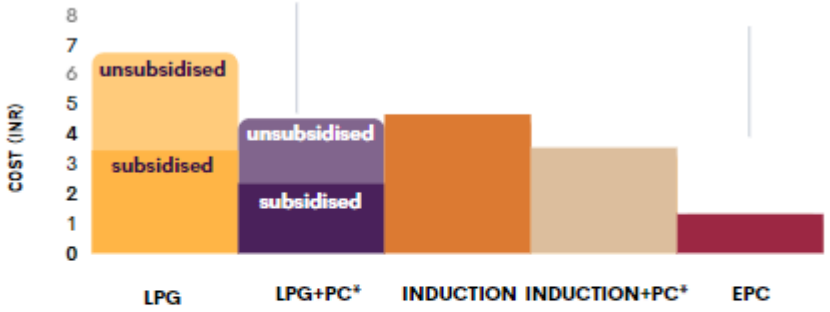
Cost & Energy - Rajma Masala

The EPC is the cheapest way to cook Rajma Masala. Unsubsidised LPG is the most expensive, however, using a pressure cooker can reduce the cost by around 25%. Induction is approximately 25% cheaper than LPG and similar savings are possible with the pressure cooker. Subsidised LPG is cheaper than induction, however, the EPC is the most energy-efficient and therefore more cost-effective because:

- the EPC is insulated so less heat escapes
- the EPC is fully automated, so it turns the heating element off as soon as it reaches pressure

40%

Cost saving with EPC vs LPG with pressure cooker



Best performer

EPC

60%

Cost saving with EPC vs induction with pressure cooker

*PC = Pressure Cooker

Rajma Masala

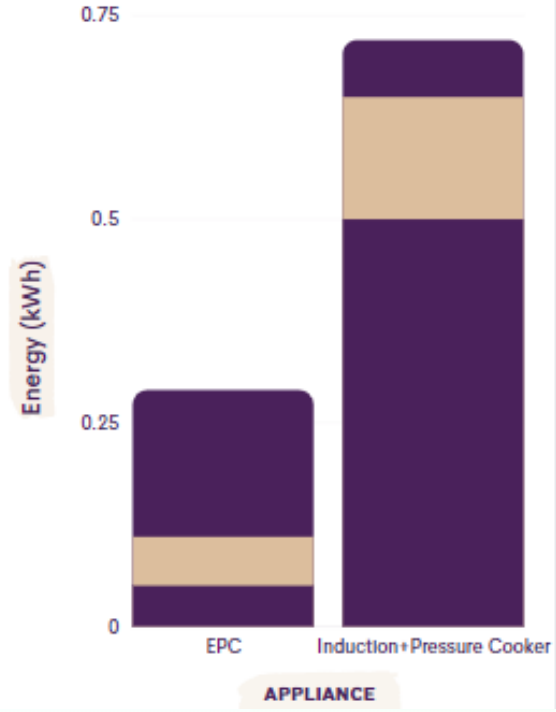
Energy Comparison

We tested cooking a Rajma Masala on an **electric pressure cooker (EPC)** and on an **induction stove with a pressure cooker**. The results showed the EPC was **more energy-efficient** and **60% cheaper** than the induction stove and pressure cooker. The induction stove, however, cooked the meal in less time than the EPC.

