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India SMART UTILITY Week 2024

Supporting Ministries



Session: Sustainable Solar-based Induction Cooking

Harnessing Electric Cooking for Sustainable Energy transition

Presented By

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KPMG India owes a big thanks....

The demonstration projects are being executed under the UK-India bilateral technical assistance programme – “Accelerating Smart Power and Renewable Energy in India” (Aspire) which is being implemented by Foreign Commonwealth and Development Office (FCDO), Govt. of the UK in association with the Ministry of Power and Ministry of New and Renewable Energy, Government of India.

KPMG is the implementation advisor to FCDO in relation to the Aspire programme.

KPMG India is collaborating with EESL, ICA, ANERT, and EMC for these projects.



Concern: Lack of Access to Clean Cooking

- 33.8% of Indian households use biomass, chips, and crop residue (Urban - 6.5% & Rural - 46.7%) as their primary source of cooking fuel*
- More than 60% of the rural households in Chhattisgarh, Odisha, West Bengal, Nagaland, Madhya Pradesh, Tripura, Rajasthan Jharkhand, and Meghalaya, are primarily dependent on biomass for their cooking requirement

*Source: NSSO-Ministry of Statistics and Program Implementation, March 2023.



Actions Taken: Clean Cooking Schemes

[Source: PMUY: Home](#)



Shortcoming in Existing Scheme: Low Refilling Rate

[Source: LPG connections under PMUY \(PIB\)](#)

THE ISSUE: LACK OF ACCESS TO CLEAN COOKING

Primary reliance on polluting fuels and technologies for cooking¹

32.1%



of Indian population

~442 MILLION



of Indian population

~111 MILLION



Indian households

Primary cooking fuel - 2020-21²



33.8%

Households using Firewood, chips and crop residue



Rural 46.7%



Urban 6.5%



62.0%

Households using LPG



Rural 49.4%



Urban 89.0%

Source: NSSO-Ministry of Statistics and Program Implementation, March 2023.; [Electric stoves as a solution for household air pollution: Evidence from rural India](#), ISI Delhi, 2022

- One of the major schemes toward clean cooking was the Ujjawala scheme
- More than 90 Million LPG connections were provided to the beneficiaries
- Under the Ujjawala scheme, the government provides a subsidy of INR 200/cylinder (up to 12 cylinders) to beneficiaries; however, the increased cost of cooking gas led to a reduction in usage
- On average, Ujjawala beneficiaries use around **3.66 LPG** cylinder refills per year

24-hour average PM 2.5 AQG levels³

WHO Recommended levels

<15 µg/m³

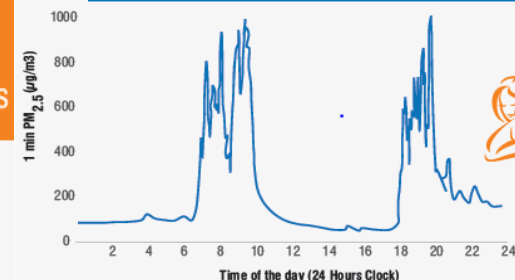
Outdoor levels in Indian villages

~130 µg/m³

Indoor levels in Indian rural households during cooking

>1000 µg/m³

PM 2.5 Concentrations in Indian Rural Households³



Women and children are more frequently exposed to elevated levels of HAP and therefore bear a greater burden. Additionally, they are responsible for time-consuming task of collecting fuelwood



India's 20-50% of ambient air pollution is caused by indoor cooking and heating⁴



0.8 million premature deaths due to Household Air Pollution⁵ (HAP)

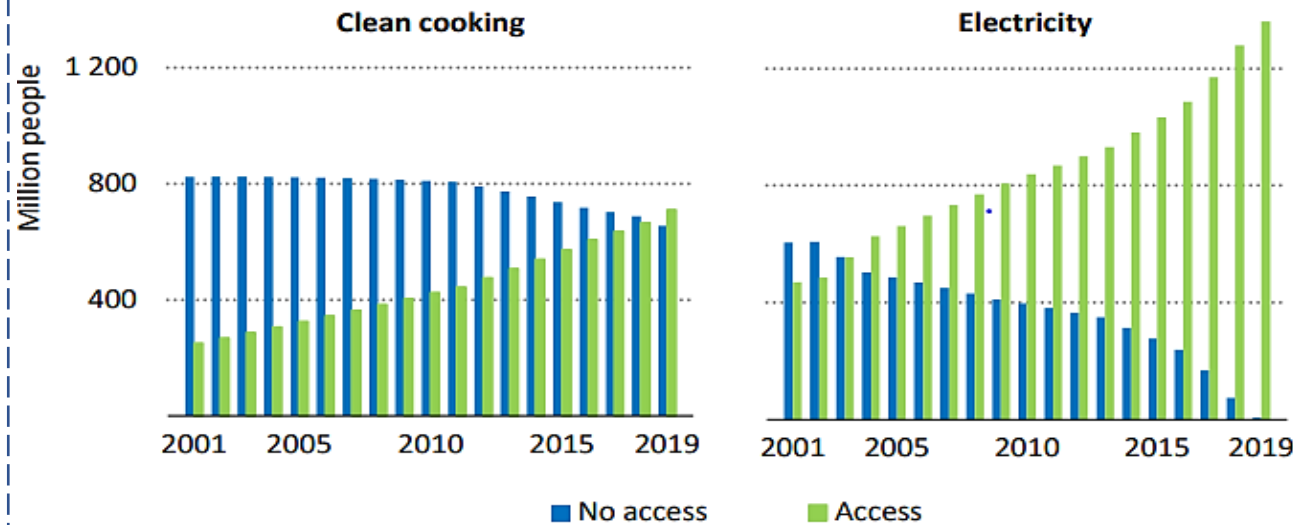
Achieving Net Zero Pathways through Electric Cooking



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India's high electricity access substantiates the potential for grid-connected solar-based cooking



- Access to clean cooking has increased from 400+ million people in 2010 to close to 700 million by 2019*. However, a substantial part of India's population still lags in clean cooking access.
- Promoting clean cooking would support India's target of becoming net zero by 2070, by mobilizing the eminent shift from firewood/LPG to solar-based electric cooking as a clean cooking choice in the future.

- Clean Cooking has direct linkages with India's climate actions presented at the 26th session of the Conference of the Parties (COP26).

Linkages of clean cooking with India's commitment at COP 26



Reach 500GW Non-fossil energy capacity by 2030.



50 per cent of its energy requirements from renewable energy by 2030.



Reduction of total projected carbon emissions by one billion tonnes from now to 2030.



Reduction of the carbon intensity of the economy by 45 per cent by 2030, over 2005 levels.



Achieving the target of net zero emissions by 2070.



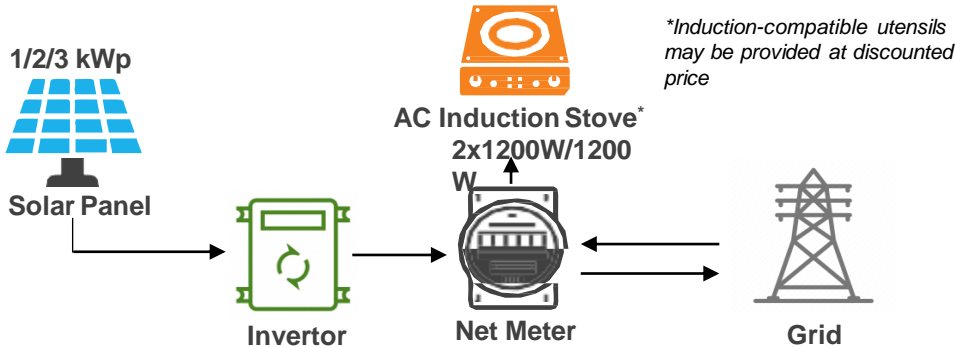
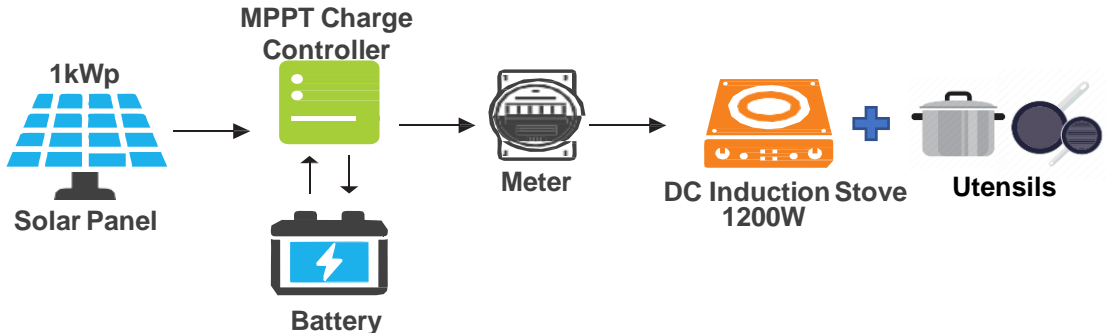
* [India Energy Outlook 2021 \(windows.net\)](https://www.windows.net)