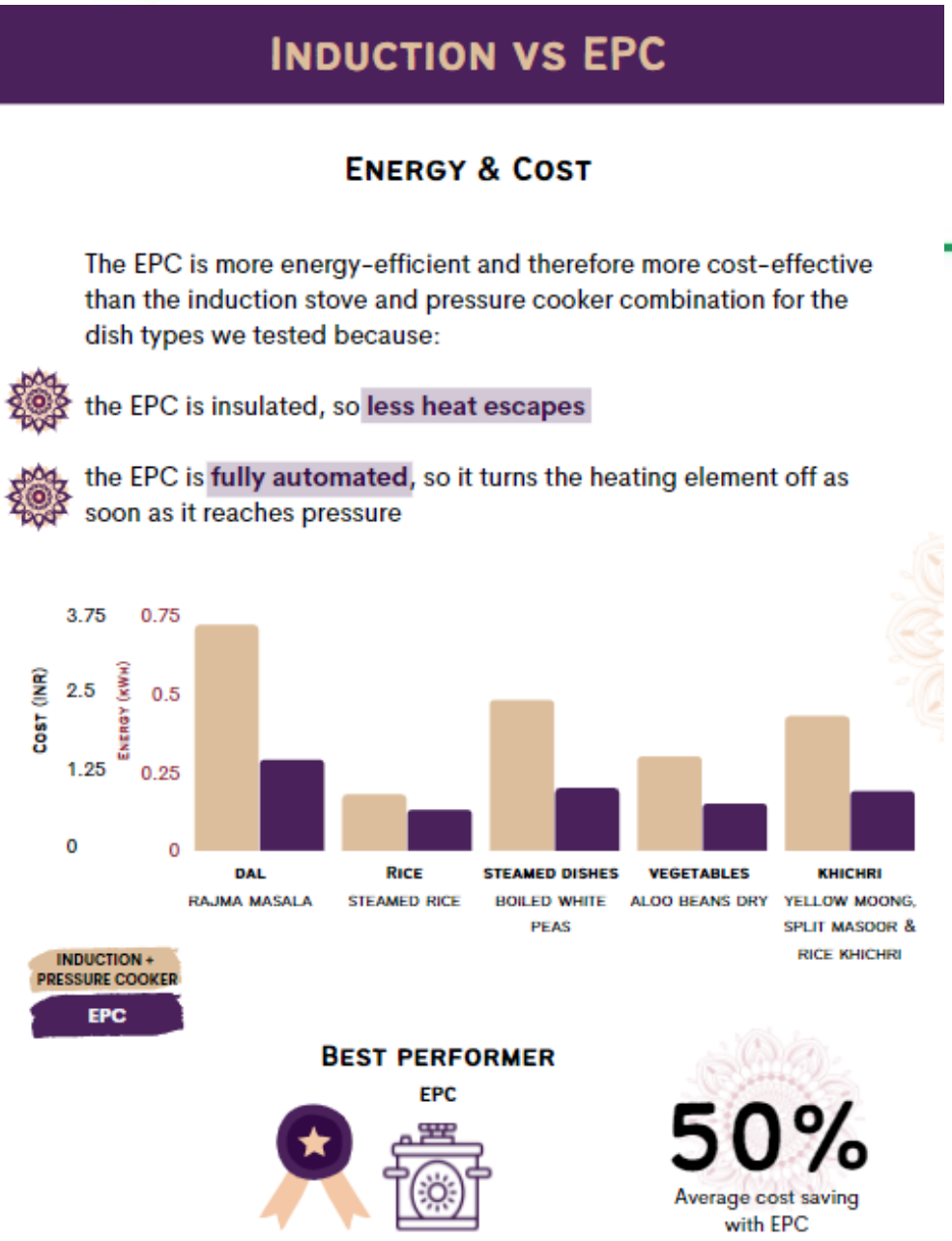
Device/Appliance	Time	Energy	Cost
EPC	64mins	0.29kWh	INR 1.45
Induction Stove + Pressure Cooker	55mins	0.72kWh	INR 3.60

60%

cheaper using an EPC



ISGF India Smart Grid Forum



Key Takeaways

- India will increase its use of renewable energy, and smart grids, increasing its independence from global fossil fuel prices.
- Its population currently relies on fossil fuels and increasingly unsustainable wood for its cooking.
- Leveraging the electrical gains with energy efficient appliances is obvious. (Go electric Campaign)
- A particularly interesting new energy efficient appliance (on the world stage since 2010) is the electric pressure cooker.
- A combination of EPC and induction stove, or EPC with LPG is very cost effective for consumers.
- As energy companies seek to actively manage demand (and supply) through smart data, providing a utility based service with facilitating upfront purchase of consumer equipment with payment collection through the billing is a way forward.

- Some final words –
- **Manufacturing**:- India is well placed to provide the world with improved energy efficient cooking appliances
- **Innovation** - There are some 'Pay as you go' appliances now available on the world (Cambodia (Induction) and Kenya (EPC)). India could take this forward (for India and for the world).
- **Reducing costs through bulk purchase** – India showed the way with LED lights – can the same be done now for energy efficient electric appliances
- **Time of day or specific tariffs** could be implemented through smart data – eg Uganda has introduced a cooking tariff.
- Rural areas can be served by **Solar Home Systems** – currently we have systems at $300 in Malawi, India could create an industry that served the rural areas (although most villages now connected?)
- Alternatively connected minigrids, which also can utilise tariffs to maximise use of storage.

- Thank you