Proposed Solutions



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	S-ICS Without Battery (Grid Connected)	S-ICS With Battery (Off-Grid)
Target Beneficiary	 <p>Indian households that currently rely on LPG/PNG /firewood</p>	 <p>BPL households having “Jan Dhan” Accounts, and are dependent on firewood/cow dung cake/biomass</p>
Key Characteristics	<ul style="list-style-type: none"> Living in urban/semi-urban/rural areas Reliable electricity access Good household infrastructure Appropriate electricity distribution infrastructure 	<ul style="list-style-type: none"> Living in rural areas Primarily dependent on firewood/ cow dung cake /biomass Unreliable electricity access Poor household infrastructure Low capacity of distribution transformers Lower sanctioned load <2kW
Proposed Model	 <p>1/2/3 kWp Solar Panel</p> <p>Inverter</p> <p>AC Induction Stove* 2x1200W/1200</p> <p>Net Meter</p> <p>Grid</p> <p><i>*Induction-compatible utensils may be provided at discounted price</i></p>	 <p>1kWp Solar Panel</p> <p>MPPT Charge Controller</p> <p>Battery</p> <p>Meter</p> <p>DC Induction Stove 1200W</p> <p>Utensils</p>
Intended Outcomes	<ul style="list-style-type: none"> Access to cleaner mode of cooking Negligible operating cost Net metering benefits Impact on grid peak power 	<ul style="list-style-type: none"> Access to cleaner mode of cooking Negligible operating cost Nil impact on grid peak power

CASE STUDY 1: ANERT RTS + Induction Project



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Objective: The project proposes to study the impact of a solar-based induction cooking solution comprising RTS + induction + utensils on LPG and biomass usage for BPL households in Kerala.

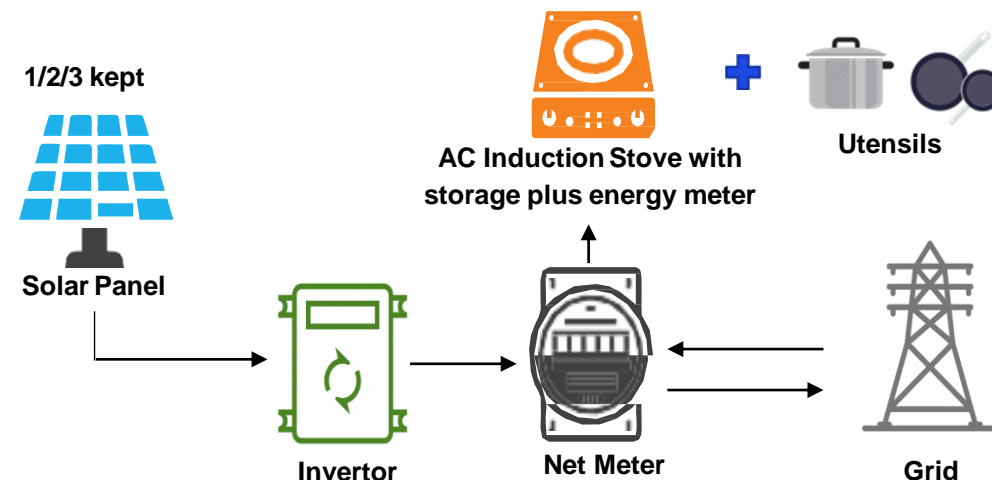
Target:

1000 target beneficiaries from the pool of PMAY Life Mission project and Puntarena Project.

Key Highlights

- Induction stoves with storage plus energy meter for future analysis
- Distributing induction friendly utensils for quick adaptation
- Awareness and Training programs

Proposed Solution



Key outcome: Proof of concept encompassing the below 6 components.



Understanding the beneficiaries and baseline



Suitability of the technical configuration



Field level implementation constraints



User Experience & endline assessment



Quantum of carbon generated



Changes required in the project plan for successful implementation

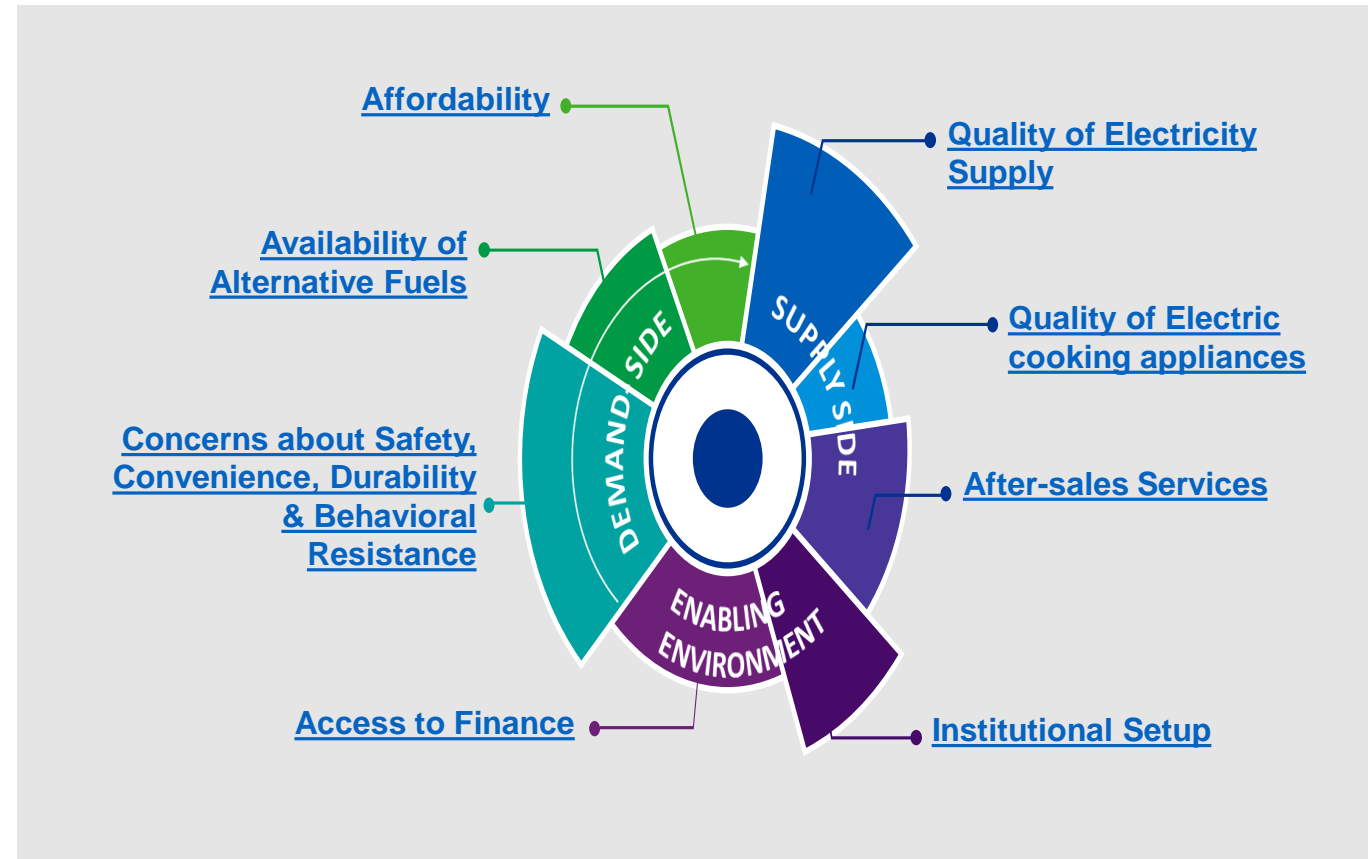
Recommendations/Conclusions



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- ❑ With most households already equipped with electricity connections, India stands primed to embrace electric cooking and leverage existing rooftop solar scheme for sustainable energy solutions.
- ❑ The success depends on to what extent we are able to overcome key barriers to electric cooking/ solar based electric cooking options.
- ❑ Need for a National level strategy/program for scaling up electric cooking/solar based electric cooking . For this need collaboration amongst key players- MOP,MOFCC, Discoms, PSUs, carbon developers, MORD, NRLMs, community



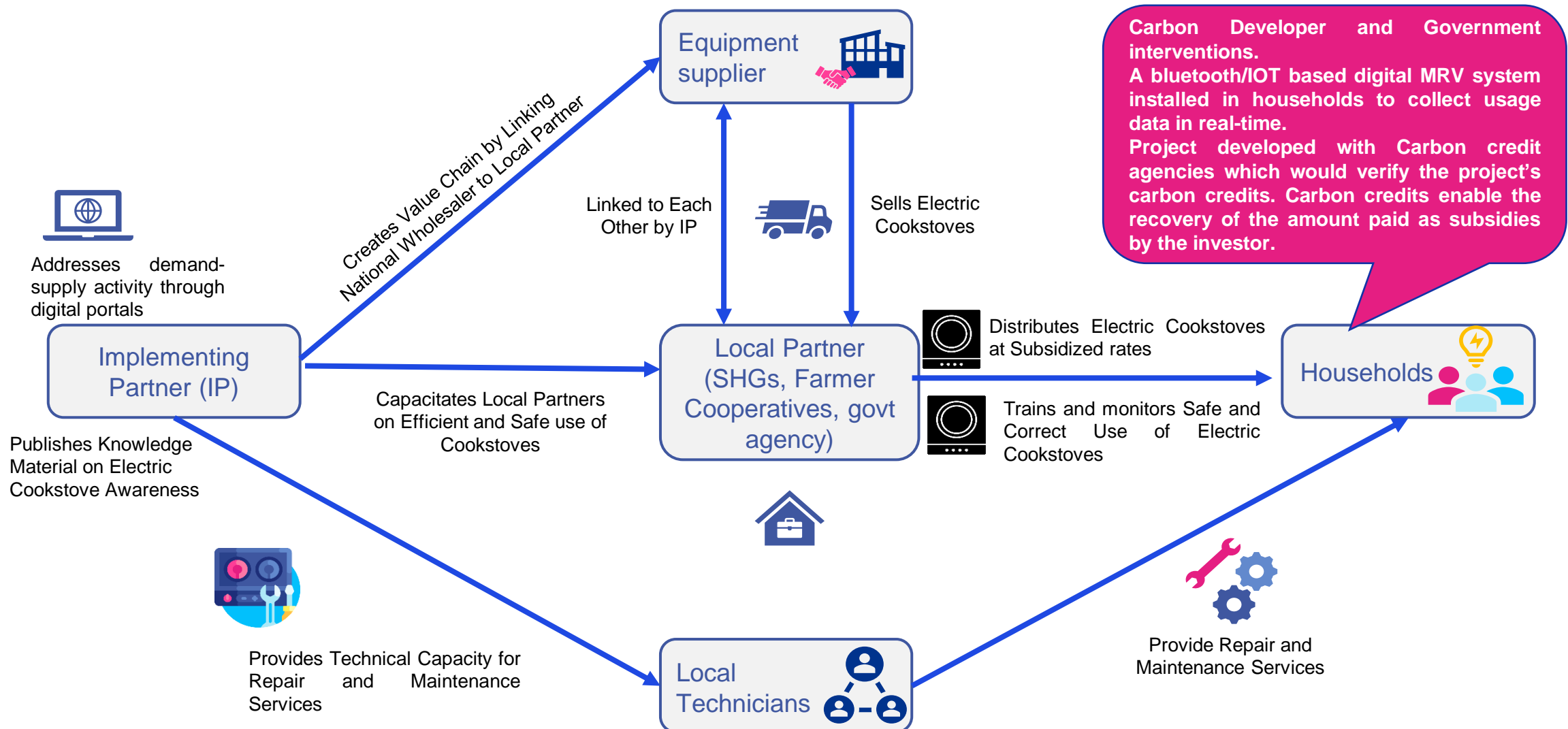
THANK YOU

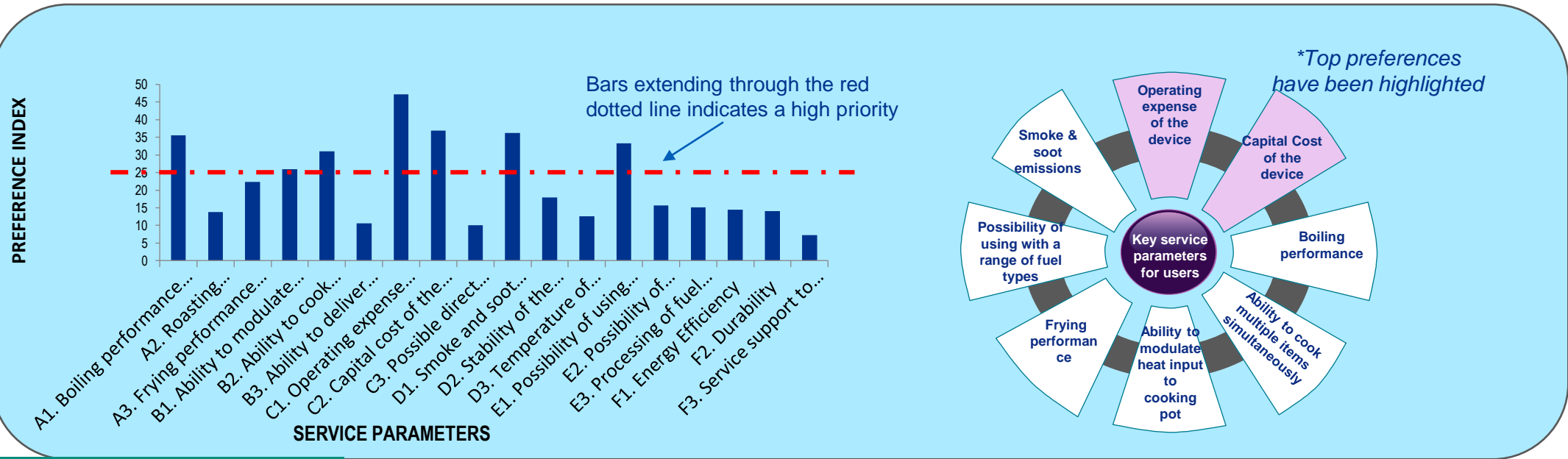
*For discussions/suggestions/queries email: **isuw@isuw.in***

visit: www.isuw.in

Links/References (If any)

ANNEXURE





Sundarbans, India
(GIZ and KPMG, 2019)

- Operating expense & capital cost are the topmost Preferred Cooking Service Parameters

Uttar Pradesh, India
(ASPIRE* and ICA**, 2023)

- Households reported lesser usage of induction stoves after their meters were changed from the fixed fee to unit meters
- Poor households (Antyodaya) having no access to biomass and cowdung, have to buy firewood/cowdung and even LPG (particularly during rainy season) from the market

Myanmar
(KPMG, 2021)

- High cost of electricity supply in mini-grid areas is a major deterrent
- Retailers' interviews revealed that the price is one of the major factors that influences consumer's buying decision apart from brand sensitivity and appliance size parameters.

Availability of Alternative Fuels



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Uttar Pradesh, India
(ASPIRE* and ICA**, 2023)



(Rampur Dan-Jaunpur)



(Hariharpur-Pratapgarh)



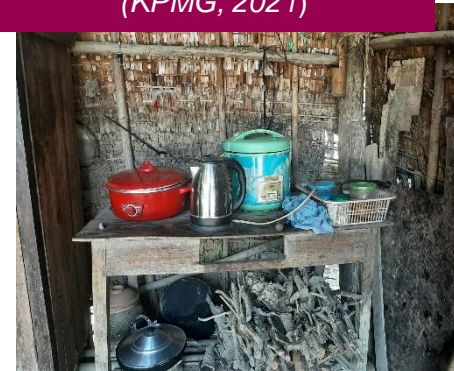
Composition of the traditional fuel: Upley, Crop Residue, and wood (Kharsoma-Sultanpur)

Village Name	Per capita biomass consumption (in kg)
Kharsoma	1.578
Bikwajitpur	1.533
Jura Dandu Pur	1.350
Jayapur	1.152
Sahapur	1.125
Saray Arjun	1.068
Krishnapur	1.017
Hariharpur	1.008

- *Traditional cooking method is being reported to be used despite possessing an LPG connection*
- *Both LPG and Induction cooking methods being used simultaneously*

- *In mountainous regions, use of induction cooking is observed more as cost and effort to transport LPG is relatively high*
- *Electricity is available at subsidized rate (e.g. Himachal Pradesh) where hydro power generated electricity is predominant*

Myanmar
(KPMG, 2021)



Households using electricity as primary source of cooking are observed to mostly stack with collected firewood followed by charcoal and purchased firewood in grid areas. Charcoal is widely used for affordable cooking in Myanmar, though prices vary. Firewood is typically collected free of charge from the environment

[BACK](#)



Uttar Pradesh, India
(ASPIRE* and ICA, 2023)



Electric shock: Ankita, stopped using induction after 2 months as she was noticing electric shocks after each incident of dal spillover



Uttar Pradesh, India
(ASPIRE* and ICA, 2023)

Absence of utensils: Manju was given an induction stove with utensils. Within 2-3 days, Manju started cooking all her meals on the induction. But she stopped using after one month when demonstration utensils were taken away from her, and she was given monetary benefits to buy new ones.

Tamil Nadu, India
(Environment for development and Indian Statistical Institute, 2023)

- Teflon glass breakage, moisture collection, and circuit/wire burns in induction stoves are common complaints by customers.
- Some older people faced technology barriers when using induction cooktops.



Uttar Pradesh, India
(ASPIRE* and ICA, 2023)



Absence of kitchen Slab: In the absence of a suitable kitchen infrastructure, households position their induction cookstoves either on the floor or on elevated surfaces closer to the ground which leads to reported damage to fans due to collection of dust and moisture.

Quality of Electricity Supply



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Saray Arjun-Allahabad

Extra cabling/power plug & switches required to run Induction



Kharsoma-Sultanpur



Kharsoma-Sultanpur

Extra cabling/power plug & switches required to run the Induction



Kharsoma-Sultanpur



Kharsoma-Sultanpur

Can run the Induction on existing wiring but safety measures are not there



Krishnapur-Allahabad

Poor condition of wiring (power plugs and switches)

Comparatively better wiring

Uttar Pradesh, India
(ASPIRE* and ICA, 2023)

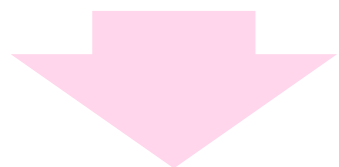
- Those having adequate connected load required to run induction stoves cite issues like electricity supply shortages, involving 2-12 hours of daily outages with multiple disruptions, and voltage fluctuations, etc. for lesser usage of such appliances
- Also, often there is no adequate connected load and wiring infrastructure to run electric cooking appliances

Myanmar
(KPMG, 2021)

- While low voltage problems are observed more in grid areas (aging grid), mini grid areas are characterized by supply shortages and limited connected load problems.

Myanmar (KPMG, 2021)

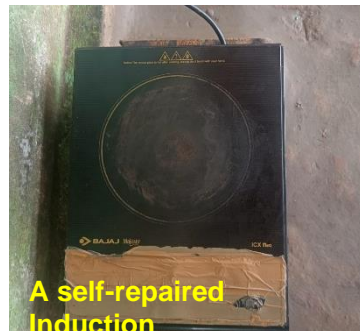
- *The availability of low-quality electric appliances has led to market spoilage in Myanmar, making users wary of electric cooking appliances.*
- *Low-quality appliances increase the chances of faults and failures in the appliance and the possibilities of electrical shocks, and therefore, creating a negative perception of electric cooking appliances in general.*



Quality assurance standards and safety certification

- *During the stakeholder interactions it was found that suppliers and distributors are not aware of specific quality assurance regulation or safety certification and e-waste disposal regulation in Myanmar.*
- *Suppliers and NGOs further mentioned difficulties in competing with various low price but also low-quality products.*





Uttar Pradesh, India
(ASPIRE* and ICA, 2023)

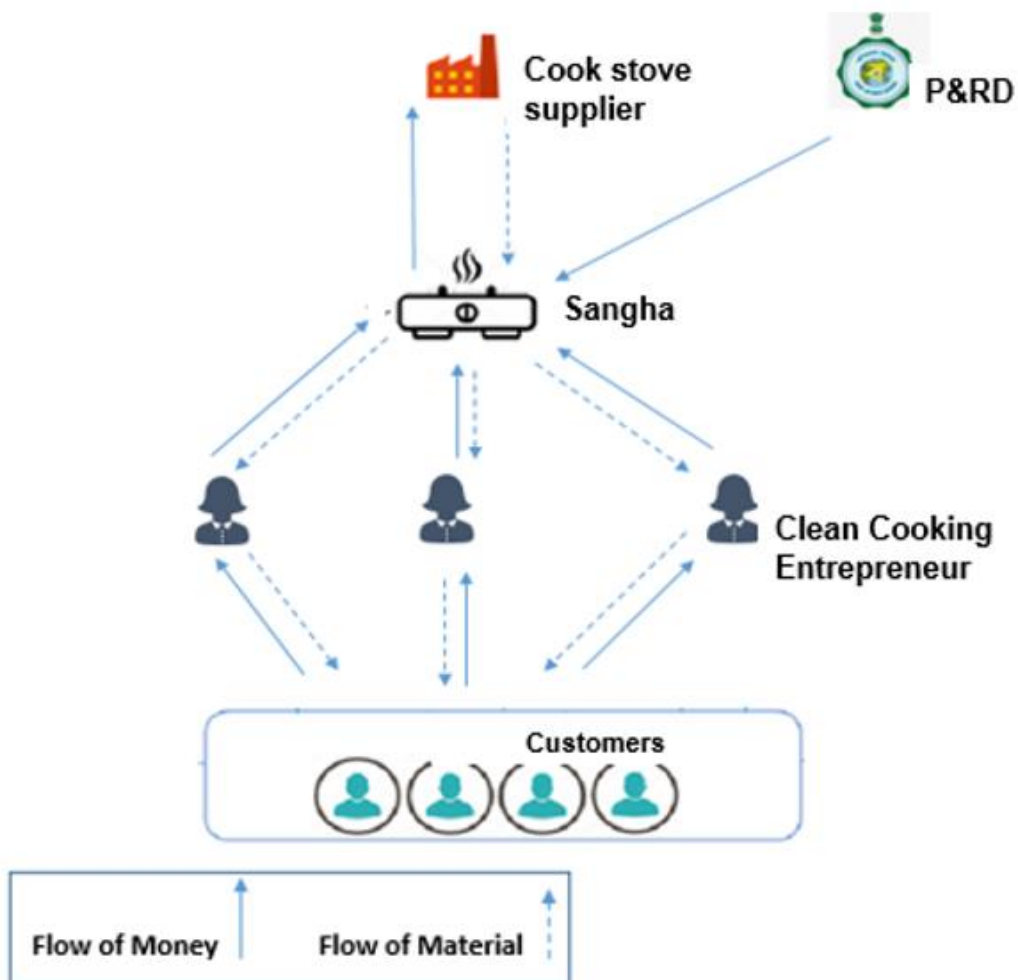
- **Limited after sales services are present at regional level**
- **Repairing/coping mechanisms after breakdown** - Most of the households who reported a breakdown (predominantly due to voltage fluctuations and wear and tear) bought a new appliance or either repair on their own.
- Some households however reported stopping of use of the specific e-cooking appliance all together.

Myanmar
(KPMG, 2021)

- **Warranty/return policy-**
 - More than 50% of households across all sampled regions reported that the appliance came with no warranty or return policy.
 - Majority of retailers interviewed do not offer any warranties in order to simplify their operations, even when the warranty is available from the original supplier. Products are tested and demonstrated as well-functioning at points of purchase
 - Average number of appliances reported to break down ranges between 1 to 3 across sampled regions.

Diagrammatic Representation of Business Model

Sundarbans, India
(GIZ and KPMG, 2019)



We need decentralized models which can run on their own with initial seed money provided to women/targeted groups for scaling clean cooking in remote regions.